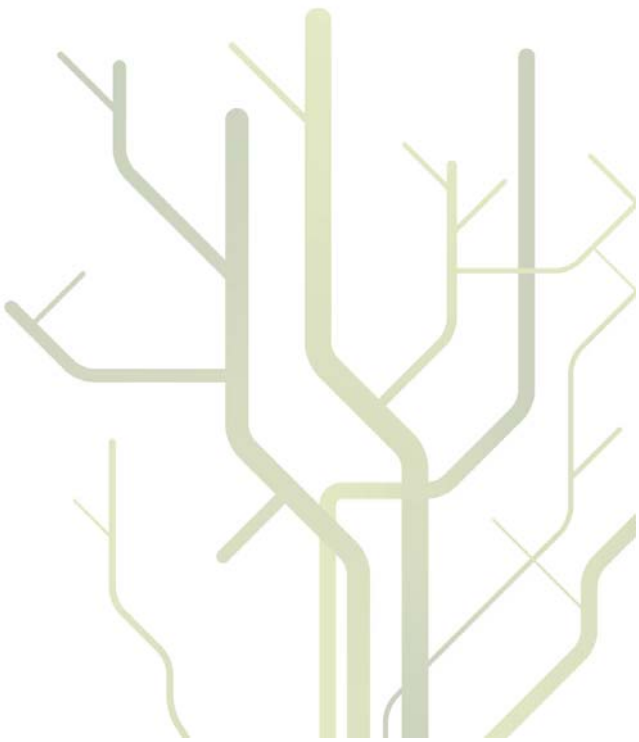
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF COMMUNITY MEDICINE

A study of fish consumption and cardiometabolic risk factors among the circumpolar population of the rural Nenets Autonomous Area in comparison with the urban population of Arkhangelsk County

Natalia Petrenya

A dissertation for the degree of Philosophiae Doctor
May 2012



UNIVERSITY OF TROMSØ UIT

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Title of the PhD thesis:

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List of papers

This thesis is based on the following papers and they are referred to in the text by their roman numerals.

Paper I

Petrenya N, Dobrodeeva L, Brustad M, Bichkaeva F, Menshikova E, Lutfalieva G, Poletaeva A, Repina V, Cooper M, Odland JØ. Fish consumption and socio-economic factors among residents of Arkhangelsk city and the rural Nenets autonomous area. Int J Circumpolar Health. 2011 Feb;70(1):46-58. Epub 2011 Feb 16.

Paper II

Natalia Petrenya, Magritt Brustad, Marie Cooper, Liliya Dobrodeeva, Fatima Bichkaeva, Gulnara Lutfalieva and Jon Øyvind Odland (2012). Serum apolipoproteins in relation to intakes of fish in population of Arkhangelsk County (J Nutrition and Metabolism, accepted for publication, 17.04.2012).

Paper III

Natalia Petrenya, Liliya Dobrodeeva, Magritt Brustad, Fatima Bichkaeva, Gulnara Lutfalieva, Marie Cooper, Jon Øyvind Odland (2012). General and central obesity and obesity-associated cardiometbolic risk in women from the rural Nenets Autonomous Area compared to Russian urban counterparts (J BMC Public Health, submitted, under review).

Abstract

Russia is a country with a high level of cardiovascular diseases (CVD) death. The nation has experienced several economic crises after the dissolution of the Soviet Union in 1991. While CVD-related deaths have decreased in Japan, North America and Western Europe during recent decades, CVD deaths in Russia have increased.

Fish consumption is believed to have cardio-protective effects. Fish consumption in the Russian Federation dropped dramatically during the period of post Soviet reforms. According to Russian Federal State Statistics Service, in 1994-2000 it was approximately 9-10 kg per capita per year, which was half that of Soviet times. In 2010, fish and fish product consumption was reported to be 15.5 kg per capita per year. Epidemiological studies where diet is the central focus are scanty in the Russian Federation.

Lean reindeer meet and local cold water whitefish species high in omega-3 fatty acids are among the main sources of nutrients in the rural area of the Nenets Autonomous Area／Okrug (NAO) and are not normally consumed by the urban Arkhangelsk population in Arkhangelsk County. The traditional diet high in omega-3 fatty acids has been shown to be favorably related to blood lipid profiles.

The unique indigenous circumpolar population Nenets is among the rural NAO inhabitants. Economical crises and transition to western lifestyle are believed to negatively affect the health of the native circumpolar population of the Russian Arctic, however little information on health and prevalence of chronic diseases and their risk factors is available.

On the contrary, plenty of large studies on health conditions of native Arctic people in Canada, Greenland, US and scandinavian contries have been performed.

The objectives of this PhD thesis were to contribute to the knowledge about health conditions of the circumpolar population of the rural NAO in comparison with the urban population of Arkhangelsk County with focus on risk factors for CVD; to estimate fish intake in these populations and to study the relationship between fish intake and blood apolipoprotein profile. We have additionally studied the prevalence and pattern of obesity in women.

The results of the thesis suggest that fish intake in Arkhangelsk County is comparable to the level officially reported for the Russian Federation. However, the rural NAO residents have experienced an increasingly impaired availability of local whitefish species, which has resulted in reduced consumption compared to the Soviet Union period, at least in some communities.

A great prevalence of smokers among men and a high proportion of obese women were detected in both locations. We did not find any differences in apolipoprotein B/apolipoprotein A-I ratio in either men or women, when communities were compared, however, relatively favourable lipid profiles were seen in the NAO group. This could be at least partially explained by higher physical activity in men and lower intake of saturated fat from meat dishes in women from the rural NAO group. The findings also suggest that despite lower level of cardiometabolic risk markers among normal weight women from NAO compared to their urban Arkhangelsk counterparts, diabetes and CVD are likely to increase in this female indigenous population due to high prevalence of central obesity known to be associated with cardiometabolic risk. Low levels of high-density lipoprotein cholesterol, high blood pressure and greater waist circumference were the major components of metabolic syndrome in women from both locations. Fish consumption was not associated with dyslipidemia in our study. In addition, our survey provides evidence of alcohol-related problems in the Arctic population of Russia which should be further investigated.

The main conclusion from this work is that a traditional and nutritionally important component of the diet i.e. fish intake is decreasing in the rural NAO population. Low monthly income was found to be a socio-economic indicator of low fish consumption. To maintain the fishing activities and increase availability of valuable fish species is important for the rural NAO group. Lifestyle, leading to obesity, low physical activity, high consumption of foods rich in starch, sugar and saturated fat, smoking, hazardous alcohol consumption and hypertension are the modifiable risk factors and should be targeted to prevent further increases in incidence of CVD and diabetes. More detailed analysis of dietary habits is needed. Large representative cross-sectional studies and prospective cohort studies are also required.

Keywords: Arkhangelsk County; Arkhangelsk; Nenets Autonomous Area / Okrug; Indigenous people; Cardiovascular diseases risk factors; Blood lipids; Obesity; Apolipoproteins; Fish consumption.

Abbreviations

CVD - cardiovascular diseases

WHO - World Health Organization

CHD - coronary heart disease

MONICA - Monitoring of Trends and Determinants in Cardiovascular disease

TC - total cholesterol

HDL-C - high-density lipoprotein cholesterol

TG - triglycerides

PUFAs - polyunsaturated fatty acids

NAO - Nenets Autonomous Area／Okrug

Rosstat - Russian Federal State Statistics Service

IHD - ischemic heard disease

LDL-C - low-density lipoprotein cholesterol

Apo - apolipoprotein

NCEP／ATP III - National Cholesterol Educational Program／Adult Treatment Panel III

BMI - body mass index

VLDL-C - very low-density lipoproteins

IDL-C - intermediate-density lipoproteins

SFAs - saturated fatty acids

MUFAs - monounsaturated fatty acids

MetS - metabolic syndrome

FFQ - food frequency questionnaire

HOMA-IR index - Homeostasis Model Assessment of Insulin Resistance index

EPA - ecosapentanoic acid

DHA - docosahexanoic acid

NOWAC - the Norwegian Women and Cancer Study

ALA - alpha – linolenic acid

SBP - systolic blood pressure

WC - waist circumference

AU - alcohol unit

CAGE questionnaire - Cutting down, Annoyance by criticism, Guilty feeling and Eye-openers questionnaire

DBP - diastolic blood pressure

1 Introduction

1.1 Mortality trends from cardiovascular diseases (CVD) and cerebrovascular diseases in Europe, other areas of the world and the Russian Federation

Russia is a country with high level of CVD death. While CVD-related deaths have decreased in Japan, North America and Western Europe during the last decades, the CVD deaths in Russia increased. According to the World Health Organization (WHO), in the European Union (27 countries) coronary heart disease (CHD) mortality (age-standardized by world population) in men declined from 139/100,000 in 1985-1989 to 93/100,000 in 2000-2004 (33% decrease). In women, the fall was from 61/100,000 to 44/100,000 (27% decrease). In the Russian Federation, CHD mortality rates in 2000-2004 were exceedingly high, around 380/100,000 for men (23% increase) and 170/100,000 for women (2% increase). In the European Union, a decline by over 30% in cerebrovascular disease mortality was registered for both sexes. In the Russian Federation, higher cerebrovascular disease mortality rates of 226/100,000 for men and 159/100,000 for women were registered in 2004 (a more than 24% increase since the late 1980s for men and 15% for women) [1].

Interpretation of these trends is complex. The international WHO project MONICA (Monitoring of Trends and Determinants in Cardiovascular disease), Finnish/Russian/Estonian, Swedish/Lithuanian, and US/Russian surveys have shown that in Eastern European countries the prevalence of traditional risk factors (hypercholesterolemia, hypertension and smoking with the significant exception of male smokers) was not higher. The number of female smokers and plasma lipid levels (total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C) and triglycerides (TG)) were even more favorable in Eastern Europe [2].

Smoking and alcoholism are suggested important risk factors for CVD among Russians. Excessive alcohol consumption has been shown to be related to CVD death in the Russian population in several studies [3-6]. One study demonstrated that vodka consumption as measured by sales per capita was significantly associated with both male and female CVD mortality rates: a one liter increase in vodka sales would result in a 5.3% increase in the male CVD mortality rate and a 3.7% increase in the female rate. The consumption of beer and wine were not associated with CVD mortality rates [7]. The psychosocial stress due to the failure of economic and political systems to satisfy material and psychosocial population needs was probably an important factor in “the CVD epidemic” in Eastern Europe [2].

Nutritional risk factors have been less investigated. The intake of antioxidants from domestic and imported fruits, vegetables, vegetable oils and nuts in most East European countries was substantially lower than in the West [2].

Improvements in diet by reduction in saturated and trans-fatty acids and increased intakes of polyunsaturated fatty acids (PUFAs), vegetable and fruit consumption may well explain part of the major declines in CHD mortality in the US, Western Europe and Japan [8-10].

It has been demonstrated that reducing saturated fat consumption by 1% and increasing monounsaturated and polyunsaturated fat by 0.5%, each would lower blood cholesterol levels by approximately 0.06 mmol/l, resulting in approximately 9800 fewer CHD deaths and 3000 fewer stroke deaths each year in Europe [11].

Little is known about PUFAs consumption in the population of Russia. An atherogenic diet and obesity have been suggested as significant risk factors related to CVD in this population [12-15].

1.2 Statistics on CVD mortality and life expectancy in Arkhangelsk city, the rural Nenets Autonomous Area / Okrug (NAO), the Arkhangelsk region and the Russian Federation

During the study period (2007-2009), CVD in the Arkangelsk region accounted for more than 50% of mortality. According to Russian Federal State Statistics Service (Rosstat), in 2008 crude CVD mortality in Arkhangelsk region was 836.3/100,000 which is in agreement with the level in the Russian Federation generally (835.5/100,000). The average age at CVD death was 66.5 for men and 77.8 for women. Cardiovascular mortality in the rural NAO was 539.8/100,000. Among the urban women living in the Arkhangelsk region, the all CVD death was 709.4/100,000: 51.1/100,000 from myocardial infarction, 390.5/100,000 from ischemic heard disease (IHD), 248.9/100,000 from cerebrovascular diseases. Among urban men, living in the Arkhangelsk region the all CVD death was 752.2/100,000: 57.9/100,000 from myocardial infarction, 457.5/100,000 from IHD, 191.5/100,000 from cerebrovascular diseases [16].

The life expectancy in the Russian Federation is less than in Western Europe: in 2007, it was 61.4 years for men and 73.9 years for women, in 2008, it was 61.8 year for men and 74.2 years for women, and in 2009, it was 62.8 years for men и 74.7 years for women [17].

In 2007, the life expectancy in the Arkhangelsk region was 73.8 years for urban women, and 60.9 years for urban men. The rural NAO was characterized as an area with very low life expectancy (48.2 years for men and 65.9 years for women in 2007) and high

mortality rate from accidents, alcohol poisoning, murders, suicides, drowning (432.8 per 100,000) and a high infant mortality rate (14.6 per 1 000) in 2008 [16].

1.3 Risk factors for CVD

Cardiovascular diseases have a complex multifactorial etiology.

The global cardiovascular risk is the probability of suffering from a coronary event or stroke in a given period of time and in this sense it is an absolute risk, generally reported as percentage at 10 years [18].

Numerous risk factors, derived from longitudinal studies of healthy people at baseline, have been postulated to be related to CVD. The most important modifiable risk factors are elevated serum TC, high low-density lipoprotein cholesterol (LDL-C), low HDL-C, high blood pressure, smoking, lack of exercise, diabetes and glucose intolerance, central obesity and atherogenic diet.

A global case-control study of risk factors for acute myocardial infarction in 52 countries (INTERHEART study) found that among the nine risk factors studied, cigarette smoking and abnormal lipids were of particular importance [19].

Based on the generally accepted view, CVD is primarily an environmental, rather than a genetic disorder. However, non-modifiable risk factors, such as age (> 55 years in men, > 65 years in women), male sex and family history of premature CHD are also considered.

The quantitative relationship between the listed risk factors and CHD risk has been elucidated by the Framingham Heart Study and other studies [20]. Various scoring systems are available, e.g. Framingham Risk Score, European Risk Score, Sheffield Tables. The Framingham database is generally accepted and has been widely used [21].

Total cholesterol was positively associated with IHD mortality [22]. It has been demonstrated on the US population-based sample, the Framingham Heart Study, that the corresponding multivariable-adjusted attributable risk percent for CHD associated with elevated TC (> or = 200 mg/dL= 5.172 mmol/L) was 27% in men and 34% in women [23].

Low-density lipoprotein cholesterol typically makes up 60-70 percent of total serum cholesterol. It contains a single apolipoprotein (Apo), namely ApoB-100 (ApoB). Low-density lipoprotein cholesterol is the major atherogenic lipoprotein. High low-density lipoprotein cholesterol level is a superior predictor of CHD risk [24]. Reducing the concentration of these particles is the primary target for CHD prevention according to the latest guidelines from the National Cholesterol Educational Program／Adult Treatment Panel III (NCEP／ATP III) [25].

Many individuals who have CHD do not have substantially elevated LDL-C but have derangement of other lipid fractions, most commonly low levels of HDL-C [26]. High-density lipoprotein cholesterol makes up 20-30% of the total serum cholesterol. The major apolipoproteins of HDL-C are ApoA-I and ApoA-II. The relationship between HDL-C and cardiovascular risk appears to be linear, continuous, negative and independent of other risk factors such as blood pressure, smoking and body mass index (BMI). Treatments that increase HDL-C levels have been shown to be effective in reducing incidence of CVD both in primary and secondary prevention settings [27].

Evidence is conflicting regarding the performance of apolipoproteins vs. traditional lipids for predicting CHD risk. A large population-based cohort study demonstrated that the overall performance of ApoB/ApoA-I ratio for prediction of CHD was comparable with that of traditional lipid ratios, but did not offer incremental utility over TC/HDL-C ratio [28]. However, another epidemiologic study suggested that instead of measuring the cholesterol in LDL or HDL, measuring their respective apolipoproteins, ApoB-100 and ApoA-I, may improve CHD risk assessment and in some observational and interventional studies, ratios of lipids and/or apolipoproteins have been better predictors of CHD risk than levels of any other lipid fraction [26]. These results were confirmed in a cohort of postmenopausal women [29]. In the US population, apolipoprotein measurements significantly predicted CHD death, independently of conventional lipids and other CVD risk factors (smoking, dyslipidaemia, hypertension, obesity, diabetes and C-reactive protein). Furthermore, the predictive ability of ApoB alone to detect CHD death was better than any of the routine clinical lipid measurements [30]. The ApoB/ApoA-I ratio is a measure of imbalance between atherogenic and anti-atherogenic lipoproteins. Current opinion is that ApoA-I, ApoB values and the ApoB/ApoA-1 ratio may be used as estimates of cardiovascular risk or as treatment goals in patients undergoing treatment for hyperlipidaemia [31-33]. Based on results from the Apolipoprotein-related MOrtality RISk (AMORIS) [34] and INTERHEART studies [19], ApoB/ApoA-I values above 0.9 in men and 0.8 in women indicate a high risk of myocardial infarction.

The role of TG in CHD risk assessment has long been debated [35-37]. Some authors suggest that lipid assessment in vascular disease can be simplified by measurement of either TC and HDL-C levels or apolipoproteins without regard to TG [38]. Although updated meta-analyses have suggested that TG are an independent risk factor for CHD, a consensus has emerged that TG more appropriately represent a biomarker of CHD risk rather than an independent risk factor [39]. Nevertheless, recent epidemiology attests that

hypertriglyceridemia may be a causal risk factor for CVD and 15% reduction in TG in high risk individuals could translate into a further 15% reduction in coronary events [40]. Triglycerides may considerably improve prediction of CVD events in women. Indeed, special aspects of coronary risk in women include the stronger role of diabetes, hypertriglyceridemia and HDL-C [41]. The most likely candidates for atherogenic triglyceride-rich lipoproteins are remnant lipoproteins [42]. These lipoproteins include small very low-density lipoproteins (VLDL-C) and intermediate-density lipoproteins (IDL-C). Their elevations emerged as a strong predictor of coronary atherosclerosis and CHD [43-47].

Risk assessment that takes into account the entire lipid profile will identify more high-risk individuals. However, measurements of ApoA-I, ApoB and remnant lipoproteins is not recommended for routine risk assessment in NCEP / ATP III [25]. Only TC, LDL-C, HDL-C and TG have been recommended for assessing CHD risk in routine clinical practice.

Twenty eight per cent of CHD events in men and 29% in women were attributable to blood pressure levels that exceeded high normal (> or = 130/85 mmHg) in the Framingham Heart Study [23].

Physical activity can improve several metabolic risk factors associated with CVD and is associated with a lower risk of CVD mortality [48, 49].

In fact, diet contributes to the development of atherosclerosis, the underlying cause for CVD. Diet affects blood lipid levels, blood glucose levels, body weight and blood pressure. Nutrient-dense foods including fruits and vegetables, whole grains, low-fat dairy, lean protein foods including fish and seafood, and vegetable oils are considered beneficial for blood lipids and other CVD risk factors. Consumption of energy-dense diets is related to the high prevalence of dyslipidaemia. Foods and nutrients to limit include solid fats (saturated fatty acids (SFAs), trans-fatty acids), added sugars, refined grains and sodium [50]. During the past several decades, reduction in fat intake has been the main focus of national dietary recommendations to decrease risk of CHD. Types of fat consumed have, however, a more important role in determining the risk of CHD than the total amount of fat in the diet [51]. A follow-up study in which data from 11 American and European cohort studies were pooled together, found that replacing SFAs with PUFAs rather than monounsaturated fatty acids (MUFAs) or carbohydrates prevents CHD over a wide range of intakes [52].

Higher-than-optimum blood glucose is a leading cause of CVD mortality in most world regions [53]. Fasting hyperglycemia is an independent risk factor for CVD [54].

Central obesity significantly and independently contributes to cardiovascular outcomes and to residual risk after accounting for the Framingham equations [55]. Many studies support

the evidence that obesity is strongly related to CVD [56-61]. A study of 91,246 ambulant patients in 27 European countries demonstrated that abdominal obesity impacted similarly on the frequency of diabetes across Europe, despite regional differences in cardiovascular risk factors and CVD rates. Increasing abdominal obesity may offset future declines in CVD, even where CVD rates are lower [62].

Through complex endocrine pathways, individuals with obesity, have a propensity to develop insulin resistance [63], a key abnormality associated with an atherogenic, prothrombotic and inflammatory profile which has been named metabolic syndrome (MetS) [64, 65]. The metabolic syndrome is a cluster of risk factors for CVD and type 2 diabetes mellitus, which occur together more often than by chance alone. Several major organizations have made an attempt to unify MetS criteria [66]. Abdominal obesity, increased TG level, low HDL-C, hypertension and elevated glucose concentration are generally included in this cluster [67].

The ability of insulin to stimulate glucose uptake varies more than six-fold in apparently healthy individuals [68]. The Homeostasis model assessment is used to yield an estimate of insulin sensitivity and β-cell function from fasting plasma insulin and glucose concentrations. The original equations (by Matthews et al.) are widely used clinical and epidemiological tool and simplify to: Homeostasis Model Assessment of Insulin Resistance index (HOMA1-IR index) = fasting plasma insulin concentration (mU/l) × fasting plasma glucose (mmol/l))/22.5 and HOMA1-%B = 20 × fasting plasma insulin concentration (mU/l))/fasting plasma glucose (mmol/l) − 3.5 for insulin resistance and β-cell function respectively [69]. Reported values for the definition of insulin resistance (the top 25% of the distribution in non-diabetic subjects) vary widely [70]. Low HOMA-IR values indicate high insulin sensitivity, whereas high HOMA-IR values indicate low insulin sensitivity (insulin resistance).

1.4 Marine diet: aspects in relation to cardiovascular risk in Arctic indigenous populations

Favorable lipid profile and low mortality from IHD has been reported among indigenous circumpolar populations, when compared to non-indigenous populations.

In the late 1970s, epidemiological studies by Bang and Dyerberg [71-75] showed that Greenland Inuit had a lower risk of CVD compared to the Danish population due to low intake of SFAs and high intake of n-3 PUFAs, derived from fish, seal and whale (PUFAs / SFAs ratio was 0.84 in Inuit and 0.24 in Danes). The intake of proteins in Inuit was almost

double compared to Danes, compensated for by a reduction in carbohydrate. Inuit were reported to have decreased serum concentrations of TC, TG, LDL-C and VLDL-C and men also had increased levels of HDL-C [71-76].

In the early 90s, a health survey conducted in the Inuit of Nunavik in Quebec, Canada, demonstrated that mean consumption of traditional food of marine origin (mattak (white whale skin), red char (arctic char), ringed seal meat, lake trout, lake whitefish and etc.) was 131 g/day, investigated by 24-h dietary recall in the total group and 163 g/day, investigated by food frequency questionnaire (FFQ) in women. The n-3 fatty acid concentrations, expressed as the percentage of total fatty acids in plasma phosphlipids, were positively associated with HDL-C concentrations and inversely associated with TG concentrations and the ratio of total to HDL cholesterol. In contrast, concentrations of TC, LDL-C and plasma glucose increased as n-3 fatty acid concentrations increased [77]. During the period 1992-1996, the age-standardized mortality rate for IHD was lower among Inuit (66.3⁄100,000) than among the non-indigenous Quebec population (140.2⁄100,000) [78]. In the early 90s, a similar study was conducted among the Inuit of Greenland. The intake of marine food was estimated to be 22% of the total energy and distributed as 100 g⁄day of seal, 64 g⁄day of fish, 44 g⁄day of whale and 17 g⁄day of sea-birds. A diet rich in marine oils was positively associated with serum HDL-C and blood glucose and inversely with VLDL-C and TG among this population [79].

The diet of Alaska Natives, including Inuit, American Indians and Aleuts traditionally consisted of foods rich in n-3 PUFAs [80]. The mean daily intake of fish and shellfish for Alaska Natives was 109 g in 1987-1988 when the national intake was 17 g. An autopsy study by McLaughlin et al. (1989-1993) in a sample of Alaska Native and non-Native subjects indicated that Alaska Natives had less advanced atherosclerosis in coronary arteries, along with higher proportions of n-3 PUFAs and lower proportions of n-6 PUFA in adipose tissue, than did non-Natives. The significant positive association was observed between blood HDL-C and long-chain n-3 adipose tissue triglyceride fatty acid in Alaska Natives [81].

1.5 Fish consumption in the Russian Federation and Europe

Based on long-term research and observation, fish consumption is considered to be a healthy dietary pattern. Furthermore, its preventive effect on the development and progression of CVD has been demonstrated by many studies [82-86]. The main effect was attributed to long-chain n-3 PUFAs, ecosapentanoic acid (EPA) and docosahexanoic acid (DHA).

The World Health Organization recommends regular fish consumption, 1 to 2 servings per week. Each serving should provide the equivalent of 200 to 500 mg of EPA and DHA

[87], and cardioprotective benefits have been observed with daily consumption of as little 25 to 57 g of fish high in omega-3 fatty acids (salmon, trout, mackerel, herring, sardines, anchovies) [88]. Indeed, in general, fish consumption levels are often below dietary advice [89].

Russia experienced several economic crises after dissolution of the Soviet Union in 1991 [12]. Fish consumption in the Russian Federation dropped dramatically during the period of post Soviet reforms. According to Rosstat in 1994-2000 it was approximately 9-10 kg per capita per year, which was half that of Soviet times [90]. Data on fish and fish products consumption among the population of the Russian Fderation from 1970 up to 2010, provided by Rosstat [91], is presented in Table 1.

Table 1 Fish and fish products consumption [a] (per capita a year; kg)

	1970	1980	1990	1995	2000	2005	2006	2007	2008	2009	2010
Fish and fish products consumption	18.6	22.5	20.4	9.5	10.4	12.6	13.1	13.9	14.6	15.0	15.5

[a] Rosstat : Russian statistical annual - 2011 year.

The average fish consumption in Europe was estimated to be approximately 21 kg (live weight equivalent per capita) in 2005 based on fish supplies report [92].

In the general population, 250 mg of EPA and DHA per day appears sufficient for primary prevention of risk of coronary death. This corresponds to one 6-oz (170g) serving (or 2 medium size servings) per week of wild salmon (approx. 1774 EPA+DHA mg per 6-oz serving). For individuals with IHD, intake of 500-1000 mg per day appears reasonable for secondary prevention of risk of coronary death [93]. The content of n-3 PUFA in seafood varies considerably in relation to location and season of capture (mackerel 1.8-5.3 g／n-3 PUFA／100 g, herring 1.2-3.1 g／n-3 PUFA／100 g, salmon 1.0-2.0 g／n-3 PUFA／100 g, trout 0.5-1.6 g ／ n-3 PUFA ／ 100 g) [94]. For freshwater mixed whitefish species (family: *Salmonidae*, subfamily: *Coregoninae*), between 1 and 1.5 g of EPA+DHA per 100 g raw fish tissue were reported [95].

Throughout Europe, substantial geographic variation exists in total fish intake, fish sub-groups and the number of types consumed. In women, the greatest intake of very fatty fish (fat 14 g or more per 100 g: herring, kippers, mackerel) was in the coastal areas of

northern Europe (Denmark ≈ 11 g⁄d, Sweden and Norway ≈ 7 g⁄d and in Germany ≈ 3-7 g⁄d). Lean fish consumption in men and women was greatest in Spain (50 g⁄d) and Greece (28 g⁄d) and lowest in the Germany and Holland. Overall, the seven fish consumed most commonly, representing 70% of intake of the whole cohort, were cod (18.7%), herring (12.8%), salmon (11.0%), hake / burbot (9.9%), tuna (8.4%), mackerel (5.7%) and trout (3.6%) [89].

Mean of whole fish, fish products, crustaceans ⁄ mollusks, roe- and roe product consumption in Norway as estimated by the EPIC (European Prospective Investigation into Cancer and Nutrition study) was found to be very high (92 g⁄day) [96].

1.6 Determinants of fish consumption

Fish consumption frequency is determined by many factors [97]. A study in Belgium demonstrated that fish consumption frequency in compliance with health recommendations was higher among women and increased with increasing age, while the presence of children in the household was associated with lower fish consumption. Also, the lowest income class had the lowest fish consumption frequency. Higher education resulted in a higher intention to eat fish, but had no effect on the consumption frequency itself [98].

Interest in healthy eating also positively influences fish consumption frequency [97].

In the Norwegian Women and Cancer Study (NOWAC) [99], it was also concluded that dietary habits differed with age. The oldest women reported higher consumption of fish, fish products and shellfish. Median for the youngest age group (45-49 years) was 70 g/day and for the oldest group (65-69 years) was 81 g/day. Practicing a healthy lifestyle and having a higher socio-economic status were associated with reporting a healthier diet [100].

Fish consumption had a positive linear association with the consumption of some other healthy foods, such as vegetables, fruits, berries, and oil both in the general population of Finland and in a population with high fish consumption. The consumption of red meat and sausages had a tendency to decrease across fish consumption tertiles but the associations were inconsistent in the study populations [101].

1.7 Fish consumption and CVD, biological effects of PUFAs

Currently, “the global epidemic” of CVD is one of the major public health concerns. The studies on diet and CVD risk factors in indigenous populations confirmed that seafood rich in n-3 PUFAs and antioxidant constituents, is favorably related to CVD risk factors and inspired extensive research into the effects of fish and n-3 fatty acid consumption on CVD outcomes of Western populations [102]. The results were summarized and critically reviewed [83, 86,

88, 93, 103-110]. Studies with different designs (observation, randomized clinical trials and experimental studies), each having complementary strengths and limitations, provide strong concordant evidence that modest consumption of fish or fish oil substantially reduces the risk of CHD death and sudden cardiac death [105].

Fish is also a good source for proteins, vitamins D, A, B, minerals (calcium, phosphorus and iron) and trace elements (selenium, iodine and zinc).

Omega-3 PUFAs include alpha – linolenic acid (18:3, n−3; ALA) and the longer chain acids, EPA (20:5, n−3) and DHA (22:6, n−3). These three polyunsaturates have 3, 5, or 6 double bonds in a carbon chain of 18, 20, or 22 carbon atoms respectively. They are essential fatty acids, meaning that they cannot be synthesized by the human body. In the "western diet" the main dietary sources of ALA are nuts, seeds and vegetable oils. As marine mammals are not a part of the "western diet", fatty fish is the main concentrated dietary source of EPA and DHA.

Possible biological effects of n-3 PUFAs consumption include antiarrhytmic properties [111-114], decreased blood pressure [115-117], decreased platelet aggregation [118-120], inhibition of new plaque development [121], reduced expression of adhesion molecules [122], improvement in endothelial function [123], plaque stabilization [124], reduced inflammatory response and immunomodulation [125-129]. The main effect of n-3 PUFAs on blood lipid profile was shown to be lowering of TG [130]. The n-3 PUFAs have also been demonstrated to reduce atherogenic remnant lipoproteins (VLDL-C and IDL-C) [131, 132]. Most evidence suggests that their consumption leads to down-regulation of synthesis and secretion of VLDL particles and accelerated TG removal from VLDL and chylomicrons through upregulation of lipoprotein lipase [133].

A systematic review of intervention studies demonstrated that effects of omega-3 fatty acids on ApoA-I levels were generally heterogeneous, but small. Little consistency in the effect of omega-3 fatty acids on ApoB levels was reported [134].

A lower EPA+DHA content was shown to be associated with lower HDL-C and higher LDL-C and TG concentrations [135].

Omega-3 fatty acids increase the size of lipid particles and make them less atherogenic [136].

Omega-3 polyunsaturated fatty acid intake was related to a protective HDL subspecies profiles and a trend towards larger particles [137, 138] independent of genetic and shared environmental factors in monozygotic twins [139]. Omega-3 polyunsaturated fatty acid supplementation has been reported to cause a shift in the distribution of HDL-C by selectively

increasing larger HDL2 subspecies [140, 141]. The mechanism for the increased LDL-C levels upon omega-3 supplementation could be related to higer conversion of VLDL particles into LDL [133].

1.8 Diet and lifestyle transition in Arctic Indigenous peoples and health outcomes

The current belief that the circumpolar indigenous people are protected from CVD is seriously questioned by the results of many recent studies. Increasing use of processed food high in starch, fat and sugar and decreasing physical activity lead to an increase in chronic diseases, such as diabetes and CVD among indigenous populations [142-144].

In recent years, the prevalence of CVD risk factors among native Arctic people has been increasing [145]. In Canada, indigenous people have an increased prevalence of CVD compared with other Canadians [146]. Hospitalisations for IHD have doubled in the native population despite declining rates in the general population of Ontario, Canada [147]. Increased admission to hospital for IHD among native population in the other community, Sandy Lake and extremely high rates of obesity were identified [148]. Another study reported that 60% of women and 35% of men among First Nations People living in the Manitoba community were at increased CVD risk because of low ApoA-I level [149]. In 2004, the cohort study of Inuit from Nunavik, Quebec estimated that 19% of individuals had a disease of the circulatory system. The major modifiable CVD risk factors were smoking (84%), obesity (49%) and elevated blood pressure (18%). Prevalence of CVD risk factors was globally higher among women. However, 88% of men and 99.5% of women were in the lowest Framingham risk score (0-1) [150]. The encouraging lipid profile with high HDL-C and low TG was observed in this population again 12 years later [77, 150].

A recent study of the Alaskan indigenous population showed that the prevalence of low HDL-C and high LDL-C was higher than among the US population with an overall prevalence of high cholesterol among Alaskan participants of 40%. It was concluded that most Alaskan Natives are now more sedentary and have transitioned to a mixed traditional and Western diet, thus the high prevalence of dyslipidemia is likely to continue [151].

1.9 Obesity, metabolic syndrome and co-morbidities (CVD and diabetes mellitus) in Russia and Arctic Aboriginal population, gender aspects

The World Health Organization currently recognizes obesity as a “global epidemic”, because of the dramatic increase worldwide: obesity has more than doubled since 1980 and more than

one in ten of the world's adult population is obese [152]. Obesity is associated with severe chronic ailments, including diabetes mellitus, CVD and hypertension [64, 153, 154].

Obesity affects all nations, including ethnic minorities [155-157]. Accumulation of fat tissue generally is related to imbalance between caloric intake and energy expenditure [158], as well as genetic predisposition [159]. The lack of physical activity and the adoption of poor nutritional habits lead to rapid weight gain in Indigenous peoples; they are believed to be at higher risk, because they experience nutrition transition and lifestyle changes to a greater extent due to integration within the majority populations of their countries in the last decades [142, 160].

Currently, some population based studies showed that obesity and MetS are increasing more rapidly among the female population (including middle aged and young individuals) compared to the male population. In the United States, a greater age-adjusted increase in the prevalence of the MetS was observed in women compared to men. Women aged < 40 years had a 76% relative increase of prevalence of the MetS compared with a non significant increase of 5% in men of the same age group. Generally, MetS now affects approximately 30% of the adult population in the United States [161].

The World Health Organization statistics demonstrate a higher prevalence of obesity in women than in men in the Russian Federation in 1979-1985 [162]. In 2008, age-standardized estimate of obesity in women was 29.8% (25.8-33.9%) compared to 18.4% (15.1-21.8%) in men [163]. The mean BMI among Russian women increased from approximately 26 kg/m^2 to 28 kg/m^2 from 2000 to 2008. The prevalence of raised blood pressure (≥ 140 mmHg, ≥ 90 mmHg, age-standardized estimate) was 37.2% (29.0-45.8%) in men and 31.8% (24.1-39.7%) in women [164]. In 2008, age-standardized estimate of mean systolic blood pressure (SBP) in women was 128.5 mmHg (123.1-134.0 mmHg) and in men 132.2 mmHg (127.6-137.0 mmHg) [164]. As of 1st of January 2008, 2,834 million patients with diabetes mellitus were registered in Russia (282,501 with type 1 diabetes and 2,551,115 with type 2 diabetes). The true prevalence of diabetes in the Russian Federation is unknown [165]. More representative data obtained in epidemiological studies conducted by the staff of the Endocrinological Research Centre in various Regions of Russia in the past 5 years has demonstrated that the number of patients with diabetes in this country was most likely 3 to 4 times higher than the official rate, being approximately 8 million people, or 5.5% of Russia's total population [166].

Indeed, the epidemiological studies on obesity, cardiometabolic risk factors and prevalence of diabetes in the Russian Federation are limited. The World Health Organization MONICA project among residents of Moscow and Novosibirsk carried out between mid-80s

and mid-90s demonstrated that prevalence of obesity declined by 50% in the early 1990s in both residences, apparently due to extreme social and economic transitions that occurred in Russia during this period [167]. Next, The Russian Longitudinal Monitoring Survey (RLMS) reported that obesity (BMI ≥ 30 kg/m^2) rates among adults (age 18 and over, the average age of the sample not shown) increased dramatically for both genders over the 10 year period from 1994 to 2004 from 27.8% to 36.6% in women and from 9.5% to 16.3% in men. The average individual weight has increased from 69.9 kg to 72.2 kg in females and from 74.8 kg to 76.6 kg in males. The peak of female's BMI was at 63 years of age. Dietary fat and protein consumption was associated with increased BMI while education was associated with decreased BMI in women [15]. The World Health Organization conducted study from 2002 reported a relatively low percentage of obese women: 20.7% in Arkhangelsk and 18.7% in Murmansk [168]. Another population study on CVD risk factors, initiated by the University of Tromsø and conducted in Arkhangelsk in 2000, found 20.8% of women with BMI ≥ 30 kg/m^2 and 18.1% of women with waist circumference (WC) ≥ 88 cm. However, 50-59 year old and 60-69 year old women had a significantly higher proportion of increased BMI (35.9% and 33.3% respectively) and WC (31.0% and 33.3% respectively) [169]. The higher percentage (43.7%) of females aged 21 years and older with obesity and adiposity in Arkhangelsk was reported by another research group [170].

Only few studies on obesity and associated risks were performed on Indigenous peoples of the Russian Federation. The study on the Indigenous Siberian population - Yakut - reported rising rates of obesity among the Indigenous Siberian population. Again, mean value for BMI was higher (25.2 kg/m^2, mean age 40.8 years) in women than in men (23.7 kg/m^2, mean age 42.6 years). Interestingly, relatively low mean fasting glucose concentrations were documented among Yakut women (4.5 mmol/L) and men (4.4 mmol/L) [171]. Average WC was found to be 78.4 cm in Yakut women and 82.2 cm in Yakut men [172]. A more extended study on Evenki, Ket, Buriat and Yakut (different cross-sectional studies published between 1991 and 2003 were pooled together and analyzed) indicated that obesity had emerged as an important health issue among indigenous Siberians [173]. This issue was especially important for women, whose levels of obesity are nearly double those of men (12% vs. 7%). Age appeared to be an essential factor in the development of obesity, although there were sex differences in the development of excess body fat with age. Snodgrass J. and colleagues found that Yakut women (13%) had a considerably lower prevalence of obesity than North American circumpolar populations, including Alaska Natives (31%) [174], Yukon (17%) [142] and Inuit (22-30%) [142, 175, 176]. To the best of our knowledge, no systematic studies

on obesity in relation to other cardiometabolic risk markers in Indigenous Arctic population of Nenets have been performed to date.

Indigenous women often had higher prevalence of obesity when compared to men [150].

The cross-sectional International Polar Year Inuit Health Survey for adults 2007-2008 showed that 24.2% women were overweight, 41.6% were obese, 59.8% had an at-risk WC, 23.6% had elevated TG level and 19.3% had at-risk waist with high TG [177].

When American Indian and Alaska Native populations were studied, overall, 32.4% of the population were overweight, 47.1% were obese [178].

The prevalence of diabetes and impaired glucose tolerance has been extensively investigated in the circumpolar Inuit population and is considered high [179, 180]. Seven per cent of the United States, 5% of Canadian populations and between 8% and 48% of Canada's aboriginal, Inuit and Native Indian populations have been diagnosed with diabetes [181].

Central fat deposition pattern and obesity are observed more often among the Inuit, especially Inuit women, compared to Caucasian populations, but the obesity observed among the Inuit was not associated with the same degree of metabolic disturbance as in general Euro-Canadian and Danish populations [175, 182-184]. From this evidence the theory that obesity-associated risks of diabetes mellitus and CVD in Arctic Indigenous Peoples might be less, compared to Caucasian counterparts was raised. One study demonstrated that glucose and insulin levels showed no significant change in Inuit when different categories of obesity were compared. The authors speculated that there was a special type of insulin resistance in Inuit [182]. Several studies were consistent in observing that at each level of BMI or WC, the Inuit had lower levels of TG and higher levels of HDL-C [182], lower blood pressure and lipid levels than in Euro-Canadians [183]. In addition, they had lower levels of 2-hour glucose and insulin, blood pressure, TG and higher levels of HDL-C than in the Danish participants [175] and lower levels of fasting insulin and fasting glucose than in Cree individuals [184]. The unique diet and lifestyle of cold climate environments, genetics and/or other factors were suggested as contributing to differences in the impact of abdominal obesity on cardiometabolic risks. However, the evidence is sparse and underlying mechanisms are incompletely understood and need to be addressed by further research.

1.10 Nenets people

There are 160 different ethnic groups residing in the Russian Federation. Forty of them are so-called “small numbered indigenous people of the North, Siberia and Far East”. The population of these ethnic groups is 50,000 people or less and they are therefore under special protection by the State. The Nenets are one of the large population groups (44,000 people). Currently, the Nenets population is widely spread from northwestern Siberia to the northeastern European part of the Russian Federation. The population is quite isolated, has its own language, relies on natural resources and has strong food and cultural traditions. The traditional economy of the Nenets was based mainly on herding, breeding reindeer, fishing and hunting. Those who live in the Arkhangelsk region (n=7754) [185] are settled permanently in small reserved communities in the NAO, close to the Arctic Circle. During recent decades, the life-style of the Nenets people has been changing dramatically. In 1926-1927, 91.6% of the Nenets population of “Bolshezemelskaya” tundra in the NAO and the Komi republic were nomadic peoples however, by 1992 only approximately 5.1% of the population in NAO (332 individuals) were nomadic [186].

There are many similarities between indigenous inhabitants of circumpolar area of different countries. They were traditionally nomadic peoples whose culture and lifestyle were founded on hunting and gathering foods from the local environment, primarily land and marine mammals. Lifestyle changes within the last century have brought about a rapid nutrition transition, characterised by decreasing consumption of traditional diets and an associated increase in the consumption of processed, shop-bought foods. These changes may be attributed to a multitude of factors, such as acculturation, overall food access and availability, food insecurity and climate change.

2 Aims

The general aim of this PhD thesis was to study fish consumption and cardiometabolic risk factors among the circumpolar population of the rural NAO in comparison with the urban population of Arkhangelsk County.

The specific aims were:

a. To investigate and compare fish consumption among adult residents of urban (Arkhangelsk city) and the rural NAO regions of Arkhangelsk County, based on a food frequency questionnaire (paper I).
b. To describe and compare socio-economic factors between these two communities and their influence on fish intake (paper I).
c. To determine and compare serum lipid profile (total cholesterol, high-density lipoprotein, low-density lipoprotein, triglyceride, apolipoprotein A-I, apolipoprotein B, apolipoprotein B ⁄ apolipoprotein A-I ratio) in adult populations from the rural NAO and urban Arkhangelsk city (paper II).
d. To investigate the effects of fish consumption on the predictor of cardiovascular events - apolipoprotein B⁄apolipoprotein A-I ratio in these populations (paper II).
e. To study the obesity pattern, the levels of fasting glucose, insulin and Homeostasis Model Assessment of Insulin Resistance index with emphasis on gender and ethnicity in women from the indigenous Nenets settlement compared to their non-indigenous urban counterparts (paper III).
f. To address the question of whether the obesity is related differently to cardiometabolic risk factors in women from these two communities (paper III).

3 Material and methods

3.1 Project collaborators and ethics approval

The study was approved by the Ethical Committee at the Northern State Medical University, Arkhangelsk. Written consent was obtained from each participant. The project was performed in a collaboration with the Norwegian Institute of Food, Fisheries and Aquaculture Research (Nofima), Tromsø, the Institute of Community Medicine, University of Tromsø and the Institute of Environmental Physiology, Ural Branch, the Russian Academy of Sciences, Arkhangelsk.

3.2 Design

In this thesis only cross-sectional design was applied. Data was collected among volunteers recruited from urban Russian and rural Nenets communities located in the North-West of Russia. Two communities, Arkhangelsk city and the settlement in the rural NAO (Nelmin-Nos) that consisted largely of indigenous Arctic population Nenets were chosen for data collection. The characteristics of the communities are described in section 3.3 below.

3.3 Characteristics of study populations and communities

Arkhangelsk city is the urban administrative centre with a population of 348,740 (predominantly ethnic Russians) in 2008 [16]. Arkhangelsk County has administrative jurisdiction over the NAO. In 2008, the mean age of the urban population of the Arkhangelsk region was 34.7 years for men and 39.9 years for women, while the average age in NAO was 32.2 years for men and 35.7 years for women [16]. The Nenets Autonomous Area / Okrug is situated in the far Northeast of the European part of Russia, almost all of the territory is located within the polar circle. The NAO's total area is 176,700 km^2. The NAO territory may be regarded as sub-arctic and arctic tundra. The area is unique as it is the only example of flat tundra in Europe with natural, virginal landscape and natural complexes. The territory extends from North to South for 300-400 km and from West to East for nearly 1000 km from the Cape of Kanin Nose to the Urals mountain ridge. The largest river is the Pechora river; it flows north into the Arctic Ocean on the west side of the Ural Mountains. The total number of people in NAO was 42,019 in the same year [16]: 62% - Russians, 19% - Nenets, 11% - Komi, 3% - Ukrainians, 1% - Byelorussians, 4% - others.

The unique ingenious population of NAO is the Nenets People. The first historical document, in which the Nenets were mentioned, was written in the XI century. Anthropological data suggest that the first peoples in the area settled in the Paleolithic era, the eighth century B.C..

Nenets means “man”. The older and more widespread name for the Nenets is Yurak-Samoyeds, or simply Yuraks.

Anthropologically, the Nenets are representatives of the Uralic race. The Nenets languages are classified as members of the Uralic language family, making them distantly related to some European national languages – namely Finnish, Estonian, and Hungarian. The language has two very distinct dialects (tundra and forest). The written Nenets tundra language was established in the 1930s. The Nenets have both Mongoloid and European characteristics. The eastern Nenets display more Mongoloid characteristics. The Nenets of the Arkhangelsk region exhibit somewhat stronger European characteristics.

Currently, the population is partly genetically mixed with other ethnicities (in the Arkhagelsk region mostly with Komi and Russians).

There are forty five rural settlements in NAO. The most prominent are Nes (Kanin Pensinula), Indiga, Nelmin-Nos, Varandey (Malozemelskajya tundra), Krasnoe, Karataika, Khorey-ver (Bolshezemelskajya tundra), Bugrino (Kolguev Island). The settlements are small in terms of inhabitants, the percentage of the Nenets residing in these settlements varies. The villages are widely spread across NAO and barely accessible.

The indigenous village of Nelmin-Nos, where samples were collected, is located within the Arctic Circle in the rural NAO (figure 1).

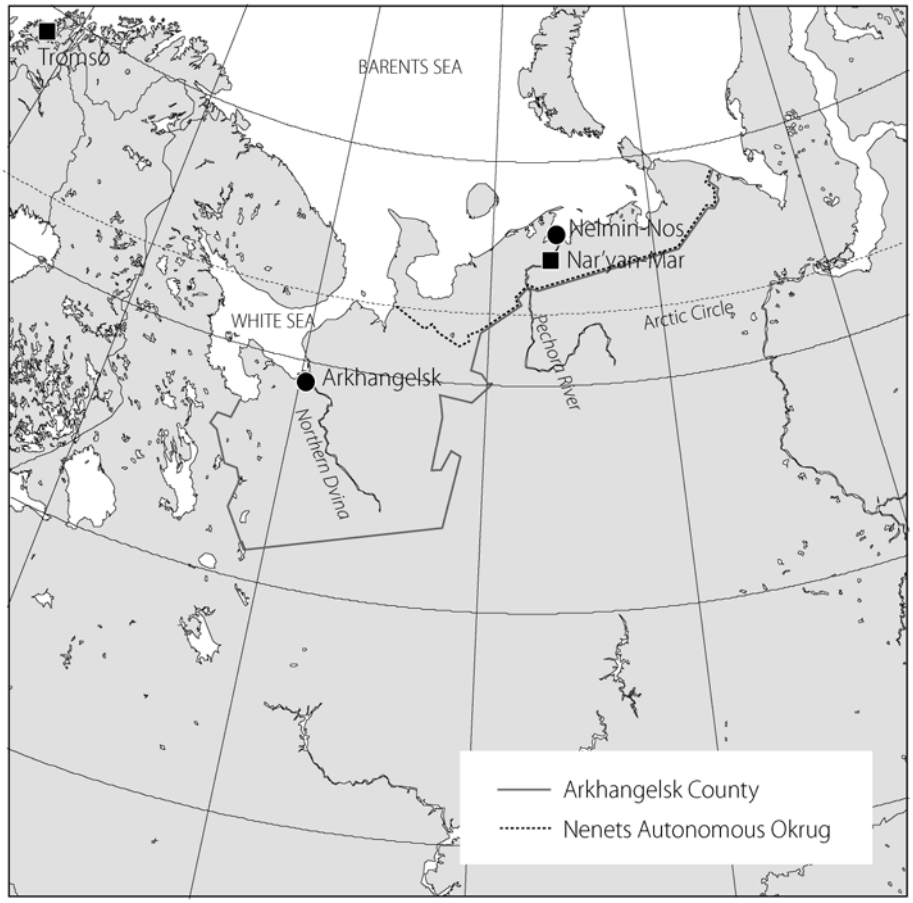

Figure 1 Study area

In 2008, the total population of the village aged 18 years or older was 580 people (282 women and 298 men). Nenets people constituted 93% of the adult population. The place for field work was chosen because the settlement of Nelmin-Nos is the most monoethnical in the region, stable and relatively large. The small local medical station was available for the project work and for accommodation. We assumed that the population habitually consumed fish, because the settlement is located on the banks of the Pechora river, approx. 70 km south of the Barents Sea. Additionally, a large freshwater lake "Golodnaya Guba" suitable for fishing is located nearby. Winter was selected as the best time for field work. First of all, the frozen biological samples could be stored and transported under more favourable conditions. Secondly, in winter, when the ice became solid, it was possible to reach the village from Naryan-Mar via the Pechora river using tracked vehicles which permitted the transport of large amounts of medical equipment. We also wished to study a reasonably isolated population. The indigenous village Nelmin-Nos is located approx. 60 km from Naryan-Mar which is a 3h journey from Naryan-Mar, the administrative center of NAO. The majority of the population have studied Russian at boarding schools and currently all of the population

speaks Russian. Hence the questionnaires were written in Russian only. Use of the Nenets language is declining amongst the younger generation.

The traditional economy of the Nenets was based mainly on herding, breeding reindeer, fishing, tundra and marine hunting. The Nenets people's traditional diet was low in carbohydrates and high in proteins and fats. Main sources are caribou meats and fish [186]. The area of reindeer pastures accounts for approx. 72% of the NAO territory.

People in the village of Nelmin-Nos live in wooden houses built during the Soviet period with no piped water supply. Drinking water is obtained from river and is not readily accessible. The village is located in a swampy area and during autumn and spring a high ground water level is problematic. The majority of houses are old and in need of repair. The village of Nelmin- Nos was founded in 1937 as a fixed center for the Nenets nomadic herding enterprise. By the 1970s, the Nenets were forced to change their nomadic lifestyle for a more sedentary lifestyle. Reindeer herding became paid labor as a part of the Soviet planned economy. In 1940, a dairy farm was established in the village in addition to the herding enterprise, this was a completely new activity. In the 1980s, Nelmin-Nos was one of the most economically successful settlements in NAO. Since the fall of the Soviet Union, reindeer herd size has been dramatically decreased. The transition to the market economy between 1990 and 2000 in NAO resulted in a high unemployment rate (40-50% of active Nenets population) and substantial reduction (by 37%) of the reindeer herd and dairy cow breeding, hunting and fishing. In general, between 1990 and 1999, a 40% reduction in the reindeer herd was registered in Russia. From 2000, the State discontinued supply of and support for reindeer meat production. The dramatic changes influenced negatively the economy and - consequently - all aspects of life in the region. The village of Nelmin-Nos have not yet through with economical crisis. Currently, the development enterprise “Vyucheisky” is not profitable and the dairy farm no longer exists. An alternative to the “Vyucheisky” enterprise has been the development of several small private herd breeding communities (“obchiny”) comprised of families and individuals (altogether 41 individuals) of the village of Nelmin-Nos. The reduction in reindeer stock by approx. 70% compared with the Soviet era was registered in this area. The socio-economic conditions in the village of Nelmin-Nos were studied in 1994 and monitored in 2007. In 1994, more than half of the respondents reported that they had to spend their entire income on food vs. 32% in 2007. In 1994, 25% of residents had difficulties in buying necessities compared to 13% in 2007 [187]. In addition to living in a harsh climate, the Nenets often have poor socio-economic and housing conditions as well as limited access to health services.

Traditionally fishery in the North is one of the most important sources of life support for indigenous peoples of the Far North. The Pechora basin from the fishery point of view is the central water system in the European North with large stocks of salmon and whitefish species, high in omega-3. The local whitefish species are unique and genetically pure. The most valuable - Inconnu (*Stenodus leucichthys nelm*) - is listed in the "Russian Red Data Book" (a state document established for documenting rare and endangered species of animals, plants and fungi that exist within the territory of the Russian Federation and its continental shelf and marine economic zone). The whitefish species are from the salmon family. The term whitefish in this context should not be confused with lean marine fish species with white flesh, such a cod (*Gadus morhua*). The Pechora basin whitefish species are a semianadromous fish family, a biological group occupying an intermediate position between resident and anadromous fish. They feed in the brackish waters of river deltas or in "sea-lakes". To reproduce, these fish travel to the lower courses of rivers, but usually do not move too far up against the current. They spawn in fresh water. Semianadromous fish differ from anadromous fish (*Salmo salar*) in that they do not live in water with oceanic salinity and usually do not travel too far out to sea. Many species are commercially valuable. The largest shoal of Atlantic salmon is Pechora salmon. The development of oil fields in the NAO increased man's impact on the local water ecosystems. Long-term observation by SevPINRO (1958-1997) showed that until the 1960s the water reservoirs of the Pechora reaches were abundant in whitefish owing to the well-developed lake and river system, high forage reserves in places of habitation and that the ratio of whitefish to non-exploitable species was 80:20%. In the 1990s, the situation changed drastically and the ratio became 45:55%. The whitefish reserves had drastically declined by 1997 [188].

Pollution, poor river reclamation and excessive exploitation of valuable fish resources were the main underlying factors. There were eight fish farms ("kolhozy") around this area as well as the "Pechorsky fish plant" in Naryan-Mar during the Soviet era. Currently the "Pechorsky fish plant" and many fish farms are closed. During the Soviet era the size of the predatory fish population was under regulatory control. However, in the post-Soviet era these regulations were repealed. In recent years the population of non-commercial lean freshwater fish species, such as id (Russian name yaz, *Leuciscus idus*), roach (Russian name Soroga, *Rutilus rutilus*), perch (Russian name okun, *Perca flavescens*) and Northen Pike (Russian name schuka, *Esox lucius*) has substantially increased. The predatory fish eat small whitefish thus preventing the valuable fish from growing to maturity. Previously, the predatory fish spawned upstream and were never found in salt water. Currently, they spawn in places

inhabited by whitefish places, along with whitefish, and are detected in salt water. No systematic procedure aimed to maintain good ecological conditions, for example, clearing grass from reservoirs or providing free passage for valuable fish, is conducted. Poachers are also a problem. Every year the State announces quotas for recreational fishing. To catch fish legally fishermen are required to obtain a license. The penalty for illegal fishing is a fine.

3.4 Sample size, sampling details

The entire sample consisted of 300 subjects between 18 and 77 years of age (54 males and 246 females). In total, 28 men (16.9%) and 138 women (83.1%) from Arkhangelsk city and 26 (19.4%) men and 108 (80.6%) from the village of Nelmin-Nos were enrolled.

Arctic indigenous people (Nenets) from rural NAO represented 88.9% of the entire Nelmin-Nos subgroup. The Arkhangelsk city population consisted mainly of ethnic Russians.

Article 1 was based on the entire sample (n=300). The samples from Arkangelsk and Nelmin-Nos were well-matched according to age- and gender- distribution.

The total number of participants in article 2 was 249. One hundred and thirty two men and women from Arkhangelsk city, aged 21-70 and 117 men and women (87% - Nenets) from the NAO, aged 18-69. Pregnant women, subjects taking cholesterol-lowering medications or with a self-reported history of diabetes, CHD and stroke were excluded from the analysis. In addition, four subjects from Arkhangelsk city and five subjects from the village of Nelmin-Nos who had missing questionnaire data were also excluded. The rationale for excluding subjects (34 individuals (20.5%) from the Arkhangelsk sample and 17 individuals (12.7%) from the Nelmin-Nos sample) was to control for potential confounders. Age distribution in males and females before and after exclusion by residence in comparison with official statistical data is shown in Table 1 and Table 2 in article 2.

Article 3 is based on female samples only (n=240), 135 women aged 21-72 from Arkhangelsk city and 105 women, aged 19-77 from the NAO (88.6% - Nenets). Pregnant women and subjects with diabetes type I were excluded from the analysis.

It was not feasible to obtain access to the population registers of the Arkhangelsk region because of legal restrictions. Hence, the study subjects were not selected randomly.

For recruitment purposes we chose some institutions in Arkhangelsk city where female workers were predominant e.g. a scientific institute, library, retail outlets and the clothing industry. Both verbal and written invitations to the health screening were used. In addition, some enrollment was achieved through invitation letters distributed to mailboxes of block housing in the vicinity of our research centre in Arkhangelsk.

In Nelmin-Nos recruitment to the study was primarily through advertisement of the health screening placed in various public areas (medical centre, shops, school, school canteen, kindergarten, museum, public bath house) as well as through verbal invitation by local health professionals. Similar to the strategy used in Arkhanglsk city, the sites for advertisements were chosen on the basis of predominance of female workers.

The study in Arkhangelsk city was conducted between April 2008 and April 2009. Field work in the village of Nelmin-Nos was performed in February 2009.

Screening consisted of the questionnaire survey, physical examination and blood sampling.

3.5 Questionnaire survey

Diet, medical history and lifestyle information was collected via research staff-administered or self-administered questionnaires (appendix I). The same questionnaire was applied for both methods.

We used either face-to-face interview (60.2% for Arkhangelsk, 26.5% for Nelmin-Nos) or self-administration of the questionnaire (39.8% for Arkhangelsk, 73.5% for Nelmin-Nos). Trained research staff conducted the interviews and provided assistance to the participants when needed. There were fewer face-to-face interviews vs. self-administrated questionnaires in the Nelmin-Nos group.

3.6 Food frequency questionnaire, dietary variables

Data on fish consumption was not available for 13 subjects from the Arkhangelsk city sample and for 16 subjects from Nelmin-Nos.

The questionnaire was developed on the basis of the NOWAC FFQ [189]. Some modifications were made to the NOWAC questionnaire to adapt it to Russian conditions. The FFQ included a detailed fish questionnaire designed to obtain information about seasonal variations in fish consumption, frequency of consumption of different fish species and portion sizes for fried and boiled fish.

The questions on fish consumption had formerly been validated in the NOWAC study [190]. However, the questionnaire was not validated for men and for the population groups studied. For this present survey, a pilot study was performed in order to evaluate the questions and the time load and some improvements were made. The final, 11-page version consisted of several sections, including personal information, social background, FFQ, etc. (appendix I).

The whitefish species from the salmon family are presented in Table 2. These are native to the Pechora river and commonly eaten by participants from Nelmin-Nos.

Table 2 Latin, English and Russian names for whitefish

Latin	English	Russian
Coregonus lavaretus	Siberian whitefish	Sig
Coregonus peled	Syrok	Pelyad
Coregonus nasus	Broad whitefish	Chir
Stenodus leucichthys nelma	Inconnu	Nelma

Fish categories were defined according to fat content, less than 4% for lean fish (cod, haddock, saithe, wolfish, flounder and redfish) and more than 4% for oily fish (salmon, trout, mackerel, herring, pink salmon, whitefish) [95, 186, 191-193]. Questions related to portion size were asked for boiled and fried cod, haddock and saithe separately. Portion sizes were defined in number of units (one slice (150 gram), one and a half slices (225 gram), two slices (300 gram), three+ slices (450+ gram)). For wolfish, flounder, redfish, whitefish and freshwater fish portion size was calculated as an average of boiled and fried portions (boiled+fried)/2. Because fatty fish species, such as salmon, trout, mackerel, herring and pink salmon are consumed in a wide variety of ways it would have been cumbersome to define servings separately for each preparation. We assumed the standard portion to be 150 gram for all of these fish species. Consumption in g/day was calculated collectively for all the fish categories, lean fish, oily fish and separately for whitefish. Respondents, especially in NAO, often reported consumption of a variety of freshwater fish in the category "Other fish" e.g. pike. Therefore, we included freshwater fish in total fish consumption.

Fat consumption in grams/day was estimated from the intake of meat dishes, including soups based on meat/chicken broth. We calculated the average amount of fat (gram per portion) for all listed food items drawn from the National Russian food composition tables [193]. A frequency was given without portion size indication. Standard portions of 75 gram for meat, chicken and meat rissoles/cakes, 50 gram for canned meat, 100 gram for sausages and 250 gram for soup were used [193].

In addition, participants from Arkhangelsk were asked how often they ate fatty fish as a main dish, i.e. never/seldom, once a month, 2-3 times a month, once a week, two and more times a week.

3.7 Ethnicity

Four questions on ethnicity were developed based on a Russian validated version of the Survey of Living Conditions in the Arctic: Inuit, Saami, and the Indigenous Peoples of Chukotka study (SLiCA study) [194]. Ethnicity was defined as Nenets if either the mother or father of the participant considered themselves to belong to Nenets and in addition, when the participant was Nenets by documentation and considered him/herself Nenets. The majority of NAO participants had ethnic Nenets for parents. Some younger people had mixed parentage, for example, the father was of Russian origin or mixed aboriginal and non aboriginal origin and the mother was of Nenets origin. Ethnicity was defined as Russians/Other (for example, Ukrainian, Byelorussian, Komi) if mother and father of the participant considered themselves to belong to Russians/Other and in addition the participant was Russian/Other by documentation and considered themselves Russians/Other (100% of men and women from Arkhangeslk). The majority of Arkhangesk participants had ethnic Russian parents.

3.8 Socioeconomic variables

We obtained information about level of education, working status, marital status and number of children per household. The following question on monthly income was asked: "What is your household's overall monthly income per person on average from all sources, including wages, pensions, cash benefits, stipends and other income? 1) Less than 1500 rubles 2) 1500,1-2500 rubles 3) 2500,1-3500 rubles 4) 3500,1-4500 rubles 5) 4500,1-6000 rubles 6) 6000,1-8000 rubles 7) 8000,1-12000 rubles 8) more than 12000 rubles".

We assessed fish availability with two additional questions: "How often do you or members of your family go fishing? 1) Weekly 2) 1-3 times per month 3) 1-11 times per year 4) Never" and "Has fish availability changed since 1991, in your own estimate? 1) Less available 2) More available 3) Not changed".

3.9 Lifestyle factors

Physical activity was categorized as sedentary, moderate or high. A sedentary job and leisure lifestyle were defined as sedentary physical activity. Walking and other physical activity, such as light gardening of at least 4h per week during leisure or work were defined as moderate physical activity. High physical activity included sports, such as jogging, skiing, gymnastics, swimming or intensive gardening or its equivalent for at least 4h a week.

Participants were subdivided into two groups: i.) every day and occasional smokers, defined as current smokers, and ii.) ex- or never smokers defined as non-smokers. Ex-

smokers, who quit smoking less than 2 years ago, were included in the group of current smokers.

With respect to alcohol consumption participants were asked the following questions: how much did you drink during the last 7 days and how often and how much have you drunk on average in the last twelve months? Categories were: never/seldom, 1 per month, 2-3 per month, 1 per week, 2-4 per week, 5-6 per week. The questions also addressed the type of alcoholic beverage consumed. The daily and weekly number of alcohol units (AU) consumed was calculated. One AU corresponded to 13.8 g of pure alcohol.

In general, heavy drinking is defined as having an average of > 14 drinks per week/> 2 drinks per day for men or > 7 drinks per week/1 drinks per day for women, binge drinking is defined as having an average of > or = 5 drinks on 1 occasion for men or > or = 4 drinks on 1 occasion for women [195].

Alcohol dependence refers to a repetitive pattern of excessive alcohol use with serious adverse consequences, often including lack of control, tolerance, and withdrawal. Alcohol abuse refers to continued drinking despite adverse consequences (in the absence of dependence).

We assessed alcohol problems by a formerly used Russian version of the CAGE (Cutting down, Annoyance by criticism, Guilty feeling and Eye-openers) - questionnaire [196]. Participants replied yes or no to four specific questions focus on Cutting down, Annoyance by criticism, Guilty feeling and Eye-openers [197]. Summary scores were calculated across responses and two or more positive answers were taken as the cut-off point for problem drinking. The CAGE-questionnaire is short, feasible to use and easily applied in clinical practice. The CAGE-questionnaire has demonstrated high test-retest reliability (0.80-0.95), and adequate correlations (0.48-0.70) with other screening instruments. The questionnaire is a valid tool for detecting alcohol abuse and dependence [198]. The accuracy of screening methods for alcohol problems in primary care was evaluated. The Alcohol Use Disorders Identification Test (AUDIT) was most effective in identifying subjects with at-risk, hazardous, or harmful drinking (sensitivity, 51%-97%; specificity, 78%-96%), while the CAGE questions proved superior for detecting alcohol abuse and dependence (sensitivity, 43%-94%; specificity, 70%-97%) [199]. However, the CAGE-questionnaire was relatively insensitive in predominantly white US general clinical female populations [200].

3.10 Prevalence of hypertension and diabetes

Individuals were defined as having hypertension when they reported having high blood pressure, hypertension as a disease and/or taking medication for high blood pressure on a regular basis and/or during the last 2 weeks. Individuals were defined as having diabetes if they reported having diabetes and ever having taken glucose lowering medication or had taken medication during the last 2 weeks.

3.11 Physical examination, anthropometric and blood pressure measurements

Body weight in kg (± 50g) was measured using an electronic scale (A&D UC-322, Japan) with participants wearing light clothing. Height was measured to the nearest 0.1 centimeter using a standard stadiometer. Body mass index in kg/m^2 was calculated.

The waist circumference was measured at the narrowest part between the lower rib and the iliac crest (the natural waist) or, in cases of indeterminate waist narrowing, halfway between the lower rib and the iliac crest. The measurements were recorded to nearest 0.5 cm with the individual standing and breathing normally. The hip circumference was defined as the widest circumference over the buttocks.

Systolic blood pressure and diastolic blood pressure (DBP) were measured after 5 minutes rest in a seated position in standard measurement position on the brachial artery with an OMRON M6 Comfort oscillometric automatic blood pressure monitor in the Arkhangelsk group and with standard sphygmomanometer using the auscultatory (manual) technique in the Nelmin-Nos group. First reading was used for analysis.

3.12 Blood sampling and laboratory measurements

Fasting venous blood samples were collected using vacutainers and centrifuged within 30 minutes. Serum was aliquotted and stored frozen at -20°C. The samples from Nelmin-Nos were drawn by the same staff, stored frozen and transported to Arkhangelsk city. All of measurements were performed at the laboratory of Biochemistry at the Institute of Environmental Physiology with an automated clinical biochemical analyzer «MARS» (Infopia Co, Ltd, Anyang, Korea) or «Cary 50» spectrophotometer (Australia). Reagents from "Chronolab AG" (Switzerland) were used. Total Cholesterol, HDL-C and TG were measured by enzymatic-colorimetric tests. Low-density lipoprotein cholesterol was measured by a turbidimetric method as previously described by Burstein and Samaille [201, 202]. Very low-density lipoprotein cholesterol was calculated with the Friedewald Equation, triglyceride/5. Apolipoprotein A-I and ApoB were assayed by an imminoturbodimetric method with

polyclonal goat serum anti-human apolipoprotein antibodies ("Chronolab AG"). The assay and calibrator concentration have been standardized against the WHO/IFCC SPI/0I standard for ApoA-I and the WHO/IFCC SP3/07 for ApoB (CDC, USA). Insulin was measured by enzyme immunoassay with Evolis Fully Automated ELISA Processor, "Bio-Rad" (Germany) and kit «DRG» (Germany) (EIA-2935) in 45 individuals from Arkhangelsk and 81 individuals from Nelmin-Nos. Both external and internal quality controls were established. Measurements met the standards of the international Quality Assurance/Quality Control network. The analytic covariance for all parameters was ≤3%.

3.13 Definition of metabolic syndrome

The NCEP / ATP III criteria (US) were used to define a MetS. Any 3 of the following constituted diagnosis: elevated WC (≥ 88 cm), elevated serum fasting glucose (≥ 6.1 mmol/L (or glucose lowering medication)), elevated TG (≥ 1.7 mmol/L (or cholesterol-lowering medication)), reduced HDL-C (< 1.3 mmol/L (or cholesterol-lowering medication)) and elevated blood pressure (≥ 130 mmHg SBP and/or ≥ 85 mmHg DBP (or treatment for hypertension)). We used these criteria as the most practical instead of other alternatives [65, 203].

3.14 Insulin resistance

Insulin resistance was defined by the calculated HOMA-IR index = fasting insulin (μU/mL) x fasting glucose (mmol/L)/22.5 [69].

3.15 Statistical methods

Statistical analysis was performed using SPSS for Windows statistical package (version 15.0 and later 19.0, SPSS Inc. Chicago, IL, USA). The Mann-Whitney U-test, the Chi-square test for independence, the Multiple Linear regression, the Univariate General Linear Model and the Analysis of Covariance were applied.

4 Summaries of papers

4.1 Paper I

Petrenya N, Dobrodeeva L, Brustad M, Bichkaeva F, Menshikova E, Lutfalieva G, Poletaeva A, Repina V, Cooper M, Odland JØ. Fish consumption and socio-economic factors among residents of Arkhangelsk city and the rural Nenets autonomous area. Int J Circumpolar Health. 2011 Feb;70(1):46-58. Epub 2011 Feb 16.

Fish consumption is considered important for the human health and believed to protect against CVD. There is a gap in knowledge regarding fish consumption in the Russian Federation. Fish consumption in the Russian Federation dropped dramatically during the period of post Soviet reforms. At the same time CVD deaths increased. Consumption of local fish species is an important component of the traditional diet of the residents of the rural circumpolar area in the Russian European North. This population have a lifestyle, living conditions and food supply that are quite different to those of the urban residents of the same region.

In the present study, we have attempted to describe total fish consumption and consumption of different lean and oily fish species in relation to socio-economic status in two populations from the Arkhangelsk region. The urban residents of Arkhangelsk city, who have easy access to a variety of market fish and residents of indigenous Nenets settlement, who rely mostly on local fish species.

Firstly, the present survey uncovered differences in the socio-economic characteristics of the study participants. Education level was lower, the number of full-time employees was less, percentage of persons with low monthly income was higher and the number of children per household was higher in the rural NAO group when compared to the Arkhangelsk group.

Secondly, lower total fish consumption was revealed among the residents of indigenous village, especially women compared to their Arkhangelsk counterparts. Average total fish consumption in this community was equal to approximately 1.25 portions of 150g per week. Residents of Arkhangelsk city consumed approximately 2.25 portions of 150g per week on average. However, oily fish were not dominating in the diet of urban participants. Locally caught whitefish species, high in omega-3 fatty acids, constituted a major part of the total fish consumption in the participants of indigenous settlement, while lean marine fish species were almost not eaten. Cod and cod family fish species were most commonly consumed by residents of Arkhangelsk city.

Thirdly, it was found that poor economical status, estimated as monthly income per capita, negatively influenced fish intake in both study populations. It is an important finding that half as many participants ≥ 35 years old from Nelmin-Nos (69.9%) reported that fish had become less available since the start of political reforms in 1991. There were 6.8% residents of Nelmin-Nos, who reported better availability of fish and 23.3%, who reported the same availability of fish. Fishing difficulties seems to be related to reduced fish consumption in the residents of the rural NAO.

The findings of the study indicate that total fish consumption per year was 17,763 kg per capita for Arkhangelsk and 9864 kg per capita for the Nelmin-Nos village. It appears that omega-3 blood / tissue status is less than recommended in the high proportion of the population studied and needs to be investigated.

4.2 Paper II

Natalia Petrenya, Magritt Brustad, Marie Cooper, Liliya Dobrodeeva, Fatima Bichkaeva, Gulnara Lutfalieva and Jon Øyvind Odland (2012). Serum apolipoproteins in relation to intakes of fish in population of Arkhangelsk County (J Nutrition and Metabolism, accepted for publication, 17.04.2012).

The aim of this study was to explore serum lipid profiles of residents of urban (Arkhangelsk city) and rural NAO regions of Arkhangelsk County. Secondly, to investigate the effects of fish consumption on the predictor of cardiovascular events ApoB/ApoA-I ratio in these populations.

The main finding of this study was that participants from NAO had a relatively favourable lipid profile compared to participants from Arkhangelsk. Women from NAO had lower levels of TC and ApoB. The conventional serum lipids were more favourable in men from NAO, HDL-C was higher, while VLDL-C, LDL-C and TG were significantly lower.

Age-adjusted geometric means of ApoB/ApoA-I ratio were 1.02 and 0.98 in men and women from Arkhangelsk and 0.84 and 0.91 in men and women from NAO respectively. Age and consumption of animal fat were positively associated with ApoB/ApoA-I ratio in women (pooled samples from Arkhangelsk and NAO). Body mass index and low levels of physical activity were positively associated with ApoB/ApoA-I ratio in men (pooled samples from Arkhangelsk and NAO). Reported oily fish consumption was not significantly correlated with ApoB/ApoA-I ratio.

As consumption of saturated fat was positively related to atherogenic apolipoprotein profiles. A more detailed analysis of dietary data is needed. Imbalance between saturated and polyunsaturated fatty acids in the diet estimated as consumption ratio might be important dietary risk factors for dyslipidemia.

4.3 Paper III

Natalia Petrenya, Liliya Dobrodeeva, Magritt Brustad, Fatima Bichkaeva, Gulnara Lutfalieva, Marie Cooper, Jon Øyvind Odland (2012). General and central obesity and obesity-associated cardiometbolic risk in women from the rural Nenets Autonomous Area compared to Russian urban counterparts (J BMC Public Health, submitted, under review).

Obesity represents a rapidly growing threat to the health of populations and is related to severe chronic ailments, including type 2 diabetes mellitus, CVD and hypertension. Currently, circumpolar groups (women to a greater extent than men) are believed to be at higher risk due to rapid transition from traditional subsistence-oriented economies, the lack of physical activity and the adoption of poor nutritional habits. The World Health Organization in 2008 recognized that approximately 30% of Russian women are obese.

In this study, we compared anthropometric characteristics, rates of general and central obesity obtained through BMI and WC measurements, rates of MetS and its components, levels of serum fasting glucose, insulin and HOMA-IR. We estimated whether the obesity is related differently to cardiometbolic risk in women from the rural Nenets and the urban Russian communities.

The main results indicate that prevalences of general and central obesity were high in both communities, 44.3% vs. 36.6% and 46.4% vs. 47.8% in NAO and Arkhangelsk women respectively. A higher prevalence of general, but not central obesity was observed in the rural NAO group compared to the Arkhangelsk group. Nenets women have different anthropometric characteristics, compared to European Russians, such as lower height, weight and hip circumference.

Metabolic syndrome was observed in 31.3% of NAO and 36.4% of Arkhangelsk participants. High TG levels were recorded in 15.4% of NAO and 20.6% of Russian city inhabitants. Low HDL-C, high blood pressure and increased WC were the most frequent markers of MetS in both residences with no differences between the populations.

Geometric means of fasting glucose (4.4 mmol/L vs. 4.9 mmol/L) and HOMA-IR (1.3 vs. 1.7), but not of insulin levels (6.8 μU/ml vs. 8.2 μU/ml) were lower in women from NAO compared to Arkhangelsk participants.

The magnitude of cardiometabolic risk associated with higher BMI is different in women from NAO. Nenets women with BMI ≥ 30 kg⁄m^2 had lower insulin and HOMA-IR levels than the Russian women. The normal weight (BMI ≤ 24.9 kg⁄m^2) women from NAO had lower levels of glucose, insulin, HOMA-IR, TG and ApoB than the Russian women at this BMI level.

Four risk factors (insulin, HOMA-IR, HDL-C and TG) were associated with BMI and six risk factors (insulin, HOMA-IR, DBP, HDL-C, TG and ApoB) were associated with WC among the Nenets women.

The study confirmed that obesity is a concern in both populations. Adiposity is clearly associated with the highest cardiometabolic risk among both Nenets and Russian women. The diet, physical activity and socio-economic factors need to be investigated in more detail in order to prevent obesity, diabetes mellitus and CVD in this population.

5 Discussion

5.1 Methodological considerations

Methodological considerations are always a central issue in epidemiological studies. The discussion possible weaknesses and strengths of methodological aspects is helpful when drawing of conclusions from the statistical results.

Cross-sectional study design

In a cross-sectional study, the investigator makes all of the measurements on a single occasion or within a short period of time. Cross-sectional designs are very well suited to the goal of describing variables and their distribution patterns and are a source of information about the health and habits of the population in the year they are carried out [204].

In cross-sectional studies, a large random selection of subjects who are representative of a defined general population are enrolled and their health status, exposures, health-related behaviour, demographics and other relevant information are measured. As such, cross-sectional studies provide a useful "snap-shot" of what is happening in a single study sample at one point of time [205].

The chosen cross-sectional study design can not provide definite information about cause-and-effect relationships, it indicates associations that may exist and are therefore useful in generating hypotheses for future research.

In fact, cross-sectional studies are an inexpensive first step in the process of identifying health problems of the population studied and collecting information of possible risk factors [205]. It is important to note that we can investigate many different variables and provide a broad base of knowledge about subjects studied using cross-sectional design.

Random and systematic errors

Random error is a wrong result due to chance – sources of variation that are equally likely to distort estimates from the study in either direction. Among several techniques for reducing the influence of random error, the simplest is to increase the sample size. The use of a larger sample diminishes the likelihood of a wrong result by increasing the precision of the estimate.

Systematic error is a wrong result due to bias-sources variation that distorts the study findings in one direction. The only way to improve the accuracy of the estimate (the degree to

which it approximates the true value) is to design the study in a way that reduces the size of the various biases [204].

Sample size

The sample size of our study was relatively small and could result in reduced statistical power, wider confidence intervals or risks of errors in analysis. From 580 of the adult population of the village 134 persons took part in the study (23%). The Nelmin-Nos group covered quite a high percentage of the total adult female population. From 298 of the female population 108 persons took part in the study (36%).

Selection bias

Selection bias is a systematic difference in terms of exposures or outcomes between subjects enrolled for a study and those not enrolled. This leads to an under- or over-estimation of descriptive statistics, such as prevalence rates, or association statistic, such as odds ratios [205].

For example, non-random selection can lead to selection bias. A major effect of selection bias is that it reduces the external validity of the study.

Generalisability or external validity is an extent to which the study results can be applied to the target population, in our case the generalisability of the results to the communities studied.

In our study we selected subjects in the community who represented the healthy population.

These samples are often recruited using mass mailings and advertising, and are not fully representative of a general population, because they must (a) volunteer, (b) fit inclusion and exclusion criteria and (c) agree to be included in the study. True “population-based” samples are difficult and expensive to recruit, but useful for guiding public health and clinical practice in the community. One of the largest and best examples is the National Health and Nutritional Examination Survey (NHANAS), a probability sample of all US residents [204].

One of the limitations of our study is the difficulty in obtaining a representative sample due to the lack of a population registry available for research. This could reduce the external validity and generalisability of our findings.

Age distribution

Age distribution in males and females before exclusion (samples used in paper 1) and after exclusion (samples used in paper 2) by residence in comparison with official statistical data, obtained from Rosstat for the year 2008 for the Arkhangelsk region and in the medical center of Nelmin-Nos for the year 2009 is shown in Table 3 and Table 4.

Table 3 Age distribution (%) in males before and after exclusion by residence in comparison with official data

Age groups	Arkhangelsk region urban population 2008 n=323701#	Arkhangelsk city entire study sample April 2008-April 2009 n=28	Arkhangelsk city study sample after exclusion n=21, excluded n=7	Nelmin-Nos population 2009 n=268	Nelmin-Nos entire study sample February 2009 n=23*	Nelmin-Nos study sample after exclusion n=22*, excluded n=1
20-29	26.8	21.4	14.3	23.9	26.1	27.3
30-39	21.3	28.6	38.1	25.4	26.1	27.3
40-49	20.0	25.0	28.6	25.7	21.7	22.7
50-59	18.3	14.3	9.5	17.5	21.7	18.2
60+	13.6	10.7	9.5	7.5	4.4	4.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

*Three males from Nelmin-Nos (age group 18-19 years old) were not included in the present table.
#36.2 % of males are Arkhangelsk residents.

Table 4 Age distribution (%) in females before and after exclusion by residence in comparison with official data

Age groups	Arkhangelsk region urban population 2008	Arkhangelsk city entire study sample April 2008-April 2009,	Arkhangelsk city study sample after exclusion	Nelmin-Nos population 2009	Nelmin-Nos entire study sample February 2009	Nelmin-Nos study sample after exclusion
	n=405329#	n=138	n=111, excluded n=27	n=285	n=107*	n=91*, excluded n=16
20-29	21.5	9.4	9.0	20.4	14.0	14.3
30-39	17.3	18.1	22.5	24.9	24.3	25.2
40-49	18.0	17.4	17.1	20.7	22.4	25.3
50-59	19.9	42.8	43.2	21.4	26.2	27.5
60+	23.3	12.3	8.2	12.6	13.1	7.7
Total	100.0	100.0	100.0	100.0	100.0	100.0

*One female from Nelmin-Nos (age group 18-19 years old) was not included in the present table.
#38.3 % of females are Arkhangelsk residents.

The sample of Arkhangelsk women had fewer participants in age groups 20-29 and 60, and more participants in age group 50-59 when compared with the urban population of the Arkhangelsk region.

Differences (the Chi-square test) between age distribution of the Arkhangelsk study population before or after exclusion and official age-distribution of the urban population of Arkhangelsk region as well as between age-distribution of study population of Nelmin-Nos before or after exclusion and official age-distribution of this indigenous community were not significant.

Young subjects were underrepresented in our sample. However, the deviations from official average age were similar for both residences. For the entire sample, median age in Arkhangelsk was 4.8 years higher in men and 10.6 years higher in women than officially reported for the urban population of the Arkhangelsk region in 2008. For the entire sample median age in Nelmin−Nos was 4.3 years higher in men and 10.3 years higher in women than officially reported for the NAO population by the year 2008.

Gender distribution

Samples from Arkangelsk and Nelmin-Nos largely consisted of women and were more representative for female population (for example, total fish consumption in Arkhangelsk, compared to Nelmin-Nos). However, almost all statistics were based on separate female and male sample analysis or adjusted for gender.

It is also important, that the samples from Arkangelsk and Nelmin-Nos were well-matched according to gender-distribution.

General characteristics of the study populations

General characteristics of the study populations compared with the Arkhangelsk region adapted from Averina M. [196] are shown in Table 5.

Table 5 General characteristics (%) of the study populations compared with the population of the Arkhangelsk region

	The study population						Arkhangelsk region [a]	
	Arkhangelsk		Nelmin-Nos		Arkhangelsk and Nelmin-Nos			
	2008-2009		2009		2008-2009		1999	
	men	women	men	women	men	women	men	women
Education								
Primary	7.4	5.2	44.0	15.2	25.0	9.6	13.3	10.8
Secondary, secondary professional	29.6	50.0	52.0	72.3	40.4	59.9	74.6	77.4
Higher [b]	63.0	44.8	4.0	12.5	34.6	30.5	12.1	11.8
Marital status								
Married	29.6	14.6	42.3	29.5	35.8	21.3	25.0	20.2
Not married [c]	59.3	60.0	57.7	45.7	58.5	53.6	66.4	56.4
Divorced	11.1	13.1	0.0	5.8	5.7	9.8	4.4	8.0
Widowed	0.0	12.3	0.0	19.0	0.0	15.3	4.1	15.3
Working status [d]								
Student	1.9	3.1	4.0	2.8	1.9	3.0	9.0	10.0
Employed	65.4	81.5	52.0	63.2	65.4	73.3	62.0	55.0
Housewife	0.0	1.5	0.0	2.8	0.0	2.1	0.0	2.0
Retired [e]	11.5	10.8	12.0	17.9	11.5	14.0	15.0	24.0
Unemployed	9.6	0.8	16.0	6.6	9.6	3.4	14.0	9.0

[a] The population of the Arkhangelsk region in 1999 (aged 15–72 years), according to the official statistics [Goskomstat of the Russia. Women and Men of the Arkhangelsk region: Statistic Compendium. Arkhangelsk, Russia: Arkhangelsk region Committee of State Statistics, 2000, adapted from Averina M. [196]].
[b] Complete and incomplete higher education.
[c] Including not registered marriage.
[d] Percentage from all the respondents, who answered the question.
[e] In our samples retired, don't work.

In general, the pooled study populations of men and women, which represented both the urban and rural communities, were more representative of Arkhangelsk County by education, marital status and working status than the individual groups.

In the pooled samples of men, the younger subjects (students) and persons with secondary or secondary professional education were somewhat underrepresented. The persons with primary and higher education were somewhat overrepresented.

Monthly income

In our study, the level of income was measured as average family monthly income per capita (i.e. a family monthly income adjusted for family size). This is important because family sizes in NAO were on average bigger than in Arkhangelsk. Several options to answer the question on income were offered to the participants according to the official statistics of income level distribution in the area. Income is sensitive information, so gradations that are used in the compendium of Rosstat, instead of open question for the year 2007 were chosen.

The percentages of respondents with income below the official poverty level were determined.

Our urban sample was representative for the entire population of the region with respect to monthly income. We can not make a conclusion about generalisability of the sample from Nelmin-Nos for the entire population of the settlement or the rural NAO, because no data on monthly income were available for comparison. When the Nelmin-Nos sample was compared to the rural and urban NAO official data, an inferior economy was observed in the settlement (Table 6).

Table 6 Distribution of the study population by household's monthly income per capita (%)

	NAO[a] 2007	Arkhangelsk region[b] 2007	Arkhangelsk sample 2008-2009	Nelmin-Nos sample 2009
6,000.0 rubles	5.9	30.4	25.8	35.0
6,000.1-12,000.0 rubles	16.4	37.9	41.4	26.0
Over 12,000.0 rubles	77.7	31.7	32.8	39.0

[a] The Nenets Autonomous Area in numbers, statistical compendium, Rosstat; 2008
[b] The social portrait of the Arkhangelsk region, statistical compendium, Rosstat; 2007

Internal validity

A study has internal validity if its measurements and methods are accurate and repeatable, that is if measurements are a good estimate of what they are expected to measure and if the within-subjects and between-observer errors are small.

Questionnaire design

The main aim of the study was to measure fish consumption.

No Russian version of a fish consumption questionnaire was available for the study. We therefore chose to use one previously validated in the NOWAC [190]. Some modifications were made to the NOWAC questionnaire to adapt it to Russian conditions. This approach gave us an opportunity to compare our results on fish consumption with results already reported by the NOWAC study.

The method used to access fish consumption was the FFQ. This is described in detail in paper 1.

The basic FFQ consists of two components. These include a limited checklist of foods and beverages and a frequency response section for subjects to report how often each food item was eaten over a specified period of time.

The underlying principle of the food frequency approach is that estimation of average long-term diet, for example intake over weeks, months or years, represents conceptually important exposure rather than intake on a few specific days.

Each food item must have three general characteristics. Firstly, the food must be used reasonably often by an appreciable number of participants. Secondly, the food must have a substantial content of nutrients of interest. Thirdly, to be discriminating, the use of the food must vary from person to person.

Several options exist regarding portion size. The first is to collect no additional information on portion sizes (non-quantitative FFQ). The nutrient content for typical or average portion size is used. In our study this approach was used to estimate saturated fat from meat dishes.

Semi-quantitative FFQs collect portion size information as standardized portions (i.e., eggs (1), whole milk (150 ml glass), bread (1 slice), ice cream (1⁄2 cup), butter (1 teaspoon)) or as a choice of portion sizes (i.e., ice cream (1⁄4 cup, 1⁄2 cup, 1 cup, 1-1⁄2 cups)). Questionnaires can include sets of diagrams relating to portion size to specify the amount. Questionnaires can also include open questions, i.e. “How much milk would you typically drink? Specify number of glasses…”.

In our study for fish consumption the choice of portion sizes was given in two additional questions for boiled and fried fish meals. Some subjects ignored either type of portion size questions when questions were self-administered. In this case, the minimum portion size of 150 g was assumed.

The food frequency questionnaire used has certain limitations.

The questionnaire on fish consumption was not validated for men and for the population groups studied, which can result in lower internal validity.

The respondents answered nine cross-check questions. It has been observed that intake values are often overestimated when the number of cross-check questions increases and are underestimated when several items are summarized in one question [206, 207].

Mine K. et al. [207] reported that extensive questioning results in a different value of absolute intakes of fish compared with brief questioning, but does not add any information if ranking individuals according to overall consumption of fish. In one Australian validation study, aggregate measures of consumption of fresh/frozen/canned fish (fresh fish) and smoked/salted/dried fish (preserved fish) were generated from the FFQ and were compared with responses to the summary questions regarding intakes of similar items. Both methods were tested for validity, using correlation and linear regression techniques with EPA, and retest reliability. The summary fresh fish measure underestimated frequency and grams per week given by the aggregate question by about 50%, while estimates from the summary preserved fish measure were approximately three times that of the aggregate measure. Multiple linear regression analysis suggested that the aggregates accounted for more of the variation in EPA levels, but the difference was minimal. Intra-class correlations confirmed that both methods were reliable. The study indicates that extensive questioning results in

different absolute intakes of fish compared with brief questioning, but does not add any information if ranking individuals according to overall consumption of fish.

It is likely that fish intake will be overestimated for the Arkhangelsk group because all fish items were available on the market. It is also likely that intake will be underestimated for the Nenets group, simply because they reported predominantly one category – whitefish. However, ranking of individuals according to overall consumption of fish by tertiles performed separately for Arkhangelsk city and the indigenous village seems not to be affected by the method. It would be very useful to measure EPA and DHA and total omega-3 fatty acids concentrations in the blood samples to validate our questionnaire by performing a correlation between those biochemical markers of fish consumption and the fish consumption variable.

The 24-hour dietary recall method (detailed information about everything the subject ate and drank from midnight to midnight of the previous day or over the past 24-hour period and dietary history method (24-hour dietary recall, a menu recorded for 3 days and checklist of food consumed over preceding month) is time consuming, expensive, and highly skilled professionals are needed for both the interview and processing of information. If a suitable number of recalls are collected over a long period (e.g., six recalls per individual spaced over 12-month period), these method may also be used to estimate usual intake in prospective studies. The most common current use of recall methods in nutritional epidemiology is to assess the validity of a FFQ used as a primary dietary data collection instrument. The accuracy of the dietary intake data depends on the subject's short-term memory [208].

Lower intake of fish than originally reported was also detected in the retest of both the NOWAC FFQ and 24 hour recall [209, 210].

The questionnaire on fat consumption from meat dishes was also not validated. The questions were composed similarly to those validated in the NOWAC study [209-211], but modified to match the conditions and traditional food items of the Russian North West.

In general, strengths of food frequency method 1) representative of "habitual" intake 2) preferable method of measuring intake for nutrients with very high day-to-day variability 3) questionnaire processing is significantly less expensive than food records or diet recalls 4) can be easy for literate subjects to complete as a self-administered form 5) suitable for very large studies 6) designed to rank individuals according to intake.

In general, weaknesses of food frequency method 1) retrospective method that relies upon the respondent's memory 2) cost may increase dramatically for questionnaires that must be interviewer-administered, e.g., low literacy populations 3) less sensitive to measures of

absolute intake for specific nutrients 4) arbitrary groupings of foods may not correspond to the perception of the respondent 5) exclusion of foods popular to ethnic minority groups that are significant contributors of nutrients will skew the data.

A pilot study

A pilot or feasibility study is a small experiment designed to test logistics and gather information prior to a larger study, in order to improve the latter's quality and efficiency. A pilot study can reveal deficiencies in the design of a proposed experiment or procedure and these can then be addressed before time and resources are expended on large scale studies.

For the present survey, a pilot study (n=50) was performed in Arkhangelsk in order to evaluate the questions and the time load, and some improvements were made. We followed the procedures, listed below, to improve the internal validity of the questionnaire:

- asked the subjects / interviewers for feedback to identify ambiguities and difficult questions;
- recorded the time taken to complete the questionnaire and decide whether it is reasonable;
- discarded all unnecessary, difficult or ambiguous questions;
- assessed whether each question gives an adequate range of responses;
- established that replies could be interpreted in terms of the information that was required;
- checked that all questions were answered;
- re-worded or re-scaled any questions that were not answered as expected.

However, completing a pilot study successfully is not a guarantee of the success of the full-scale survey. Many problems may not become obvious until the larger scale study is conducted.

The final, 11-page version consisted of several sections, including personal information, social background, FFQ, lifestyle, medical history, etc. The design facilitated using the questionnaire in both communities (appendix I).

Information bias

Information bias or measurement bias occur when the outcome or the exposure is misclassified.

1) Recall bias or reporting bias

Diet is a very complex exposure to measure [212]. Recall bias may happen due to inaccurate or no report (tiredness, misunderstanding and memory problems), tendency to underestimate consumption of "unhealthy foods" and over estimate consumption of "healthy foods".

Some questions may be sensitive. In our study, many participants avoided answering alcohol- and tobacco-related questions. The actual consumption of alcohol and tobacco could not be optimally assessed using only the questionnaire. One more limitation of our study is that we did not measure laboratory markers of excessive alcohol consumption such as, gamma-glutamyl transferase, that would supplement information obtained through the CAGE test. Our results on alcohol consumption and tobacco use should be interpreted with caution as they might be biased due to under-reporting. Lower alcohol consumption and higher GAGE scores in Nelmin-Nos participants could also be explained by genetic differences in alcohol tolerance.

We included the sensitive information on physical activity, alcohol and tobacco use at the end of the questionnaire to reduce the amount of incompleted questionnaires.

2) Interview bias

Questionnaires versus interviews

There are two basic approaches to collecting data. Questionnaires are instruments that respondents administer to themselves and interviews are those that are administered verbally by an interviewer. Each approach has advantages and disadvantages.

Questionnaires are generally a more efficient and uniform way to administer simple questions, such as those about age. Interviews are usually better for collecting answers to complicated questions that require explanation and interviewers can make sure that responses are complete. Interviews may be necessary when participants have a variable ability to read and understand questions. Interviews are more time consuming and they have the disadvantage that the responses may be influenced by the relationships between interviewer and respondent. Interviews are inevitably administrated at least a little differently each time.

Both methods of collecting information are susceptible to errors caused by imperfect memory; both are also affected by the respondent's tendency to give socially acceptable answers, although not necessarily to the same degree.

In general, self-administered questionnaires are more economical than interviews and are more readily standardized [204].

Both self-administration and face-to-face interviews were used in our study. Self-administration was used because some participants declined participating in face-to-face interview. The possibility to arrange face-to-face interviews was restricted in the settlement of Nelmin-Nos due to restrains of working conditions there and eligible project recourses. The same questionnaire was applied for both methods.

There were fewer face-to-face interviews in the Nelmin−Nos group. This could result in information bias, especially on sensitive information regarding alcohol intake, tobacco use and physical activity level. A higher proportion of missing data on alcohol consumption was observed in NAO, compared to Arkhangelsk. It is a difficult question to decide which of the methods of administration is better, because self-administration added privacy and can enhance the validity of the responses. Interviews, on the other hand, can ensure more complete responses and enhance validity through improving understanding [204].

To test for possible recall bias (the Chi-square test) we compared fish consumption according to the questionnaire survey method. No differences were found.

Confounding

Confounders are variables which are associated with the predictor of interest and affect the outcome. Sometimes there are several predictor variables, each of which may act as confounders to the others. For example, although coffee drinking, smoking, male gender and personality type are associated with myocardial infarction, they are also associated with each other. The goal is to determine which of the predictor variables are independently associated with myocardial infarction and which are associated with myocardial infarction only because they are associated with another (causal) risk factor.

To avoid the effect of confounders we used adjustment (paper 1,2,3), method of restriction and a method of subdividing sample into different groups, i.e. stratification (paper 1,2,3).

1) Adjustment

Multivariate adjustment technique was used in our study. The advantage is that we can adjust for the influence of many confounders simultaneously. However, if the pattern is very different from linear attempts to adjust using a linear model will be imperfect and the estimate of the independent effect of predictor will be incorrect [204].

In paper 2, positive associations between oily fish consumption and ApoB/ApoA-I ratio disappeared after controlling for confounders in females. A second order quadratic term variable of oily fish consumption was used in the model. This model was found more appropriate due to observed non-linear reverse U-shape association between ApoB/ApoA-I ratio and tertiles of oily fish consumption.

Age, smoking status, BMI and alcohol consumption that are the typical examples of confounders in epidemiology, were also considered in our study. Our questionnaire provides an extensive body of potential confounders to control for.

This method, however, has limitations. First, we were unable to adjust for all possible confounders (due to low sample size or unmeasured exposure). It is likely that some dietary and lifestyle factors might have influenced our results. For example, unmeasured binge drinking, differences in socio-economic status, psychosocial distress or low fruit and vegetable consumption would affect the study findings on ApoB⁄ApoA ratio in paper 2.

Adjustment for total energy intake is usually appropriate in epidemiological studies to control for confounding. Failure to account for total energy intake can obscure associations between nutrient intakes and disease risk or even reverse the direction of association [213]. However, we have not calculated the total energy from the diet. We calculated the amount of fat consumed from meat dishes and adjusted our models (paper 2) for this variable.

2) Restriction

In paper 2, we excluded 17% of the sample comprised of pregnant women, subjects taking cholesterol-lowering medications, subjects with self-reported diabetes, CHD and stroke, and subjects with missing questionnaire data. This exclusion could artificially skew the results and reduced the sample size of our study. However, the proportions of excluded people from both samples were approximately equal.

3) Stratification

Number of strata is limited by sample size needed to each stratum.

Unmodifiable risk factor for CVD - age, and modifiable risk factors for diabetes mellitus and CVD - levels of fasting serum glucose, insulin, HOMA-IR, SBP, DBP, serum TG, HDL-C, ApoA-I, ApoB and ApoB/ApoA-I ratio, were compared within each residence across BMI and WC groups and between residences at every level of BMI and WC in paper 3.

We divided women into three BMI and three WC groups. Due to low sample size in each stratum, only one covariable age was used to adjust for. This leads to incomplete control for confounding.

The multivariable models were applied separately in the Nelmin-Nos group and the Arkhangelsk group (paper 1), because we observed the considerable differences in socio-economic status between two populations. The multivariable models were applied separately in men (pooled samples from Arkhangelsk and Nelmin-Nos) and women (pooled samples from Arkhangelsk and Nelmin-Nos) in paper 2, because men and women respond differently to cardiovascular risk factors.

Measurements of risk factors

1) Anthropometric measurements

A crude population measure of general obesity is BMI, a person's weight (in kilograms) divided by the square of his/her height (in meters). Height, weight and hip circumference were considerably lower in Nenets women (paper 3) whilst BMI was higher compared to the Arkhangelsk women. It has previously been reported that Arctic indigenous people (Inuit and Far East Asians) have shorter legs and relatively higher sitting heights compared with all other populations studied [214]. No specific guidelines with respect to recommended anthropometric characteristics exist for the Nenets population. Consequently, using BMI values to estimate cardiometabolic risk in Nenets women may overestimate the number of individuals that are overweight and obese when general WHO criteria are used.

2) Arterial blood pressure

It is recommended that three consecutive measurements of arterial blood pressure should be performed and their mean (or the mean of the second and third measurements) used in the analysis [215]. Due to restrains of working conditions and eligible project resources we measured this parameter only once during examination in Nelmin-Nos (paper 3). We therefore used the first and only reading of blood pressure in our rural subgroup when making comparison with the Arkhangelsk subgroup. It is possible, that the average blood pressure in our study is systematically different from the true value. In the study by Averina M. [196], the

mean SBP of Arkhangelsk females was comparable to age-adjusted geometric mean of SBP in our participants (129.0 mmHg vs. 123.0 mmHg respectively), but DBP was somewhat higher in our respondents (73.6 mmHg vs. 83.6 mmHg).

3) Laboratory measurements

All the samples were drawn in the morning after an overnight fast and were analyzed in the same laboratory using standardized laboratory techniques and kits. We made an effort to ensure that every individual was fasted. Both external and internal quality controls were established. Measurements met the standards of international Quality Assurance/Quality Control network. The analytic covariance for all parameters was ≤ 3%.

5.2 Discussion of main findings

In our study, we compared urban Arkhangelsk and rural NAO populations, the latter consisting largely of indigenous Arctic population Nenets, for the prevalence of factors related to CVD. The material is unique because the Nenets population is not readily accessible for research due to its remote geographical location. No systematic data, describing socio-economic factors, health-related behaviour, dietary factors, obesity pattern and biochemical CVD-related parameters in this indigenous population has been published before.

In the first article, the intake of different fish species among residents of the Arkhangelsk region was described. Detailed data on socio-economic status was analyzed together with fish consumption and socio-economic determinants of fish consumption were identified.

In the second article, serum TC, HDL-C, LDL-C, VLDL-C, TG, ApoA-I, ApoB, ApoB⁄A-I ratio was compared between these two communities. In addition, associations between predictors of CVD events, ApoB/ApoA-I ratio, and age, residence, BMI, physical activity, smoking habit, fat consumption from meat dishes, alcohol consumption or alcohol dependence (estimated by CAGE test) and fish intake (indicator of n-3 PUFAs content) were estimated separately in men and women (pooled samples from Arkhangelsk and NAO).

During data analysis, we observed that a high proportion of women from Arkhangelsk and NAO were overweight or obese. Therefore, our third paper was focused on obesity pattern among females and obesity-associated cardiometabolic risk factors, including glucose, insulin, HOMA-IR index, blood pressure, HDL-C, TG, ApoA-I, ApoB, and ApoB⁄A-I ratio.

The rural NAO population had inferior socio-economic characteristics compared to Arkhangelsk population as judged by their level of education, income and employment.

We have not analyzed living conditions, which is also considered as a part of socio-economical status. However, we observed that houses in the indigenous settlement were in poor condition, with no water supply and with furnace heating. Higher energy expenditure can be expected in people doing the housework in these circumstances. In addition, the climate conditions are harsher, e.g. due to lower average environmental temperature in the rural NAO compared to Arkhangelsk. Our urban respondents lived in block housing with central heating, water supply, and a refuse chute. To measure and compare the impact of the differences in living conditions is a difficult task.

There is a considerable body of evidence for an association between socio-economic factors and mortality from all causes. Moreover, an inverse relationship between socio-economic status and almost all the CVD risk factors has also been reported. Both these associations could be attributed to hypertension as there is consistent and substantial evidence that low socio-economic status is related to both the prevalence and incidence of hypertension. Furthermore, there seems to be an inverse relation between socio-economic status and cigarette smoking, obesity, plasma fibrinogen, diabetes and physical activity [216], i.e. factors clustering with hypertension and CVD.

It is possible that older people who had an adverse lipid profile in middle-age died prematurely and were underrepresented in the NAO sample. The rural NAO was characterized in 2007 as an area with very low life expectancy (48.2 years for men and 65.9 years for women). In 2007, the life expectancy in Arkhangelsk was 61.4 years for men and 74.2 years for women [16].

Measures of income are obviously an important marker of socio-economic status. Income provides an access to goods and services, including foods and medical care [216].

According to official statistical data, the subsistence minimum level for the last 3 months of the year 2008 was defined as a monthly income per capita of 5 661 rubles (30 Russian rubles≈1 US$) for the Arkhangelsk region excluding NAO and 8 659 rubles for the Arkhangelsk region including NAO [217]. The difference in subsistence minimum level between the two regions resulted from higher life expenses in NAO. The average salary in the Arkhangelsk region including NAO doubled in 2008 (41,181 rubles) when compared to the Arkhangelsk region excluding NAO (18,181 rubles) [217]. The percentage of participants who reported a monthly income per capita up to 8 000 rubles was 49.5% in Nelmin-Nos while only 26.0% of participants from Arkhangelsk city reported income up to 6 000 rubles. Therefore, participants from Nelmin-Nos appeared to have on average inferior economy compared to their urban counterparts.

Fish is considered a healthy food choice. Taste and other sensory features were found to be the most important food choice motive in Russia, while "goodness for health" was ranked only 6th place. The price sensitive group was identified as having lower motivation and interest in healthy food. Availability of the product in shops in the vicinity to the house was another important motivation factor [218].

Lean reindeer meet and local cold water whitefish species high in omega-3 fatty acids are among the main sources of nutrients in the rural area of the NAO and not normally consumed by the urban Arkhangelsk population.

We have shown that current median oily fish consumption was 19.5 g⁄day in both the rural NAO and the urban Arkhangelsk city population samples. Oily fish primarily consumed by the NAO subgroup was local self-caught whitefish species while market-bought fish, predominantly processed herring, was the most frequently consumed seafood item in the urban subgroup (paper 1).

The limited access of the Nelmin-Nos population to market food, particularly fish, high prices for fish, reduction in the local whitefish population and increased fishing difficulties are very important observations in our study. These can lead to substitution of energy, derived for example, from processed meat or other "unhealthy foods" for energy, traditionally derived from fish (paper 1).

It is likely that a high proportion of the oily fish eaten by subjects from Arkhangelsk sample was consumed in the form of salted, pickled, smoked, dried or canned preparations. Only 17.5% participants reported eating fatty fish as the main dish at least once a week. An unexpected finding was lower than anticipated total fish intake in the population sample from NAO. Women from Arkhangelsk had higher total fish consumption when compared to women from NAO (paper 1). Only few people among the participants reported taking fish oil supplements, but not on a regular basis (data not shown). The estimation of the percentage of people with n-3 PUFA deficiency would be important in the populations studied.

In paper 2, we concluded that oily fish consumption was 121.8 g ⁄ week and 140 g ⁄ week among women from Arkhangelsk and Nelmin-Nos respectively and 279.3 g ⁄ week and 296.1 g ⁄ week among the corresponding groups of men.

Historically, due to the geographical location, fishing has been one of the main activities and an important way of life for residents of the Arkhangelsk region. Arkhangelsk County covers a large area (approx. 587,400 km^2) with coasts on three arctic seas: White, Barents and Kara. Northern fish species are the major source of essential nutrients particularly during the Arctic winter. The apparent fish and fish product consumption, based on a survey

of consumer expenditure in the Arkhangelsk region (2008) was estimated as 1.9 kg per capita per month (22.8 kg per capita per year), compared to meat and meat products at 5.5 kg per capita per month [217]. In the Arkhangelsk sample, the total fish consumption was approx. 18 kg per capita per year, in the Nelmin-Nos sample approx. 10 kg per capita per year. Thus, the average consumption in rural and urban areas of Arkhangelsk County was approx. 14 kg, which is in agreement with data reported by Rosstat for the year 2008 (14.6 kg) [91].

Participants from NAO appeared to have a relatively favorable lipid profile compared to participants from Arkhangelsk. The ApoB/ApoA-I ratio was 0.84 in men from NAO vs. 1.02 in men from Arkhangelsk. The difference, however, did not reach significance after adjustment for age. The conventional serum lipids were clearly more favorable in men from NAO. Levels of HDL-C were higher, while VLDL-C, LDL-C and TG were significantly lower (paper 2).

Men from NAO had also significantly lower BMI, compared to Arkhangelsk men and tended to be more physically active (72% reported high level vs. 38% in Arkhangelsk). However, the latter difference was not statistically significant (paper 2).

Body mass index and low levels of physical activity were positively associated with ApoB/ApoA-I ratio in men (pooled samples from Arkhangelsk and NAO). Reported oily fish consumption was not significantly correlated with ApoB/ApoA-I ratio in men.

The prevalence of obesity and physical inactivity should be of concern. American Indian and Alaskan Native people with higher levels of activity had significantly better clinical characteristics (HDL-C, TG, BMI and WC) [219].

The prevalence rates for overweight and obesity are different in each region, with the Middle East, Central and Eastern Europe, and North America having higher prevalence rates.

In most countries, women show a greater BMI distribution with higher obesity rates than do men [220, 221]. The WHO statistics demonstrate the higher prevalence of obesity in women in the Russian Federation than in men in 1979-1985 [162]. In 2008, age-standardized estimate of obesity in women was 29.8% (25.8-33.9%), compared to 18.4% (15.1-21.8%) in men [163].

The Russian Longitudinal Monitoring Survey (RLMS) reported that obesity rates among adults increased dramatically for both genders (especially for women) over the 10 year period from 1994 to 2004, from 27.8% to 36.6% in women and from 9.5% to 16.3% for men [15]. In 2008, WHO age-standardized estimate of obesity in women was 29.8% (25.8-33.9%), compared to 18.4% (15.1-21.8%) in men [222].

Few studies on obesity and associated risks have been performed in Indigenous peoples of the Russian Federation [171, 223]. The study of indigenous Siberian populations reported rising rates of obesity. Again, the mean value for BMI was higher in women than in men and levels of obesity in women were nearly double those of men (12% vs. 7%).

Physiologically, women deposit more fat tissue, than men. However, women store more fat in the gluteal-femoral region, whereas men store more fat in the visceral (abdominal) depot, underplaying the reduced risk of CVD and diabetes in women [224, 225]. However, both types of fat distribution can be found in both genders. After menopause, body fat distribution shifts towards a more male pattern, and pro-atherogenic blood lipid changes take place [226].

In our study (paper 2), women from NAO had lower levels of TC and ApoB. Age and consumption of animal fat were positively associated with ApoB/ApoA-I ratio in women (pooled samples from Arkhangelsk and NAO).

We expected to detect negative associations between fish consumption and ApoB/ApoA-I ratio. However, no associations have been observed. Some cross-sectional studies observed that fish consumption/PUFAs content is favorably related to blood lipids. The undetected associations in our study can be explained by methodological weakness or some other reasons.

Results from a National Health and Nutrition Examination Survey (NHANAS) 1999-2002 in non-pregnant, non-diabetic females aged 16-49 showed that total 30 day fish frequency consumption was positively associated with HDL-C [227]. One of the strength of this study was large sample size of 1245 women. Our sample size was relatively small which could result in attenuated statistical power.

The findings from a cross-sectional study (sample size was not different from our study: 152 men and women) in Tromsø, Norway suggested that long-term intake of even small amounts of fish had positive biological effects. In that survey, the predictor which was positively associated with lower serum TG and increased HDL-C and ApoA-I, was EPA, but not DHA. The DHA did not correlate with TG and even showed opposite negative associations to HDL-C and ApoA-I [228]. As we know, both EPA and DHA are present in oily fish. The ratio EPA/DHA, as well as content EPA+DHA in seafood may vary considerably, and is another factor which could influence the results.

The next issue is the amount and variability of seafood consumed by a population. In our study, the average intake was equal to the reported national average, which is, apparently, below the recommended threshold. The consumption of marine foods in the rural NAO

village was much lower than in Inuit. For example, the intake of marine food in Grenland Inuit was estimated to be 22% of the total energy and distributed as 100 g⁄day of seal, 64 g⁄day of fish, 44 g⁄day of whale and 17 g⁄day of sea-birds. This diet, rich in marine oils, and different from what was observed in Nenets, was positively associated with serum HDL-C and blood glucose and inversely with VLDL-C and TG [79].

Some authors have suggested that the method of preparation may influence health effects. Salted fish consumption, predominantly herring, was found to relate to hemorrhagic strokes in a Finnish study [229]. The intake of fried fish or fish sandwiches was associated with a higher risk of ischemic stroke [230], with structural abnormalities indicative of systolic dysfunction and potential coronary atherosclerosis. The authors concluded that the impact of preparation method on results should be considered [231].

Yet another aspect is that the main effect of n-3 fatty acids on blood lipid profile has been shown to be lower TG [130, 232]. The reduction of serum TG seems to be dependent on the baseline level and is more frequently observed in hypertriglycerolaemic persons and subjects with CVD [233]. In our study (paper 2), persons with CVD and diabetes were excluded and the majority of participants were normotriglycerolaemic.

The effect of omega-3 fatty acids intervention on apoliporotein profile was not consistent and is not well-understood.

A systematic review of intervention studies [134] demonstrated that effects of omega-3 fatty acids on ApoA-I levels were generally heterogeneous, but small. Most of 27 studies found a small net change in ApoA-I with omega-3 fatty acid consumption. Three-quarters of studies found net changes between -5% and +5% (-7 to +10 mg/dL). No study found a large net increase in ApoA-I level. A small number of studies found larger net decreases of up to 18% reductions (-33 mg/dL). Little consistency in the effect of omega-3 fatty acids on ApoB levels was reported. About half of the 25 studies found a small net increase and half a small net decrease in ApoB levels. One study found a significant decrease and one found a significant increase in ApoB levels.

In paper 3 we attempted to answer the following questions:

- Are anthropometric characteristics of Nenets and Russian women different?
- What is the prevalence of obesity based on BMI and WC measurements in these two populations and is there any difference between the residences?
- What is the prevalence of MetS components in the two populations and is there any difference between the residences?

- Is obesity associated with impaired glucose metabolism, dyslipidemia and hypertension in women from NAO?

Nenets women have different anthropometric characteristics, compared to European Russians, such as lower height, weight and hip circumference.

A higher prevalence of general, but not central obesity is observed in the rural NAO group compared to the Arkhangelsk group.

The rate of MetS is also high in the sample from NAO and equals the prevalence found in the Russian population. Low HDL-C, high BP and increased WC were frequent in both residences with no differences between the populations.

Fasting glucose level is considerably lower in the Nenets women when compared to the Russian women. The magnitude of cardiometabolic risk estimates associated with higher BMIs differs among women from NAO. Nenets women with BMI $\geq$ 30 kg⁄m^2 had lower insulin levels and HOMA-IR than the Russian women. The normal weight (BMI $\leq$ 24.9 kg⁄m^2) women from NAO had lower levels of glucose, insulin, HOMA-IR, TG and ApoB than the Russian women at this BMI level. Four risk factors (insulin, HOMA-IR, HDL-C and TG) were associated with BMI and six risk factors (insulin, HOMA-IR, DBP, HDL-C, TG and ApoB) were associated with WC among the Nenets women.

Obesity is a concern in both populations. Adiposity is clearly associated with the highest cardiometabolic risk among both Nenets and Russian women. The diet, physical activity and socio-economic factors need to be investigated in more detail in order to prevent obesity, diabetes mellitus and CVD in this population.

International research

There were several difficulties with respect to international character of this research project encountered during this work. They are well described in the literature.

Firstly, the physical distance between the institutions involved limited face-to-face communication. Secondly, language differences were often superimposed on the communication barriers caused by the distance. Thirdly, even when linguistic barriers are overcome, cultural differences can cause serious misunderstandings between investigators or between investigators and subjects. Frequent, clear and open communication and prompt clarification of any questions or confusion are essential. Written affiliation agreements that spell out mutual responsibilities and obligations may help clarify issues, such as data ownership, authorship, publication rights and decisions regarding the framing of research results [204].

6 Concluding remarks and further research

The present thesis has addressed different aspects related to fish consumption and cardiometabolic risk factors among the circumpolar population of the rural NAO in comparison with the urban population of Arkhangelsk County. The main conclusions can be summarised as indicated below.

An unexpected finding was lower than anticipated total fish intake in the population sample from the village of Nelmin-Nos in the rural NAO. The median total fish intake, expressed as daily intake (g⁄d) was higher among the Arkhangelsk participants (pooled samples of men and women) than among the Nelmin-Nos participants (pooled samples of men and women). Only women, but not men from Arkhangelsk had higher total fish consumption when compared to women and men from Nelmin-Nos.

Residents of the indigenous village consumed predominantly locally caught fatty fish, termed "whitefish". Thus, oily fish consumption separately was not different across residences.

Unfavourable socio-economical factors and limited fish availability were observed in the rural NAO village. Higher locally caught whitefish consumption was predicted by a high frequency of fishing and high monthly income in Nelmin-Nos. A monthly income was the only independent predictor and was positively associated with oily fish consumption in the urban residents of the Arkhangelsk region.

We have not found any associations between fish consumption (estimated as total, oily or lean) and ApoB/ApoA-I ratio in pooled samples of women from Arkhangelsk and NAO and in pooled samples of men from Arkhangelsk and NAO.

We also have not detected differences in ApoB/ApoA-I ratio between volunteers free from CVD and diabetes when two residences were compared. Adjusted geometric means of ApoB/ApoA-I ratio were 1.02 and 0.98 in men and women from Arkhangelsk; 0.84 and 0.91 in men and women from NAO respectively. However, the differences between men were very close to the level of significance ($p=0.057$) and probably did not reach the level of significance due to a low male sample size.

Age and animal fat consumption predicted significantly ApoB/ApoA-I ratio in pooled samples of women from Arkhangelsk and NAO. Body mass index and the low level of physical activity predicted significantly ApoB/ApoA-I ratio in pooled samples of men from Arkhangelsk and NAO.

We found that high proportion of Arkhangelsk women have obesity and metabolic abnormalities correlated with age. The same health problems were detected in women from the rural NAO group. However, better TC and ApoB levels in the rural NAO women were detected.

In fact, we have not seen the differences in prevalence of self-reported hypertension and type 2 diabetes in women. Hypertension is a very prevalent CVD risk factor. Interestingly, considerably lower fasting glucose level and HOMA-IR were observed in Nenets women.

Men from the rural NAO were less obese and had also better lipid profiles than men from Arkhangelsk (HDL-C was higher, while VLDL-C, LDL-C and TG were lower).

It is more likely that differences in lifestyle between the two communities (nutrition habits, physical activity, etc.), rather than genetic differences influenced the results.

However, the negative factors uncovered in NAO, such as poor socio-economic conditions, reduced fish consumption (and probably reduced consumption of other traditional foods and increased consumption of western foods), changing lifestyle to more sedentary, especially among women, might cause a negative effect on health, including CVD, if not now, then in the future.

Smoking was highly prevalent among men in both communities, but not among women and should be considered an important risk factor in males.

Alcohol dependence and abuse should be of concern, however research, concentrated specifically on this problem is preferable.

In our study, we analysed two samples with different lifestyles. We have not performed analysis, based on ethnicity. However, the majority of participants from the rural NAO were unique Arctic population Nenets. We assume that the rural NAO sample is highly representative for this ethnic group.

Our study was not a large sample study, however the results are very consistent with other similar projects [234, 235].

It is not possible to conclude with certainty whether there are any clinical advantages with respect to CVD morbidity and mortality risk in the rural NAO population compared to their Arkhangelsk counterparts based on our study design. It has, however, become clear that future research should focus on assessing prevalence of CVD morbidity and mortality among Nenets population and health implications of obesity and changed lifestyle, including dietary factors and physical activity pattern. Fish consumption and omega-3 status along with environmental pollutants and prevalence of alcohol abuse in this population should be

investigated further. Large representative cross-sectional studies and prospective cohort studies are also required.

7 References

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Appendix I

The questionnaire (in Russian and in English)

МОРСКАЯ ПИЩА И ЗДОРОВЬЕ НАСЕЛЕНИЯ СЕВЕРА

Вы согласны принять участие в исследовании?
Да ☐ Нет ☐

Место жительства: .....
населённый пункт

Дата | _ | _ | | _ | _ | | _ | _ | _ | _ |
день месяц год

Инициалы | _ | _ | _ |
Ф И О (**Ф**амилия, **И**мя, **О**тчество)

Идентификационный номер участника .....

Объективные данные

Время измерения | _ | _ | часов

Артериальное давление

Измерение	Систолическое артериальное давление	Диастолическое артериальное давление
1	..... мм рт. ст.	..... мм рт. ст.
2	..... мм рт. ст.	..... мм рт. ст.
Среднее	..... мм рт. ст.	..... мм рт. ст.

Частота пульса

Измерение	Частота пульса
1	..... уд./мин.
2	..... уд./мин.
Среднее	..... уд./мин.

Антропометрия

Рост	....., ... см
Вес	....., ... кг
Окружность талии	....., ... см
Окружность бёдер	....., ... см
Индекс массы тела	..... вес кг / рост м2
Окружность талии/ Окружность бёдер	..... см

Забор крови

Время взятия крови | _ | _ | часов

Взятие крови натощак Да ☐ Нет ☐

Сколько времени прошло с последнего приёма пищи? | _ | _ | часов

Что Вы кушали, пили в последний приём пищи?

1 ..... 2 ..... 3 .....

4 ..... 5 ..... 6 .....

Употребляли ли Вы спиртные напитки вчера или сегодня? Да ☐ Нет ☐

Анкета

Личные сведения, социальное положение

Возраст | _ | _ | лет

Дата рождения | _ | _ | | _ | _ | | _ | _ | _ | _ |
день месяц год

Пол Мужской ☐ Женский ☐

Какое образование Вы получили? (Выберите только один вариант ответа)

Обучение традиционным навыкам и знаниям вне школы	☐
Неоконченная начальная школа	☐
Начальная школа	☐
Неполная средняя школа 9 кл. (или 7-8 кл.)	☐
Полная средняя школа 11 кл. (или 10 кл.)	☐
Среднее профессиональное образование (техникум, училище, колледж)	☐
Неоконченное высшее образование (университет, институт), если 3 года и более	☐
Оконченное высшее образование (университет, институт)	☐
Аспирантура после университета, института (диплом кандидата, доктора наук)	☐

Какую работу Вы выполняете (выполняли) или по какой специальности Вы работаете (работали) большую часть Вашей жизни?

должность .....

место работы .....

Я не работал(а) ☐ Не знаю, нет ответа ☐

Какая у Вас была основная работа или способ заработать на жизнь последние 12 месяцев?

должность .....

место работы .....

Я не работал(а) ☐ Не знаю, нет ответа ☐

Вы сейчас? (Выберите да или нет в каждой строке)

	Да	Нет
Работаете по найму полный рабочий день за плату	☐	☐
Работаете по найму неполный рабочий день за плату	☐	☐
Работаете не по найму, частный предприниматель	☐	☐
Домохозяйка	☐	☐
Неработающий пенсионер	☐	☐
Учитесь	☐	☐
Безработный(я)	☐	☐
Не способны работать вследствие инвалидности, проблем со здоровьем	☐	☐
В отпуске по беременности и уходу за ребёнком	☐	☐

Сколько лет Вы живете в этой северной местности?

| _ | _ | лет **(Если меньше, чем 12 месяцев, укажите 00)**

К какой этнической группе могла бы отнести себя Ваша мать? (Выберите только один вариант ответа)

Аборигенные народы Севера («чистокровная» ненка или представитель другого северного этноса) _____	☐
Неаборигенные народы (русские или др. национальность) _____	☐
Смешанная группа (аборигенные и неаборигенные народы Севера)	☐
Не знаю, нет ответа	☐

К какой этнической группе мог бы отнести себя Ваш отец? (Выберите только один вариант ответа)

Аборигенные народы Севера («чистокровный» ненец или представитель другого северного этноса) ☐
_____

Неаборигенные народы (русские или др. национальность) ☐
_____

Смешанная группа (аборигенные и неаборигенные народы Севера) ☐

Не знаю, нет ответа ☐

В соответствии со свидетельством о рождении, паспортом, другими документами Вы относитесь к...?

Русским ☐ Украинцам ☐ Белорусам ☐

Ненцам ☐ Коми ☐

Другой национальности, пожалуйста, охарактеризуйте какой ☐↓

Не знаю, Нет ответа ☐

По собственному мнению и ощущениям Вы относитесь к…?

Русским ☐ Украинцам ☐ Белорусам ☐

Ненцам ☐ Коми ☐

Другой национальности, пожалуйста, охарактеризуйте какой ☐↓

Не знаю, Нет ответа ☐

Вы (выберите только один вариант ответа):

Замужем/женат ☐ Живете вместе ☐ Разведен(а) ☐

Никогда не были замужем/женаты ☐ Вдова/вдовец ☐

Сколько человек, <u>включая Вас</u>, в возрасте старше 18 лет живут в Вашем доме?

Число | _ | _ |

Сколько детей младше 18 лет живут в Вашем доме?
Отметьте 00, если нисколько.

Число | _ | _ |

Сколько человек в Вашей семье получают доход?

Число | _ | _ |

Сколько составляет совокупный ежемесячный доход на каждого члена Вашей семьи в среднем, включая все источники: зарплаты, пенсии, пособия, стипендии, др.?

Менее чем 1500	☐	1500,1-2500	☐
2500,1-3500	☐	3500,1-4500	☐
4500,1-6000	☐	6000,1-8000	☐
8000,1-12000	☐	Более чем 12000	☐

Не знаю, нет ответа ☐

Питание

Являетесь ли Вы вегетарианцем (не употребляете мясо в пищу, но употребляете курицу и рыбу)?

Да ☐ Нет ☐

Соблюдаете ли Вы диету в настоящее время?

Да ☐ Нет ☐

Если да, какая это диета?

Если да, как долго Вы соблюдаете диету? (Впишите количество лет, месяцев):

| _ | _ | лет | | _ | _ | месяцев

Вы (отметьте ниже Да или Нет по каждому пункту):

Страдаете сниженным аппетитом
Да ☐ Нет ☐

Страдаете повышенным аппетитом
Да ☐ Нет ☐

Страдаете хроническим желудочно-кишечным заболеванием
Да ☐ Нет ☐

Далее нам важно получить информацию о Ваших привычках в еде. При ответе на каждый вопрос отметьте, как часто Вы употребляли продукт, указанный в вопросе, **<u>за последние двенадцать месяцев</u>**.

РЫБА И МОРЕПРОДУКТЫ / ТРАДИЦИОННАЯ ПИЩА

Как часто Вы употребляли рыбу <u>за последние двенадцать месяцев</u>?

	Никогда/ редко	1 в мес.	2-3 в мес.	1 в нед.	2-3 в нед.	4 -6 в нед.	1 в день	2+ в день
Рыба	☐	☐	☐	☐	☐	☐	☐	☐

В период, когда Вы употребляли рыбу, как часто Вы ели нижеприведенные продукты? (Выберите по одному ответу в каждой строке)

	Никогда/ редко	1 в мес.	2-3 в мес.	1 в нед.	2 в нед.	3+ в нед.
Вареная, припущенная треска, пикша, сайда	☐	☐	☐	☐	☐	☐
Жареная треска, пикша, сайда	☐	☐	☐	☐	☐	☐
Зубатка, камбала, морской окунь	☐	☐	☐	☐	☐	☐
Лосось (сёмга), форель	☐	☐	☐	☐	☐	☐
Скумбрия	☐	☐	☐	☐	☐	☐
Сельдь	☐	☐	☐	☐	☐	☐
Горбуша	☐	☐	☐	☐	☐	☐
Сиг, чир, пелядь, ряпушка, голец, омуль, нельма и др. подобная рыба	☐	☐	☐	☐	☐	☐

Если Вы употребляли <u>другую рыбу</u>, впишите в пустые графы ниже название рыбы и укажите, как часто Вы её употребляли

	Никогда/ редко	1 в мес.	2-3 в мес.	1 в нед.	2 в нед.	3+ в нед.
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

Опишите, какую рыбу Вы едите чаще, начиная с наиболее часто потребляемой рыбы 1 и заканчивая наименее часто потребляемой 3.

1 наиболее часто	
2	
3 наименее часто	

Зависит ли значительно Ваше потребление рыбы от сезона года?

Да ☐ Нет ☐ Не знаю ☐

Если Да, укажите, <u>преимущественно</u>, какую рыбу в какое время года и как часто (выберите *1 в мес.; 2-3 в мес.; 1 в нед.; 2 в нед.; 3+ в нед.*) Вы употребляете.

Сезон	Виды потребляемой рыбы	Как часто
зима		
весна		
лето		
осень		

Если Вы ели рыбу, сколько составляла обычная порция? (1 порция =150 г) (Выберите по одному ответу в каждой строке)

Вареная, припущенная рыба (порция)

☐1 ☐1.5 ☐2 ☐3+

Жареная рыба (порция)

☐1 ☐1.5 ☐2 ☐3+

<u>Сколько раз в год</u> Вы ели следующие продукты? (Выберите по одному ответу в каждой строке)

	0	1-3	4-6	7-9	10+
Молоки	☐	☐	☐	☐	☐
Печень рыбы	☐	☐	☐	☐	☐

Как часто Вы употребляли консервы печень трески? _____ раз в месяц. **Отметьте 0, если реже.**

Как часто Вы ели морских ракообразных (креветки, крабы)? (Выберите только один вариант ответа)

☐никогда/редко ☐1 в мес. ☐2-3 в мес. ☐1+ в нед.

Как часто Вы ели морских моллюсков (мидии, кальмары, морские гребешки)? (Выберите только один вариант ответа)

☐никогда/редко ☐1 в мес. ☐2-3 в мес. ☐1+ в нед.

По Вашим оценкам, достаточно ли рыбы Вы потребляли?

Да ☐ Нет ☐

Если Нет, почему Вы не потребляли больше рыбы?

	Да	Нет
Слишком дорого	☐	☐
Маленький выбор	☐	☐
Трудно купить свежую рыбу	☐	☐
Плохое качество	☐	☐
Отсутствуют блюда быстрого приготовления	☐	☐
Запах во время приготовления	☐	☐
Трудно приготовить	☐	☐
Не люблю вкус	☐	☐
Члены семьи не любят рыбу	☐	☐
Семейная привычка, мы не ели рыбу в моём детстве	☐	☐
Пищевая аллергия	☐	☐

Если другое важно, пожалуйста, укажите подробную информацию

Как Вы считаете, изменилась ли доступность рыбы с 1991 года?

☐Меньше доступна ☐Больше доступна ☐Не изменилась

Как часто Вы или члены Вашей семьи ловили рыбу?

Еженедельно ☐

1-3 раза в месяц ☐

1-11 раз в год ☐

Никогда ☐

Какую часть от всех продуктов питания, потребляемых Вашей семьей, составляла рыба?

Ничего/почти ничего ☐ Больше половины ☐

Меньше половины ☐ Почти всё ☐

Около половины ☐ Не знаю ☐

Какую часть от всей рыбы, потребляемой Вашей семьей, составляла заготовленная Вами рыба?

Ничего/почти ничего ☐ Больше половины ☐

Меньше половины ☐ Почти всё ☐

Около половины ☐ Не знаю ☐

Как часто Вы ели следующие виды традиционной северной пищи? (Выберите по одному ответу в каждой строке)

	Никогда/ редко	1 раз в мес.	2-3 раза в мес.	1 раз в нед.	2-3 раза в нед.	4+ раз в нед.
Оленье мясо	☐	☐	☐	☐	☐	☐
Олений жир	☐	☐	☐	☐	☐	☐
Мясо диких животных	☐	☐	☐	☐	☐	☐
Мясо тюленя	☐	☐	☐	☐	☐	☐
Жир тюленя	☐	☐	☐	☐	☐	☐
Мясо моржа	☐	☐	☐	☐	☐	☐
Жир моржа	☐	☐	☐	☐	☐	☐
Мясо кита	☐	☐	☐	☐	☐	☐
Китовый жир	☐	☐	☐	☐	☐	☐
Северные лесные ягоды	☐	☐	☐	☐	☐	☐
Северные лесные грибы	☐	☐	☐	☐	☐	☐
Другое						
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

Вспомните, какая часть Вашего меню состояла из традиционных северных продуктов питания, включая рыбу?

Ничего/почти ничего ☐ Больше половины ☐

Меньше половины ☐ Почти всё ☐

Около половины ☐ Не знаю ☐

Из общего объема традиционной северной пищи, потребляемой в Вашей семье, какая часть была добыта членами Вашей семьи в последние 12 месяцев путем охоты, рыбалки, собирательства?

Ничего/ почти ничего ☐ Больше половины ☐

Меньше половины ☐ Почти всё ☐

Около половины ☐ Не знаю ☐

ДРУГИЕ ПРОДУКТЫ И ПРИГОТОВЛЕНИЕ ПИЩИ

При ответе на каждый вопрос отметьте, как часто Вы употребляли продукт, указанный в вопросе, **за последние двенадцать месяцев**.

Сколько стаканов каждого вида молока (кисломолочных продуктов) Вы пили? (Выберите по одному ответу в каждой строке):

	Никогда/ редко	1-4 ст. в нед.	5-6 ст. в нед.	1 ст. в день	2-3 ст. в день	4+ ст. в день
Молоко (кисломолочные продукты) жирностью 3,2-3,9%	☐	☐	☐	☐	☐	☐
Молоко (кисломолочные продукты) жирностью 1,5-2,5%	☐	☐	☐	☐	☐	☐
Обезжиренное молоко 0,5%	☐	☐	☐	☐	☐	☐

Употребляли ли Вы сливки 10% и >?

Да, практически ежедневно ☐ Иногда ☐ Нет ☐

Сколько чашек чая, каждого вида кофе Вы пили? (Выберите по одному ответу в каждой строке)

	Никогда/ редко	1-6 ч. в нед.	1 ч. в день	2-3 ч. в день	4-5 ч. в день	6-7 ч. в день	8+ ч. в день
Чай	☐	☐	☐	☐	☐	☐	☐
Сваренный кофе	☐	☐	☐	☐	☐	☐	☐
Приготовленный фильтрационным способом или быстрорастворимый кофе	☐	☐	☐	☐	☐	☐	☐

Сколько стаканов пакетированных соков или газированных напитков, содержащих сахар, Вы пили? (Выберите только один вариант ответа)

	Никогда/ редко	1-3 ст. в нед.	4-6 ст. в нед.	1 ст. в день	2-3 ст. в день	4+ ст. в день
Пакетированные соки, газированные напитки, содержащие сахар	☐	☐	☐	☐	☐	☐

Сколько примерно кусков или чайных ложек рафинированного сахара Вы обычно клали в напитки (чай, кофе и другие) в среднем в день? Отметьте 0, если Вы не используете сахар.

_____ кусков или чайных ложек сахара в день

Как часто Вы употребляли следующие продукты? (Выберите по одному ответу в каждой строке)

	Никогда/ редко	1 в мес.	2-3 в мес.	1 раз в нед.	несколько раз в нед.	1 раз в день	2+ раз в день
Творог и творожные изделия	☐	☐	☐	☐	☐	☐	☐
Сметана	☐	☐	☐	☐	☐	☐	☐
Сливочное масло	☐	☐	☐	☐	☐	☐	☐
Маргарин	☐	☐	☐	☐	☐	☐	☐
Йогурт	☐	☐	☐	☐	☐	☐	☐

Как часто в среднем Вы употребляли злаки (сухие продукты из смеси зёрен), овсяные хлопья, мюсли? (Выберите только один вариант ответа)

Никогда/редко	1-3 в нед.	4-6 в нед.	1 в день
☐	☐	☐	☐

Сколько кусков хлебобулочных изделий и сухих хлебцев Вы употребляли (1/2 булочки = 1 кусок хлеба)? (Выберите по одному ответу в каждой строке)

	Никогда/ редко	1-4 в нед.	5-7 в нед.	2-3 в день	4-5 в день	6+ в день
Ржаной (чёрный хлеб)	☐	☐	☐	☐	☐	☐
Хлеб из муки грубого помола,цельнозерновой	☐	☐	☐	☐	☐	☐
Пшеничный хлеб (белый хлеб, батон)	☐	☐	☐	☐	☐	☐
Сухие хлебцы и т.д.	☐	☐	☐	☐	☐	☐

Сколько бутербродов в среднем за неделю Вы употребляли со следующими рыбными продуктами? (Выберите по одному ответу в каждой строке)

	Никогда/ редко	1 в нед.	2-3 в нед.	4-6 в нед.	7-9 в нед.	10+ в нед.
Консервированная рыба	☐	☐	☐	☐	☐	☐
Слабосолёная жирная рыба	☐	☐	☐	☐	☐	☐
Икра	☐	☐	☐	☐	☐	☐

Сколько бутербродов в среднем за неделю Вы употребляли с другими продуктами? (Выберите по одному ответу в каждой строке)

	Никогда/ редко	1-3 в нед.	4-6 в нед.	1 в день	2-3 в день	4+ в день
Варенье, джем, мёд						
Твёрдый сыр жирностью 40-50%	☐	☐	☐	☐	☐	☐
Обезжиренный твёрдый сыр	☐	☐	☐	☐	☐	☐
Плавленый сыр	☐	☐	☐	☐	☐	☐
Мясные продукты (колбаса, ветчина, бекон и др.), печеночный паштет	☐	☐	☐	☐	☐	☐

Какой вид жира Вы обычно использовали с хлебом? (Выберите более чем один вариант, если необходимо)

Я не использую жиры для бутербродов ☐
Сливочное масло ☐
Мягкий маргарин (напр., «Воймикс», «Рама») ☐
Сало и другой жир домашних животных ☐
Другой вид жира (напишите какой): _____

Если Вы использовали жир для бутербродов, каков слой данного продукта? (Выберите только один вариант ответа)

Очень тонкий слой (3 г, меньше чайной ложки) ☐
Тонкий слой (5 г, 1 чайная ложка) ☐
Толстый слой (8 г, 1,5 чайной ложки) ☐
Очень толстый слой (12 г, больше 2 чайных ложек) ☐

Как часто Вы употребляли свиное сало? Отметьте 0, если Вы редко/никогда не едите сало.

_____ раз в неделю

Как часто Вы употребляли майонез? (Выберите только один вариант ответа)

	Никогда/ редко	1-6 в нед.	1 в день	2-3 в день	4+ в день
Майонез	☐	☐	☐	☐	☐

Как часто Вы употребляли рис, спагетти/макароны, бобовые? (Выберите по одному ответу в каждой строке)

	Никогда/ редко	1-3 в мес.	1 в нед.	2 в нед.	3+ в нед.
Рис	☐	☐	☐	☐	☐
Макароны	☐	☐	☐	☐	☐
Бобовые	☐	☐	☐	☐	☐

Как часто Вы употребляли каши (рисовая, гречневая, пшённая, перловая, ячневая, манная, овсяная)? (Выберите только один вариант ответа)

	Никогда/ редко	1 в мес.	2-3 в мес.	1 в нед.	2 в нед.	3+ в нед.
Каши	☐	☐	☐	☐	☐	☐

Как часто Вы употребляли орехи, семечки? (Выберите по одному ответу в каждой строке)

	Никогда/ редко	1-3 в мес.	1 в нед.	2-4 в нед.	5-6 в нед.	1 в день	2+ в день
Орехи	☐	☐	☐	☐	☐	☐	☐
Семечки	☐	☐	☐	☐	☐	☐	☐

Как часто Вы употребляли фрукты: яблоки/груши, апельсины, бананы, виноград, персики и др.? (Выберите только один вариант ответа)

	Никогда/ редко	1-3 в мес.	1 в нед.	2-4 в нед.	5-6 в нед.	1 в день	2+ в день
Фрукты	☐	☐	☐	☐	☐	☐	☐

Как часто Вы употребляли овощи, исключая картофель? (Выберите только один вариант ответа)

	Никогда/ редко	1-3 в мес.	1 в нед.	2 в нед.	3 в нед.	4-5 в нед.	6-7 в нед.
Овощи	☐	☐	☐	☐	☐	☐	☐

Как часто Вы употребляли картофель? (Выберите по одному ответу в каждой строке)

	Никогда/ редко	1-3 в мес.	1 в нед.	2-3 в нед.	4-6 в нед.	7+ в нед.
Вареный картофель	☐	☐	☐	☐	☐	☐
Жареный картофель	☐	☐	☐	☐	☐	☐

Какой жир Вы обычно использовали при приготовлении пищи? (Вы можете выбрать более одного ответа)

- Подсолнечное масло ☐
- Сливочное масло ☐
- Твердый маргарин ☐
- Мягкий маргарин ☐
- Сливочное масло с добавками маргарина ☐
- Соевое масло ☐
- Оливковое масло ☐
- Кукурузное масло ☐
- Животный жир (свиное сало, говяжий, куриный и др.) ☐
- Другой, напишите какой именно: ☐
- Ничего ☐

Чем Вы обычно заправляли салаты? (Вы можете выбрать более одного ответа)

- Подсолнечное масло ☐
- Майонез ☐
- Сметана ☐
- Оливковое масло ☐
- Соевое масло ☐
- Кукурузное масло ☐
- Другое, напишите что именно ☐
- Ничего ☐

Сколько яиц Вы обычно съедали за неделю (в жареном, вареном виде, в омлете)? (Выберите только один вариант ответа)

☐0 ☐1 ☐2 ☐3-4 ☐5-6 ☐7+

Как часто Вы употребляли?

	Никогда/ редко	1-3 в мес.	1 в нед.	2-3 в нед.	4-6 в нед.	7+ в нед.
Выпечку, мучные кондитерские изделия	☐	☐	☐	☐	☐	☐
Конфеты, шоколад	☐	☐	☐	☐	☐	☐

Какие основные блюда Вы ели на обед, ужин. Укажите, как часто в среднем Вы употребляли то или иное блюдо за последние двенадцать месяцев. (Выберите по одному ответу в каждой строке)

	очень редко	1 в мес.	2-3в мес.	1 в нед.	2 в нед.	3 в нед.	4 в нед.	5+ в нед.
Порция мяса (говядина, свинина, баранина)	☐	☐	☐	☐	☐	☐	☐	☐
Фарш, котлета мясная (говядина, свинина, баранина)	☐	☐	☐	☐	☐	☐	☐	☐
Переработанное мясо: сосиски и т.д.	☐	☐	☐	☐	☐	☐	☐	☐
Консервированное мясо («Тушёнка»)	☐	☐	☐	☐	☐	☐	☐	☐
Субпродукты, напр. печень (говядина, свинина, баранина)	☐	☐	☐	☐	☐	☐	☐	☐
Курица, блюда из птицы	☐	☐	☐	☐	☐	☐	☐	☐
Порция жирной рыбы (скумбрия, лосось и т.д.)	☐	☐	☐	☐	☐	☐	☐	☐
Порция постной рыбы (треска и т.д.)	☐	☐	☐	☐	☐	☐	☐	☐
Натуральный мясной, куриный бульон (суп на их основе)	☐	☐	☐	☐	☐	☐	☐	☐
Уха, рыб. бульон	☐	☐	☐	☐	☐	☐	☐	☐
Другое								
	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐

Как часто Вы ели солёные закуски, «фаст-фуд»? (Выберите по одному ответу в каждой строке)

	Никогда/ редко	1-3 в мес.	1 в нед.	2-3 в нед.	4-6 в нед.	7+ в нед.
Картофельные чипсы	☐	☐	☐	☐	☐	☐
Арахис	☐	☐	☐	☐	☐	☐
Сушёную рыбу, кальмары	☐	☐	☐	☐	☐	☐
«Фаст-фуд» (картошка фри, пицца, гамбургер)	☐	☐	☐	☐	☐	☐

Как часто Вы употребляли мороженые полуфабрикаты?

☐никогда/редко ☐1-3 в мес. ☐1 в нед.
☐2-3 в нед. ☐4-6 в нед. ☐7+ в нед.

Как часто Вы жарили пищу?

Никогда/ редко	Иногда, не каждый день	Каждый день
☐	☐	☐

Как часто вы ели курицу вместе с кожей?

- Всегда ☐
- Часто ☐
- Иногда ☐
- Никогда ☐
- Я не ем курицу ☐

Добавляете ли Вы соль в уже приготовленную пищу?

Нет, никогда ☐ Да, обычно ☐ Да, иногда ☐

Удаляете ли Вы видимый жир с мяса до его приготовления или перед употреблением в пищу?

Да ☐ Нет ☐

Сколько раз в день Вы принимаете пищу? _____ Раз

Пищевые добавки

Принимаете ли Вы рыбий жир жидкий?

Да ☐↓ Нет ☐

Напишите название	Никогда/ редко	1-3 в месяц	1 в нед.	2-3 нед.	4-6 нед.	7 нед.	Как долго
	☐	☐	☐	☐	☐	☐	| _ | _ | лет | _ | _ | месяцев

Принимаете ли Вы рыбий жир (омега-3 добавки) в капсулах?

Да ☐ ↓ Нет ☐

Напишите название	Никогда/ редко	1-3 в месяц	1 в нед.	2-3 нед.	4-6 нед.	7 нед.	Как долго
	☐	☐	☐	☐	☐	☐	| _ | _ | лет | _ | _ | месяцев

Принимаете ли Вы витамины/минералы?

Да ☐↓ Нет ☐

Напишите название	Никогда/ редко	1-3 в месяц	1 в нед.	2-3 нед.	4-6 нед.	7 нед.	Как долго
1	☐	☐	☐	☐	☐	☐	| _ | _ | лет | _ | _ | месяцев
2	☐	☐	☐	☐	☐	☐	| _ | _ | лет | _ | _ | месяцев
3	☐	☐	☐	☐	☐	☐	| _ | _ | лет | _ | _ | месяцев

Принимаете ли Вы другие пищевые добавки?

Да ☐↓ Нет ☐

Напишите название	Никогда/ редко	1-3 в месяц	1 в нед.	2-3 нед.	4-6 нед.	7 нед.	Как долго
1	☐	☐	☐	☐	☐	☐	| _ | _ | лет | _ | _ | месяцев
2	☐	☐	☐	☐	☐	☐	| _ | _ | лет | _ | _ | месяцев
3	☐	☐	☐	☐	☐	☐	| _ | _ | лет | _ | _ | месяцев

Семейный анамнез

Укажите, был(а) ли у кого-либо из Ваших близких родственников (родители, родные сёстры, братья) в возрасте до 60 лет:

	Да	Нет	Не знаю
Инфаркт миокарда или острый сердечный приступ	☐	☐	☐
Инсульт, кровоизлияние в мозг	☐	☐	☐
Гипертония	☐	☐	☐
Внезапная сердечная смерть	☐	☐	☐

Укажите, страдал ли кто-либо из Ваших близких родственников (родители, родные сёстры, братья) сахарным диабетом?

Да ☐ Нет ☐ Не знаю ☐

Укажите, у кого-либо из Ваших близких родственников (родители, родные сёстры, братья) есть (были)

проблемы с контролем избыточного веса?

Да ☐ Нет ☐ Не знаю ☐

повышенный уровень холестерина?

Да ☐ Нет ☐ Не знаю ☐

Здоровье

Есть ли у Вас какие-нибудь хронические заболевания или проблемы со здоровьем?

Да ☐ Нет ☐ Не знаю, нет ответа ☐

Если «Да», укажите, пожалуйста, какие у Вас есть хронические заболевания или проблемы со здоровьем (в т.ч. гинекологические)?

Есть ли у Вас какие-либо жалобы на состояние здоровья в настоящее время?

Да ☐ Нет ☐

Было ли у Вас острое респираторное заболевание (ОРЗ) или обострение хронического заболевания в течение последних 2-3 недель?

Да ☐ Нет ☐ Не знаю, нет ответа ☐

В последний месяц (30 дней) были ли у Вас какие-либо из перечисленных ниже симптомов или жалоб?

	Да	Нет
Боли в груди во время физической нагрузки	☐	☐
Проблемы дыхания или кашель	☐	☐
Боли в шее, плече	☐	☐
Головные боли	☐	☐
Отёки на ногах	☐	☐
Приступы головокружения	☐	☐
Боли в суставах	☐	☐
Боли в спине	☐	☐
Проблемы пищеварения	☐	☐
Высокая температура	☐	☐
Болезни, выпадение зубов	☐	☐
Болезни или раздражение кожи	☐	☐
Нарушение зрения	☐	☐
Нарушение слуха	☐	☐
Проблемы со сном, бессонница	☐	☐

Когда-либо доктор, медицинская сестра или другой медицинский работник говорили Вам, что у Вас есть какие-либо из перечисленных ниже заболеваний? В каком возрасте Вам впервые об этом сказали? Получали ли Вы какое-либо лечение или принимали ли лекарства от этого состояния последние 12 месяцев?

Высокое артериальное давление, гипертония

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Было ли высоким артериальное давление во время беременности?

Да ☐ Нет ☐ Давление на верхней границе нормы (пре-гипертензия)☐

Сердечная недостаточность

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Сердечный приступ, инфаркт миокарда

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Флебит (воспаление вен/артерий)

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Тромбоз верхних или нижних конечностей

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Инсульт

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Стенокардия, ишемическая болезнь сердца

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Аритмия

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Мигрень, частая головная боль

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Бронхиальная астма

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Другие аллергические заболевания

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Если Да, какие_____

Рак. Тип?_____

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Диабет. Тип?_____

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Был ли сахар высоким во время беременности?
Да ☐ Нет ☐Сахар на верхней границе нормы (пре-диабет)☐

Заболевания желчного пузыря (камни в желчном пузыре, застой желчи, воспаление желчного пузыря)

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Болезни печени (гепатит, цирроз, печёночная недостаточность)

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Заболевания почек (гломерулонефрит, пиелонефрит, мочекаменная болезнь, почечная недостаточность)

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Заболевания щитовидной железы

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Хроническая тревога, хроническая депрессия

Наличие заболевания: Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Была ли у Вас аллергия на определенные виды продуктов?

Да ☐ Нет ☐

Если Да, отметьте на какие:

Молоко и т.д._____☐

Цитрусовые (апельсины и т.д.)_____☐

Рыба_____☐

Ракообразные_____☐

Другие (какие)_____

Как бы Вы сказали о своём здоровье, что оно?

Отличное_____☐

Очень хорошее_____☐

Хорошее _____☐

Удовлетворительное_____☐

Плохое_____☐

Не знаю _____☐

Говорил ли Вам врач или медицинская сестра, что у Вас избыточный вес, ожирение?
Да☐ Нет ☐ Нет ответа☐

В каком возрасте Вам впервые сказали? _____Нет ответа☐

Получали ли Вы какое-либо лечение или лекарства от этого состояния последние 12 месяцев? Да☐ Нет ☐

Говорил ли Вам врач или медицинская сестра, что у Вас высокий уровень холестерина?
Да ☐ Нет ☐ Не знаю☐

Когда Вам делали анализ крови на холестерин последний раз?
В течение предыдущего года_____ ☐
1-5 лет назад _____ ☐
Более чем 5 лет назад_____ ☐
Никогда _____ ☐
Не знаю _____ ☐

Последний раз Ваш холестерин был_____

Давали ли Вам медицинские работники рекомендации изменить Ваше питание из-за здоровья?
Да ☐ Нет ☐ Не знаю☐

Менструации

В каком возрасте у Вас была первая менструация?

В I _ I _ I лет

Через какой период Ваш менструальный цикл стал регулярным?
Через 1 год или менее ☐ Более, чем через год☐
До сих пор нерегулярный ☐ Не помню☐

До сих пор ли Ваш менструальный цикл регулярный?
Да ☐ Нет менструаций ☐
Мой менструальный цикл нерегулярный ☐

Если нет:
Закончился ли по физиологической причине? ☐
Были ли удалены фаллопиевы трубы (придатки)? ☐
Была ли удалена матка (гистерэктомия)? ☐
Закончился ли менструальный цикл по другой причине? ☐

Вы беременны?
Да ☐ Нет ☐

В каком возрасте у Вас полностью прекратились менструации?

В I _ I _ I лет

Как долго у Вас нет менструаций (с последней менструации)?
Меньше, чем 1 год ☐
1-5 лет ☐
5-10 лет ☐
Больше, чем 10 лет ☐

Беременности, роды, грудное вскармливание

Укажите год рождения и количество месяцев грудного вскармливания каждого ребенка (пожалуйста, сообщите о мертворожденных детях или умерших после родов). Если у Вас нет, и не было детей, переходите к следующему вопросу.

Ребёнок	Год рождения	Количество месяцев грудного вскармливания
1	☐☐☐☐	☐☐
2	☐☐☐☐	☐☐
3	☐☐☐☐	☐☐
4	☐☐☐☐	☐☐
5	☐☐☐☐	☐☐
6	☐☐☐☐	☐☐
7	☐☐☐☐	☐☐
8	☐☐☐☐	☐☐

Гормональная контрацепция

КОНТРАЦЕПТИВНЫЕ ТАБЛЕТКИ

Употребляли ли Вы когда-либо контрацептивные таблетки?
Да ☐ Нет ☐

Если Да, как долго Вы употребляли контрацептивные таблетки?

I _ I _ I лет

В каком возрасте Вы начали употреблять контрацептивные таблетки?

BI _ I _ I лет

Употребляете ли Вы сейчас контрацептивные таблетки?
Да ☐ Нет ☐

Если Да, напишите название препарата_____

Употребление гормональных препаратов в период менопаузы

ЭСТРОГЕНСОДЕРЖАЩИЕ ГОРМОНАЛЬНЫЕ ТАБЛЕТКИ/ПЛАСТЫРИ/КРЕМА/СУППОЗИТОРИИ

Употребляли ли Вы когда-либо гормональные таблетки/пластыри?
Да ☐ Нет ☐

Если Да, как долго Вы употребляли гормональные таблетки/пластыри?

I _ I _ I лет

В каком возрасте Вы начали употреблять гормональные таблетки/пластыри?

BI _ I _ I лет

Употребляете ли Вы сейчас таблетки/пластыри?
Да ☐ Нет ☐

Если Да, напишите название препарата_____

ГОРМОНАЛЬНЫЕ ПРЕПАРАТЫ ДЛЯ ВАГИНАЛЬНОГО ИСПОЛЬЗОВАНИЯ

Употребляли ли Вы когда-либо гормональные крема/суппозитории?

Да ☐ Нет ☐

Если Да, как долго Вы употребляли гормональные крема/суппозитории?

I _ I _ I лет

В каком возрасте Вы начали употреблять гормональные крема/суппозитории?

BI _ I _ I лет

Употребляете ли Вы сейчас крема/суппозитории?

Да ☐ Нет ☐

Если Да, напишите название препарата.....

Использование лекарств

Препараты для сердечно-сосудистой системы

Принимали ли Вы препараты *регулярно*?

	Да	Нет
От высокого давления?	☐	☐
От стенокардии?	☐	☐
От сердечной недостаточности и/или при неправильном сердцебиении	☐	☐

Если Вы ответили Да на один или более вышеуказанных вопросов, пожалуйста, укажите, какие препараты для сердечно-сосудистой системы Вы используете и когда начали лечение.

Препарат	Начало лечения Год / Месяц
1	
2	
3	
4	
5	

Принимаете ли Вы регулярно таблетки, содержащие ацетилсалициловую кислоту (аспирин) для профилактики сердечных заболеваний?

Да ☐ Сейчас нет, но принимал(а) раньше ☐

Нет, никогда не принимал(а) ☐

Если Да, укажите название.....

Как долго Вы употребляете их..... месяцев ..... лет

Принимаете ли Вы *регулярно* препараты, понижающие уровень холестерина?

Да ☐ Сейчас нет, но принимал(а) раньше ☐

Нет, никогда не принимал(а) ☐

Если Да, укажите название.....

Как долго Вы употребляете их..... месяцев ..... лет

Принимали ли Вы какие-либо препараты на протяжении последних двух недель?

Да ☐ Нет ☐

Если Да, это были лекарства: (выберите Да/Нет по каждому пункту)

Лекарства	Да	Нет
От высокого давления	☐	☐
Другие сердечные препараты	☐	☐
Для снижения холестерина	☐	☐
От диабета: Таблетки	☐	☐
Инсулин	☐	☐
От боли	☐	☐
От астмы	☐	☐
От симптомов аллергии	☐	☐
От хронического бронхита или эмфиземы	☐	☐
От депрессии	☐	☐
От нарушений пищеварения	☐	☐
От бессонницы	☐	☐
Успокоительные	☐	☐
От простуды, гриппа, болей в горле	☐	☐
Противовоспалительные гормоны (такие как преднизолон)	☐	☐
Витамины/минералы	☐	☐
Другие:	☐	☐
.....		

Вес

Телосложение в начальной школе. (Выберите только один вариант ответа)

Очень худощавая/ый☐ Худощавая/ый☐ Нормальная/ый☐

Полная/ый☐ Очень полная/ый☐

Телосложение в возрасте 18 лет. (Выберите только один вариант ответа)

Очень худощавая/ый☐ Худощавая/ый☐ Нормальная/ый☐

Полная/ый☐ Очень полная/ый☐

Пытаетесь ли Вы изменить Ваш вес?

☐Нет

☐Да, я пытаюсь набрать вес ☐Да, я пытаюсь снизить вес

Физическая активность

Пожалуйста, укажите уровень Вашей физической активности по шкале от самого низкого до самого высокого уровня в возрасте от 14 до 30 лет, а также на сегодняшний день. Ниже представлена шкала от 1 до 10. Под физической активностью мы понимаем физическую нагрузку на улице и дома, а также тренировки/физические упражнения и другие виды физической активности, напр., прогулки и т.д. Обведите число, наиболее точно характеризующее уровень Вашей физической активности.

Возраст	Очень низкий									Очень высокий
14 лет	1	2	3	4	5	6	7	8	9	10
30 лет	1	2	3	4	5	6	7	8	9	10
Сейчас	1	2	3	4	5	6	7	8	9	10

Тренировались ли Вы / делали ли физические упражнения для здоровья (не менее 30 минут) регулярно последние 12 месяцев?

Да ☐ Нет ☐

Если Да, то:

сколько месяцев..... месяцев

сколько часов в неделю..... часов

Сколько минут или часов в день в среднем Вы ходите / гуляете на открытом воздухе, в том числе до места Вашей работы и обратно?

	Редко/никогда	Меньше 30 минут	30 минут-1час	1-2 часа	Больше 2 часов
Зима	☐	☐	☐	☐	☐
Весна	☐	☐	☐	☐	☐
Лето	☐	☐	☐	☐	☐
Осень	☐	☐	☐	☐	☐

Какова степень физической нагрузки на Вашей работе?

В основном сижу. Во время работы я хожу мало. Пример: офисная работа за столом.	☐
В основном хожу. Я хожу много, но мне не приходится поднимать и переносить тяжести. Пример: продавец, офисная работа, требующая много ходьбы.	☐
Поднимаю и переношу небольшие тяжести. На работе мне приходится много ходить и носить тяжести или часто подниматься по лестнице или в гору. Пример: почтальон, строитель.	☐
Занимаюсь тяжёлой физической работой. Физически моя работа очень тяжёлая, мне приходится поднимать и носить тяжести, копать. Пример: тяжёлая сельскохозяйственная работа или промышленная работа.	☐
Я не работаю	☐

В свободное от работы время как часто Вы выполняете физические упражнения, другую физическую нагрузку (работа по дому или на даче, быстрая ходьба) продолжительностью не менее 30 минут, такую, чтобы появилась небольшая одышка или выступил пот?

Ежедневно	☐
4-6 раз в неделю	☐
2-3 раза в неделю	☐
Один раз в неделю	☐
2-3 раза в месяц	☐
Несколько раз в год и меньше	☐
Я не могу из-за болезни, инвалидности	☐

Какова степень Вашей физической активности в свободное от работы время? Если это зависит от сезона, отметьте группу, которая отражает степень физической активности в среднем за год. (Выберите один вариант ответа)

Я в основном читаю, смотрю телевизор и делаю то, что не требует физической активности (в основном, сидячий образ жизни в свободное время).	☐
Я хожу, катаюсь на велосипеде или двигаюсь другим образом не менее 4-х часов в неделю (это включает прогулки, лёгкую работу на огороде, ходьбу на работу и с работы).	☐
Физическая активность включает занятия спортом на любительском уровне для поддержания здоровья и физической формы, т.е. занятия бегом, лыжами, гимнастикой, плаванием, играми с мячом, выполнение достаточно тяжёлой работы на огороде или равнозначные этому виды деятельности не менее 4-х часов в неделю.	☐
В моё свободное время я занимаюсь спортом профессионально, регулярно, несколько дней в неделю, участвую в соревнованиях по бегу, играм с мячом и в других видах спорта, требующих тяжёлой физической нагрузки.	☐

Сколько обычно времени в будний день, в свободное от работы время, Вы проводите сидя (сидя за столом, в гостях у друзей, за чтением, в транспорте, смотрите телевизор, лёжа или сидя)?

_____часов_____минут

Алкоголь

Употребляете ли Вы алкоголь?

Да ☐ Нет ☐

Если да, как часто и какое количество Вы в среднем выпивали за 12 месяцев? (Выберите по одному ответу в каждой строке)

	Никогда/редко	1 в мес.	2-3 в мес.	1 в нед.	2-4 в нед.	5-6 в нед.	1+ в ден.
Лёгкое пиво (5%, бутылок 1/2 литра)	☐	☐	☐	☐	☐	☐	☐
Крепкое пиво (более 5%, бутылок 1/2 литра)	☐	☐	☐	☐	☐	☐	☐
Столовое вино, шампанское (менее 12%, бокалов 120 мл)	☐	☐	☐	☐	☐	☐	☐
Креплёное вино, наливки (16-20%, бокалов 80 мл)	☐	☐	☐	☐	☐	☐	☐
Крепкие спиртные напитки: водка, коньяк, самогон, в том числе в коктейлях (40%, рюмок 40 мл)	☐	☐	☐	☐	☐	☐	☐

Сколько лет Вы употребляете алкоголь в таких количествах? I _ I _ I лет

Вспомните, сколько бокалов, бутылок следующего алкоголя Вы выпили за последние 7 дней? Если Вы не пили, отметьте 0. (Выберите по одному ответу в каждой строке)

Лёгкое пиво (крепостью менее 5%, бутылок 1/2 литра)	
Крепкое пиво (крепостью более 5%, бутылок 1/2 литра)	
Столовое вино, шампанское (крепостью менее 12%,бокалов 120 мл)	
Креплёное вино, наливки (крепостью 16-20%, бокалов 80 мл)	
Крепкие спиртные напитки: водка, коньяк, самогон, в том числе в коктейлях (крепостью 40%, рюмок 40 мл)	

Не возникает ли у Вас мысль о необходимости отказаться от употребления алкоголя?

Да ☐ Нет ☐

Не надоедает ли Вам критика окружающих по поводу Ваших выпивок?

Да ☐ Нет ☐

Не возникает ли у Вас переживаний или чувства вины в связи с Вашими выпивками?

Да ☐ Нет ☐

Не бывает ли так, что Вы по утрам в первую очередь принимаетесь за выпивку для успокоения нервов или устранения явлений похмелья?

Да ☐ Нет ☐

Курение

Проживаете (проживали) ли Вы с заядлым курильщиком

в настоящее время? Да ☐ Нет ☐

в детстве? Да ☐ Нет ☐

Сколько часов в среднем в день Вы находитесь в накуренном помещении?

Больше, чем 5 часов ☐ 1-5 часов ☐

Меньше, чем 1 час в день ☐ Почти нисколько ☐

Вы курите в настоящее время?

Да, каждый день	☐
Да, иногда, не каждый день	☐
Нет, я никогда не курил(а) или я выкурил(а) не более 100 сигарет (примерно 5 пачек) за свою жизнь	☐
Нет, я курил(а) в прошлом	☐

Что Вы курите (курили): сигареты, папиросы, трубку, самокрутки, сигары? (Обведите в круг)

Укажите в графе «Возраст» количество выкуриваемых в среднем сигарет в день.

Возраст	Количество выкуриваемых сигарет в день						
	0	1-4	5-9	10-14	15-19	20-24	25+
15-19	☐	☐	☐	☐	☐	☐	☐
20-29	☐	☐	☐	☐	☐	☐	☐
30-39	☐	☐	☐	☐	☐	☐	☐
40-49	☐	☐	☐	☐	☐	☐	☐
50-59	☐	☐	☐	☐	☐	☐	☐
60-69	☐	☐	☐	☐	☐	☐	☐

Сколько в целом лет Вы курите (курили) ежедневно? Если меньше, чем 12 месяцев, укажите 00.

| _ | _ | Лет

Сколько в среднем сигарет/папирос Вы курите (курили) ежедневно?

Количество сигарет в день | _ | _ |

В каком возрасте Вы начали курить ежедневно?

Возраст | _ | _ |

Вопрос для тех респондентов, кто бросил курить. Когда Вы бросили курить?

| _ | _ | лет назад

Если последние 12 месяцев:

Меньше чем 1 месяц назад ☐ 1-6 месяцев назад ☐
6-12 месяцев назад ☐

Психологическое здоровье, стресс

Оцените уровень стресса за последний год?

Высокий ☐ Средний ☐ Низкий ☐

Чувствовали ли Вы депрессию за последний год?

Совсем нет	☐
Не больше, чем до этого	☐
Немного больше, чем до этого	☐
Намного больше, чем до этого	☐
Не знаю, нет ответа	☐

Чувствовали ли Вы напряжение, испытывали стресс или подвергались давлению за последний месяц (30 дней)?

Совсем нет	☐
Да – в некоторой степени, но не больше, чем люди обычно испытывают	☐
Да – больше, чем люди обычно испытывают	☐
Да – моя жизнь практически невыносима	☐
Не знаю, нет ответа	☐

Пожалуйста, скажите, насколько Вы удовлетворены качеством Вашей жизни в целом?

Очень доволен(а)	☐
Скорее доволен(а)	☐
Более или менее	☐
Скорее не доволен(а)	☐
Очень не доволен(а)	☐
Не знаю, нет ответа	☐

Медицинский работник .....

Интервьюер .....

Большое спасибо за участие!

Лабораторные данные

SEA FOOD AND HEALTH OF THE NORTHERN POPULATION

Do you agree to take part in the study?

Yes ☐ No ☐

Residence: .....
place of residence

Date | _ | _ | | _ | _ | | _ | _ | _ | _ |
day month year

Participant's Initials | _ | _ | _ |
L N M (last name, name, middle name)

Participant's Identification Number .....

Objective data

Time of taking measurements | _ | _ | hours

Blood pressure

Measurement	Systolic blood pressure	Diastolic blood pressure
1	..... mmHg	..... mmHg
2	..... mmHg	..... mmHg
Mean	..... mmHg	..... mmHg

Pulse rate

Measurement	Pulse rate
1	beats /minutes
2	beats /minutes
Mean	beats /minutes

Anthropometric data

Height	, cm
Weight	, kg
Waist circumference	, cm
Hip circumference	, cm
Body mass index	weight kg/ height m^2
Waist-to-hip ratio	

Blood sampling

Time of blood sampling | _ | _ | hours

Fasting blood test Yes ☐ No ☐

Time since last meal? | _ | _ | hours

What did you eat, drink for your last meal?
1 ..... 2 ..... 3 .....
4 ..... 5 ..... 6 .....

Did you drink alcohol yesterday or today?

Yes ☐ No ☐

Questionnaire

Personal information, social background

Age | _ | _ | years

Date of birth | _ | _ | | _ | _ | | _ | _ | _ | _ |
day month year

Gender Male ☐ Female ☐

What kind of education do you have? (Tick one box only)

Traditional skills training	☐
Incomplete primary school	☐
Primary school	☐
Incomplete secondary school, 9 years (or 7-8 years)	☐
Complete secondary school, 11 years (or 10 years)	☐
Vocational training (technical (secondary) school, college)	☐
Incomplete higher education (University, Institute) if 3 years or more	☐
Complete higher education (University, Institute)	☐
Post-graduate education (diploma of candidate or doctor of sciences)	☐

What kind of work do (did) you do or what is (was) your main occupation for the most of your life?

appointment .....
place of work .....
Did not work ☐ Don't know, no answer ☐

What has been your main occupation or way of making a living in the last 12 months?

appointment .....
place of work .....
Did not work ☐ Don't know, no answer ☐

Are you currently? (Tick yes or no on each line)

	Yes	No
Full-time employee	☐	☐
Part-time employee	☐	☐
Self-employed	☐	☐
Housewife	☐	☐
Retired, don't work	☐	☐
Student	☐	☐
Unemployed	☐	☐
Unable to work because of disability, health problems	☐	☐
On maternity leave	☐	☐
Other	☐	☐

How many years have you lived in this Northern area? (If less than 12 months, put 00)

| _ | _ | years

What ethnic group would your mother consider herself to belong to? (Tick one box only)

Aboriginal northern population (native Nenets or some other Northern ethnic group) _____	☐
Non-aboriginal population (Russian or other nationality) _____	☐
Mixed group (aboriginal and non-aboriginal population of the North)	☐
Don't know, no answer	☐

To what ethnic group would your father consider himself to belong to? (Tick one box only)

Aboriginal northern population (native Nenets or some other Northern ethnic group) ☐
_____

Non-aboriginal population (Russian or other nationality) ☐
_____

Mixed group (aboriginal and non-aboriginal population of the North) ☐

Don't know, no answer ☐

According to birth-certificate, passport or other documents, are you …?

Russian ☐ Ukrainian ☐ Byelorussian ☐

Nenets ☐ Komi ☐

If other, please, give details ☐↓

Don't know, no answer ☐

What do you consider yourself to be in your own estimate…? (Tick one box only)

Russian ☐ Ukrainian ☐ Byelorussian ☐

Nenets ☐ Komi ☐

If other, please, give details ☐↓

Don't know, no answer ☐

You are (tick one box only):

Married ☐ living together ☐ Divorced /separated ☐

Single (never married) ☐ Windowed ☐

How many people <u>including yourself</u> 18 years or older live in your home?

Number | _ | _ |

How many children under the age of 18 are living in your home? Put 00, if none at all.

Number | _ | _ |

How many people in your family have income?

Number | _ | _ |

What is your household's overall monthly income per person on average from all sources, including wages, pensions, cash benefits, stipends and other income?

Less then 1500	☐	1500,1-2500	☐
2500,1-3500	☐	3500,1-4500	☐
4500,1-6000	☐	6000,1-8000	☐
8000,1-12000	☐	More then 12000	☐

Don't know, now answer ☐

Nutrition

Are you a vegetarian (who eats chicken and fish but no meat)?

Yes ☐ No ☐

Are you currently on a special diet?

Yes ☐ No ☐

If yes, what kind of diet? ---

If yes, how long have you been on a special diet? (Write the number of years, months in the box):

| _ | _ | years | _ | _ | months

You are (tick below Yes or No for each item):

Suffer from poor appetite
Yes ☐ No ☐

Suffer from limosis
Yes ☐ No ☐

Suffer from a chronic gastrointestinal disease
Yes ☐ No ☐

We are interested in finding out about your usual eating habits. For each question, tick how often you have eaten the food in question **<u>in the last twelve months</u>**.

Fish and sea food / Traditional Northern food

How often have you eaten fish <u>in the last 12 months</u>?

	Never/seldom	1 mth.	2-3 mth.	1 wk.	2-3 wk.	4-6 wk.	1 day	2+ day
Fish	☐	☐	☐	☐	☐	☐	☐	☐

In the period of the year when you eat fish, how often do you usually eat the following? (Tick one box per line only)

	Never /seldom	1 per mth.	2-3 mth.	1 wk.	2 wk.	3+ wk.
Boiled, poached "pripjujchennaya" cod, haddock, saithe	☐	☐	☐	☐	☐	☐
Fried cod, haddock, saithe	☐	☐	☐	☐	☐	☐
Wolffish, flounder, redfish	☐	☐	☐	☐	☐	☐
Salmon (semga), trout	☐	☐	☐	☐	☐	☐
Mackerel	☐	☐	☐	☐	☐	☐
Herring	☐	☐	☐	☐	☐	☐
Pink salmon						
Siberian whitefish, broad whitefish, syrok, inconnu and other similar fish	☐	☐	☐	☐	☐	☐

If you consumed <u>another fish species</u>, please, specify what kind of fish in the blank below and tick the frequency box.

	Never/seldom	1 mth.	2-3 mth.	1 wk.	2 wk.	3+ wk.
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

Describe what kind of fish do you usually eat, starting from the most frequently eaten species (put 1) and ending with the least frequently eaten (put 3).

1 the most often	
2	
3 the least often	

Does yours fish consumption depend considerably on seasons?

Yes☐ No☐ Don't know☐

If yes, specify, what kind of fish you eat <u>predominantly</u> during what season and how often (put 1 mth.; 2-3 mth.; 1 wk. ; 2 wk. ; 3+ wk.).

season	Fish species	How often
winter		
spring		
summer		
autumn		

If you eat fish, how much do you usually eat each time? (1 slice/piece = 150 g) (Tick one box on each line)

Boiled, stewed fish (slice)

☐1 ☐1.5 ☐2 ☐3+

Fried fish (slice)

☐1 ☐1.5 ☐2 ☐3+

<u>How many times per year</u> do you eat the following? (Tick one box on each line)

	0	1-3	4-6	7-9	10+
Milt	☐	☐	☐	☐	☐
Fish liver	☐	☐	☐	☐	☐

How often do you eat canned fish liver?

_____ per month. **Put 0 if rare.**

How often do you eat crustaceans (shrimps, crabs)? (Tick one box only)

☐ Never/seldom ☐1 per mth ☐2-3 per mth. ☐1+ per wk.

How often do you eat shellfish (mussels, squids, sea scallops)? (Tick one box only)

☐ Never/seldom ☐1 per mth ☐2-3 per mth ☐1+ per wk.

In your own estimate, do you eat enough fish?

Yes ☐ No ☐

If No, why do you not eat more fish?

	Yes	No
Too expensive	☐	☐
Poor selection	☐	☐
Fresh fish not easy to get	☐	☐
Poor quality	☐	☐
Ready-made dishes not available	☐	☐
Smell during preparation	☐	☐
Difficult to prepare	☐	☐
Taste	☐	☐
Family do not like fish	☐	☐
A family habit, we did not eat fish when I was a child	☐	☐
Food allergy	☐	☐

Please give details if other is Important

Has fish availability changed since 1991, in your own estimate?

☐ Less available ☐ More available ☐ Not changed

How often do you or members of your family go fishing?

Weekly ☐

1-3 times per month ☐

1-11 times per year ☐

Never ☐

Which part of your family diet consisted of fish?

None/almost none ☐ More than a half ☐

Less than a half ☐ Almost everything ☐

About a half ☐ Don't know ☐

Which part of the fish consumed by your family was caught by members of your family?

None/almost none ☐ More than a half ☐

Less than a half ☐ Almost everything ☐

About a half ☐ Don't know ☐

How often did you eat the following traditional Northern food items? (Tick one box on each line)

	Never/seldom	1 per mth.	2-3 per mth.	1 per wk.	2-3 per wk.	4+ per wk.
Reindeer meat	☐	☐	☐	☐	☐	☐
Reindeer fat	☐	☐	☐	☐	☐	☐
Meat of wild animals (elk, boar, etc)	☐	☐	☐	☐	☐	☐
Seal meat	☐	☐	☐	☐	☐	☐
Seal blubber	☐	☐	☐	☐	☐	☐
Walrus meat	☐	☐	☐	☐	☐	☐
Walrus blubber	☐	☐	☐	☐	☐	☐
Whale meat	☐	☐	☐	☐	☐	☐
Whale blubber	☐	☐	☐	☐	☐	☐
Northern forest berries	☐	☐	☐	☐	☐	☐
Northern forest mushrooms	☐	☐	☐	☐	☐	☐
Other						
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

Recall, what part of your diet consisted of traditional Northern food items, including fish?

None/almost none ☐ More than a half ☐

Less than a half ☐ Almost everything ☐

About a half ☐ Don't know ☐

What part of the traditional Northern food eaten in your household was obtained by the members of your family by hunting, fishing, gathering in the last 12 months?

None/almost none ☐ More than a half ☐

Less than a half ☐ Almost everything ☐

About a half ☐ Don't know ☐

Other foodstuff and food preparation

For each question, tick how often you have eaten the food in question **in the last twelve months**.

How many glasses of each kind of milk (curdled dairy products) did you drink? (Tick one box on each line)

	Never/seldom	1-4 gl. wk.	5-6 gl. wk.	1 gl. day	2-3 gl. day	4+ gl. day
Milk with fat content of 3.2-3.9 % (sweet, curdled milk)	☐	☐	☐	☐	☐	☐
Milk with fat content of 1.5-2.5 % (sweet, curdled milk)	☐	☐	☐	☐	☐	☐
Skimmed milk with fat content of 0.5%	☐	☐	☐	☐	☐	☐

Did you consume cream 10% or >?

Yes, almost everyday ☐ Sometimes ☐ No ☐

How many cups of tea, of each kind of coffee did you drink? (Tick one box on each line)

	Never/seldom	1-6 c. wk.	1 c. day	2-3 c.day	4-5 c.day	6-7 c.day	8+ c.day
Tea	☐	☐	☐	☐	☐	☐	☐
Boiled coffee	☐	☐	☐	☐	☐	☐	☐
Filter coffee or instant coffee	☐	☐	☐	☐	☐	☐	☐

How many glasses of packed juice/ carbonated beverages, containing sugar did you drink? (Tick one box only)

	Never/seldom	1-3 gl. wk.	4-6 gl. wk.	1 gl. day	2-3 gl. day	4+ gl. day
Packed juice/ carbonated beverages, containing sugar	☐	☐	☐	☐	☐	☐

How many lumps or teaspoons of sugar do you usually put in drinks (tea, coffee and other) in average per day? Put 0 if you drink sugar-free tea or coffee.

_____lumps or teaspoons of sugar per day

How often did you eat the following? (Tick one box on each line)

	Never/seldom	1mth.	2-3 mth.	1 wk.	Several days per week	1 day	2+ day
Curd and curd products	☐	☐	☐	☐	☐	☐	☐
Sour cream	☐	☐	☐	☐	☐	☐	☐
Butter	☐	☐	☐	☐	☐	☐	☐
Margarine	☐	☐	☐	☐	☐	☐	☐
Yoghurt	☐	☐	☐	☐	☐	☐	☐

How often on average did you eat cereals, oat flakes or muesli? (Tick only one box)

Never/seldom	1-3 wk.	4-6 wk.	1 day
☐	☐	☐	☐

How many slices of bread/rolls and crispbread did you eat (1/2 roll= 1 slice of bread)? (Tick one box on each line)

	Never/seldom	1-4 wk.	5-7 wk.	2-3 day	4-5 day	6+ day
Rye bread (brown bread)	☐	☐	☐	☐	☐	☐
Wholemeal, whole grain bread	☐	☐	☐	☐	☐	☐
Wheat bread (white bread)	☐	☐	☐	☐	☐	☐
Crispbread, etc	☐	☐	☐	☐	☐	☐

On average, how many sandwiches per week did you eat with the following fish products? (Tick one box on each line)

	Never/seldom	1 wk.	2-3 в wk.	4-6 wk.	7-9 wk.	10+ wk.
Canned fish	☐	☐	☐	☐	☐	☐
Light-salted fat fish	☐	☐	☐	☐	☐	☐
Caviar	☐	☐	☐	☐	☐	☐

On average, how many sandwiches per week did you eat with other products? (Tick one box on each line)

	Never/seldom	1-3 wk.	4-6 wk.	1 day	2-3 day	4+ day
Home-made jam, jam, honey	☐	☐	☐	☐	☐	☐
White cheese, full cream 40-50%	☐	☐	☐	☐	☐	☐
White cheese, reduced/ low fat	☐	☐	☐	☐	☐	☐
Melted cheese	☐	☐	☐	☐	☐	☐
Meat products /spreads (sausage, ham, backon or other), liver paté	☐	☐	☐	☐	☐	☐

What kind of fat did you usually spread on your bread? (Tick more than one box if necessary)

I do not use fat on bread ☐
Butter ☐
Soft margarine (e.g., Voimix, Rama) ☐
Lard and other fat of domestic animals ☐

Other fat (indicate what kind): _____

If you use fat on your bread, how thick a layer did you usually spread on it? (Tick one box only).

Very thin scraping (3 g, less than 1 tsp) ☐
Thin layer (5 g, 1 tsp) ☐
Well-covered (8 g, 1.5 tsps) ☐
Thick layer (12 g, more than 2 tsps) ☐

How often did you eat lard? Put 0, if you seldom/never eat lard.

_____ times a week

How often did you eat mayonnaise? (Tick one box only)

	Never/seldom	1-6 wk.	1 day	2-3 day	4+ day
Mayonnaise	☐	☐	☐	☐	☐

How often did you eat rice, spaghetti/macaroni, legumes? (Tick one box on each line)

	Never/seldom	1-3 mth.	1 wk.	2 wk.	3+ wk.
Rice	☐	☐	☐	☐	☐
Spaghetti/macaronis	☐	☐	☐	☐	☐
Legumes	☐	☐	☐	☐	☐

How often did you eat porridges (rise, backwheat, millet, pearl-barley, fine-ground barley, semolina, oat)? (Tick one box only)

	Never/seldom	1 mth.	2-3 mth.	1 wk.	2 wk.	3+ wk.
Porridges	☐	☐	☐	☐	☐	☐

How often did you eat nuts, seeds? (Tick one box on each line)

	Never/seldom	1-3 mth.	1 wk.	2-4 wk.	5-6 wk.	1 day	2+ day
Nuts	☐	☐	☐	☐	☐	☐	☐
Seeds	☐	☐	☐	☐	☐	☐	☐

How often did you eat fruits: apples/pears, oranges, bananas, grapes, peaches or other fruits? (Tick one box only)

	Never/seldom	1-3 mth.	1 wk.	2-4 wk.	5-6 wk.	1 day	2+ day
Fruits	☐	☐	☐	☐	☐	☐	☐

How often did you eat vegetables, except potatoes? (Tick one box only)

	Never/seldom	1-3 mth.	1 wk.	2 wk.	3 wk.	4-5 wk.	6-7 wk.
Vegetables	☐	☐	☐	☐	☐	☐	☐

How often did you eat potatoes? (Tick one box on each line)

	Never/seldom	1-3 mth.	1 wk.	2-3 wk.	4-6 wk.	7 + wk.
Boiled potatoes	☐	☐	☐	☐	☐	☐
Fried potatoes	☐	☐	☐	☐	☐	☐

What kind of fat was usually used in cooking? (You may tick several boxes)

- Sunflower oil ☐
- Butter ☐
- Hard margarine ☐
- Soft margarine ☐
- Butter containing margarine ☐
- Soy oil ☐
- Olive oil ☐
- Corn/maize oil ☐
- Fat of domestic animals (lard, beef fat, chicken fat and other ☐
- Other, specify ☐
- None ☐

What kind of fat did you usually put in salads? (You may tick several boxes).

- Sunflower oil ☐
- Mayonnaise ☐
- Sour cream ☐
- Olive oil ☐
- Soy oil ☐
- Corn/maize oil ☐
- Other, specify ☐
- None ☐

How many eggs did you normally eat in the course of a week (fried, boiled, omelettes)? (Tick one box only)

☐0 ☐1 ☐2 ☐3-4 ☐5-6 ☐7+

How often did you eat the following?

	Never/seldom	1-3 mth.	1 wk.	2-3 wk.	4-6 wk.	7+ wk.
Pastries	☐	☐	☐	☐	☐	☐
Candies, chocolate	☐	☐	☐	☐	☐	☐

Please provide a summary of the main dishes you ate for dinner, supper. Tick the box that indicates how often on average over <u>the last twelve months</u> you ate this kind of food. (Tick one box on each line)

	Hardly ever	1 mth.	2-3 mth.	1 wk.	2 wk.	3 wk.	4 wk.	5+ wk.
Portion of meat (beef,pork,mutton)	☐	☐	☐	☐	☐	☐	☐	☐
Minced meat meat rissoles, (beef, pork, mutton)	☐	☐	☐	☐	☐	☐	☐	☐
Processed meat: sausage, etc.	☐	☐	☐	☐	☐	☐	☐	☐
Canned meat («Tushyonka»)	☐	☐	☐	☐	☐	☐	☐	☐
By-products, liver etc. (beef, pork, mutton)	☐	☐	☐	☐	☐	☐	☐	☐
Chicken, poultry dishes	☐	☐	☐	☐	☐	☐	☐	☐
Fatty fish (mackerel, salmon, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Lean fish (cod, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Natural meat, chicken broth (soup, based on it)	☐	☐	☐	☐	☐	☐	☐	☐
Fish soup(«uha»), fish broth								
other								
	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐

How often did you eat salty snacks, "fast food"? (Tick one box on each line)

	Never/seldom	1-3 mth.	1 wk.	2-3 wk.	4-6 wk.	7+ wk.
Potato chips	☐	☐	☐	☐	☐	☐
Peanut	☐	☐	☐	☐	☐	☐
Dried fish, squid	☐	☐	☐	☐	☐	☐
Fast food (deep-fat fried potato, pizza, hamburger)	☐	☐	☐	☐	☐	☐

How often did you eat frozen semi-prepared food?

☐Never/seldom ☐1-3 mth. ☐1 wk.
☐2-3 wk. ☐4-6 wk. ☐7+ wk.

How often did you fry food?

Never/seldom	Sometimes, not every day	Every day
☐	☐	☐

How often did you eat chicken with skin?

- Always ☐
- Often ☐
- Sometimes ☐
- Never ☐
- Do not eat chicken ☐

Do you add salt to food that has already been cooked?

No, never ☐ Yes, usually ☐ Yes, sometimes ☐

Do you remove visible fat from meat before preparation or before a meal?

Yes ☐ No ☐

How many times per day do you have a meal? ____ Times

Dietary supplements

Do you take fish oil?

Yes ☐↓ No ☐

Write down the brand	Never/ seldom	1-3 mth.	1 wk.	2-3 wk.	4-6 wk.	7 wk.	For how long
	☐	☐	☐	☐	☐	☐	I_I_I years I_I_I months

Do you take fish oil (omega 3) / cod liver pills/capsules?

Yes ☐↓ No ☐

Write down the brand	Never/ seldom	1-3 mth.	1 wk.	2-3 wk.	4-6 wk.	7 wk.	For how long
	☐	☐	☐	☐	☐	☐	I_I_I years I_I_I months

64.3 Do you take vitamins/minerals?

Yes ☐ ↓ No ☐

Write down the brand	Never/ seldom	1-3 mth.	1 wk.	2-3 wk.	4-6 wk.	7 wk.	For how long
1	☐	☐	☐	☐	☐	☐	I_I_I years I_I_I months
2	☐	☐	☐	☐	☐	☐	I_I_I years I_I_I months
3	☐	☐	☐	☐	☐	☐	I_I_I years I_I_I months

Do you take other dietary supplements?

Yes ☐↓ No ☐

Write down the brand	Never/ seldom	1-3 mth.	1 wk.	2-3 wk.	4-6 wk.	7 wk.	For how long
1	☐	☐	☐	☐	☐	☐	I_I_I years I_I_I months
2	☐	☐	☐	☐	☐	☐	I_I_I years I_I_I months
3	☐	☐	☐	☐	☐	☐	I_I_I years I_I_I months

Family history

Specify, if any of your first-grade relatives (parents, siblings sisters, brothers) aged <60 years have had?

	Yes	No	Don't know
Myocardial infarction or heart attack	☐	☐	☐
Stroke	☐	☐	☐
Hypertension	☐	☐	☐
Unexpected cardiac death	☐	☐	☐

Specify, if any of your first-grade relatives (parents, siblings sisters, brothers) had diabetes mellitus?

Yes ☐ No ☐ Don't know ☐

Specify, if any of your firs-grade relatives (parents, siblings sisters, brothers) have (had) problems with

overweight, obesity?

Yes ☐ No ☐ Don't know ☐

high cholesterol level?

Yes ☐ No ☐ Don't know ☐

Health

Do you have any chronic diseases or health problems?

Yes ☐ No ☐ Don't know, no answer ☐

If Yes, please, specify, what chronic diseases or health problems (including gynecological) do you have?

Do you have any health complaints at present?

Yes ☐ No ☐

Have you had an acute respiratory disease or relapse of a chronic disease in the last 2-3 weeks?

Yes ☐ No ☐ Don't know, no answer ☐

Have you had any of the following symptoms or complaints in the last month (30 days)?

	Yes	No
Chest pain during physical exercises	☐	☐
Breathing problems or cough	☐	☐
Neck/shoulder pain	☐	☐
Head ache	☐	☐
Podedema	☐	☐
Dizziness	☐	☐
Joint pain	☐	☐
Back- pain	☐	☐
Digestive disoders	☐	☐
Fever	☐	☐
Teeth diseases, dedentition	☐	☐
Skin diseases, skin irritation	☐	☐
Impaired vision	☐	☐
Impaired hearing	☐	☐
Sleep disorders, insomnia	☐	☐

Which, if any, of the following illnesses has a doctor, nurse, or other health professional told you that you have? At what age were you told first? Have you taken any treatment or medication for this condition in the last 12 months?

High blood pressure, hypertension

Presence of disease: Yes ☐ No ☐ Don't know ☐

At what age were you told first?: …….. No answer ☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes ☐ No ☐

Was your blood pressure high during pregnancy?

Yes ☐ No ☐ Borderline high pressure (pre-hypertension) ☐

Heart failure

Presence of disease: Yes ☐ No ☐ Don't know ☐

At what age were you told first?: …….. No answer ☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes ☐ No ☐

Heart attack, myocardial infarction

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?: …….. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Phlebitis (inflammation of veins/arteries)

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?: ……. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Thrombosis of the upper or lower extremities

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?: …….. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Stroke

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?: …….. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Angina, ischemic heart disease

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?: ……. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Arrhythmia

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?: …….. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Migraine or recurrent headache

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?:……. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Asthma

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?: …….. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Other allergic disorders

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?: ……. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

If Yes, specify which kinds ----------

Cancer. What type? ----------

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?:…….. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Diabetes. What type? ----------

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?:…….. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Was your blood glucose high during pregnancy?

Yes ☐ No ☐ Pre-diabetes (borderline diabetes) ☐

Gall-bladder diseases (cholelithiasis, cholestasis, cholecystitis)

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?:……. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Hepatic diseases (hepatitis, cirrhosis, hepatic failure)

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?: …….. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Kidney diseases (glomerulonephritis, pyelonephritis, urolithiasis, renal failure)

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?:…… No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

12 months?: Yes☐ No ☐

Thyroid disorders

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?: ……. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Chronic anxiety and chronic depression

Presence of disease: Yes☐ No ☐ Don't know☐

At what age were you told first?: ……No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Have you had allergic reactions to certain kinds of food?

Yes ☐ No ☐

If yes, specify which kinds?

Milk etc ---------- ☐

Citrus fruits (oranges, etc.) ---------- ☐

Fish ---------- ☐

Crustaceous ---------- ☐

Other (specify) ----------

Would you say that in general your health is?

Excellent ---------- ☐

Very good ---------- ☐

Good ---------- ☐

Fair ---------- ☐

Poor ---------- ☐

Don't know ---------- ☐

Has a doctor or nurse told you that you are overweight or you have obesity?

Yes☐ No ☐ Don't know☐

At what age were you told first?: ……. No answer☐

Have you taken any treatment or medication for this condition in the last 12 months?: Yes☐ No ☐

Has a doctor or nurse told you that you have high cholesterol level?

Yes☐ No☐ Don't know☐

When was the last time your blood cholesterol was measured?

During the previous year ☐

Between 1-5 years ago ☐

More than 5 years ago ☐

Never ☐

I don't know ☐

Has a doctor, nurse told you that you have high cholesterol level?

Yes☐ No☐ Don't know☐

Last time your cholesterol level was

During the last year (12 months) have you been advised by a health professional to change your dietary habits for health reasons?

Yes☐ No☐ Don't know☐

Menstruations

How old were you when you had your first period?

I _ I _ I years

How many years did it take before your periods became regular?

One year or less ☐ More than one year ☐

Never ☐ Don't remember ☐

Are your periods still regular?

Yes ☐ No, I have not periods ☐

My periods are irregular☐

If not:

Have they stopped due to the natural reason? ☐

Have your fallopian tubes⁄ovaries been removed? ☐

Have you had your womb removed (hysterectomy)? ☐

Have they stopped for some other reason? ☐

Are you pregnant?

Yes☐ No ☐

How old were you when your periods stopped completely?

I _ I _ I years

For how long have you had no periods (since your last period)?

Less than 1 year ☐

1-5 years ☐

5-10years ☐

More than 10 years ☐

Pregnancies, childbirth, breastfeeding

For each child, give details of year of birth and number of months of breast-feeding (please give information for still births and children who have since died). If you have not had any children, go on to the next question.

Child	Year of birth	Months breast-feeding
1	☐☐☐☐	☐☐
2	☐☐☐☐	☐☐
3	☐☐☐☐	☐☐
4	☐☐☐☐	☐☐
5	☐☐☐☐	☐☐
6	☐☐☐☐	☐☐
7	☐☐☐☐	☐☐
8	☐☐☐☐	☐☐

Hormonal contraception

CONTRACEPTIVE PILLS

Have you ever been on the contraceptive pills?

Yes ☐ No ☐

If yes, for how long have you been on the pills in total?

I _ I _ I Years

How old were you when you first started taking the pills?

I _ I _ I Years

Are you currently on the pills?

Yes☐ No ☐

If yes, write down the brand

Use of hormonal medicines in menopause

ESTROGEN-containing PILLS/PLASTERS/CREAMS/SUPPOSITORIES

Have you ever used hormone pills /plasters?

Yes☐ No ☐

If yes, for how long have you used hormone pills/plasters in all?

I _ I _ I Years

How old were you when you first used hormone pills /plasters?

I_ I _ I Years

Are you currently using pills /plasters?

Yes ☐ No ☐

If yes, write down the brand

HORMONE PREPARATIONS FOR VAGINAL USE

Have you ever used hormone creams/suppositories?
Yes ☐ No ☐

If Yes, for how long have you used hormone creams/suppositories?
|_ | _ | Years

How old were you when you first used hormone creams/suppositories?
|_ | _ | Years

Are you currently using creams/suppositories?
Yes ☐ No ☐

If yes, write down the brand .....

Use of medications

Medicines for heart and circulatory diseases

Do you take medicines on a *regular basis*?

	Yes	No
For high blood pressure?	☐	☐
For angina pectoris?	☐	☐
For heart failure and/or irregular heart rhythm	☐	☐

If you have answered Yes, please, specify what cardiovascular medicines you are taking, and when the treatment began

Medicine	Treatment begun Year / Month
1	
2	
3	
4	
5	

Do you *routinely* take medications containing acetylsalicylic acid (aspirin) for prevention of cardiac diseases?

Yes, currently ☐ Previously, but not now ☐
No, never used ☐

If Yes give the brand name .....

How long have you used them altogether?

..... months ..... years

Do you *routinely* take cholesterol-lowering medications?
Yes, currently ☐ Previously, but not now ☐
No, never used ☐

If Yes give the brand name .....

How long have you used them altogether?

..... months ..... years

During the last 2 weeks have you taken any medicines?
Yes ☐ No ☐

If Yes, was it any of the following: (tick Yes/No in each line)

Medicines	Yes	No
Antihypertensive medicines	☐	☐
Other cardiac medicines	☐	☐
Cholesterol-lowering medication	☐	☐
Glucose-lowering medication: Pills	☐	☐
Insulin	☐	☐
Painkillers	☐	☐
Medicines for asthma	☐	☐
Medicines for allergy symptoms	☐	☐
Medicines for chronic bronchitis or emphysema	☐	☐
Medicines for depression	☐	☐
Medicines for dyspepsia	☐	☐
Medicines for insomnia	☐	☐
Sedative	☐	☐
Medicines for cold, flu, throat ache	☐	☐
Anti-inflammatory hormones (as prednosolone)	☐	☐
Vitamins/minerals	☐	☐
Other:	☐	☐
.....		

Height

Body build in primary school (Tick one box only)

Very thin ☐ Thin ☐ Normal ☐ Fat ☐ Very fat ☐

Body build at the age 18 years old (Tick one box only)

Very thin ☐ Thin ☐ Normal ☐ Fat ☐ Very fat ☐

Are you trying to alter your weight?
☐ No
☐ Yes, I am trying to put on weight ☐ Yes, I am trying to lose weight

Physical activity

Please indicate the level of your physical activity on a scale from very low to very high at the ages of 14 and 30 years and today. The scale below goes from 1-10. By physical activity we mean both outdoor and indoor, as well as training/exercise and other physical activity, such as walking, etc.. Put a ring around the number that best describes your level of physical activity.

Age	Very low									Very high
14 years old	1	2	3	4	5	6	7	8	9	10
30 years old	1	2	3	4	5	6	7	8	9	10
Today	1	2	3	4	5	6	7	8	9	10

Have you done physical training / exercises (not less than 30 minutes) on permanent basis during last 12 months?
Yes ☐ No ☐

If Yes:
How many months ..... months

How many hours per week ..... hours

How many hours per day on average do you walk usually outside (including to and from work)?

	Rarely/never	Less than 30 min	30min-1hours	1-2 hours	more than 2 hours
Winter	☐	☐	☐	☐	☐
Spring	☐	☐	☐	☐	☐
Summer	☐	☐	☐	☐	☐
Autumn	☐	☐	☐	☐	☐

How much physical activity do you have at work?

Manly sitting. I do not walk much at work. Example: office work at the desk.	☐
Mainly walking. I walk in my work quite a lot but I do not have to lift or carry heavy things. Example: shop assistant, office work where one has to move.	☐
Lifting, carrying light loads. I must walk and carry a lot or often climb stairs or go uphill in my work. Example: postman, builder.	☐
Heavy manual work. My work is heavy physical work, where I have to carry or lift heavy things, to dig. Example: heavy farm work, heavy industrial work.	☐
I don't work	☐

In your leisure time, how often do you do physical exercises, other physical activities for at least 30 min which makes you at least mildly short of breath or perspire?

Daily	☐
4-6 times a week	☐
2-3 times a week	☐
Once a week	☐
2-3 times a month	☐
A few times a year or less	☐
I cannot because of disease or disability	☐

How much physical activity do you have during your leisure time? If it is varies with the seasons, mention the group the best represents your average activity per year. (Mention one group only)

I mainly read, watch television and do things that don't require physical activity (mainly sedentary leisure lifestyle).	☐
I walk, ride a bicycle, or move in other ways, requiring physical activity for at least 4 hours a week. This includes walking, light garden work, going to and coming from work.	☐
I have physical activities including amateur sport to maintain health and fit such as jogging, skiing, gymnastic, swimming, ball-games or doing quite heavy garden work or its equivalent for at least 4 hours a week.	☐
I train regularly, several days a week, for competitions in running, ball-games or other physically heavy sports.	☐

How much during your leisure time do you spend sitting on a usual week day (sitting at the desk, visiting friends, reading, traveling on a bus or sitting or lying down to watch television)?

.....hours.....minutes

Alcohol

Do you drink alcohol?

Yes ☐ No ☐

If Yes, how often and how much have you drunk on average in the last twelve months? (Tick one box on each line)

	Never/ seldom	1 mth.	2-3 mth.	1 wk.	2-4 wk.	5-6 wk.	1+ day
Light beer (5 %; bottles 1/2 l)	☐	☐	☐	☐	☐	☐	☐
Strong beer (more than 5%; bottles 1/2 l)	☐	☐	☐	☐	☐	☐	☐
Table wine, champagne (less than 12%; glasses 120 ml)	☐	☐	☐	☐	☐	☐	☐
Fortified wine, liqueur (16-20%; glasses 80 ml)	☐	☐	☐	☐	☐	☐	☐
Spirits : vodka, cognac, samogon (home-distilled vodka), also in cocktails (40%, shorts/cocktails 40 ml)	☐	☐	☐	☐	☐	☐	☐

For how many yeas have you drunk such amount?

I _ I _ I yeas

Remember. How many glasses, bottles of following alcohol have you drunk in the last seven days? If you did not drink at all put 0. (Tick one box on each line)

Light beer (5 %; bottles 1/2 l)	
Strong beer (more than 5%; bottles 1/2 l)	
Table wine, champagne (less than 12%; glasses 120 ml)	
Fortified wine, liqueur (16-20%; glasses 80 ml)	
Spirits : vodka, cognac, samogon (home-distilled vodka), also in cocktails (40%, shorts/cocktails 40 ml)	

Have you ever felt you should cut down on your drinking?

Yes ☐ No ☐

Have people annoyed you by criticizing your drinking?

Yes ☐ No ☐

Have you ever felt bad or guilty about your drinking?

Yes ☐ No ☐

Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover (eye opener)?

Yes ☐ No ☐

Smoking

Do (did) you live with everyday smoker

at present time? Yes ☐ No ☐

at childhood? Yes ☐ No ☐

How many hours a day do you spend at place where somebody smokes?

More than 5 hours a day ☐ 1-5 hours ☐

Less than one hours a day ☐ Almost never ☐

Do you smoke?

Yes, every day	☐
Yes, some days, not every day	☐
No, I never smoked or smoked less than 100 cigarettes (about 5 packs) in my entire life	☐
No, I am ex-smoker	☐

What do (did) you smoke: cigarettes, unfiltered cigarettes, pipe, rolling tobacco, cigars? (Put a ring around)

Please fill in for each age group up to your present age how many cigarettes you smoked on average per day in that period.

Age	Number of cigarettes smoked per day						
	0	1-4	5-9	10-14	15-19	20-24	25+
15-19	☐	☐	☐	☐	☐	☐	☐
20-29	☐	☐	☐	☐	☐	☐	☐
30-39	☐	☐	☐	☐	☐	☐	☐
40-49	☐	☐	☐	☐	☐	☐	☐
50-59	☐	☐	☐	☐	☐	☐	☐
60-69	☐	☐	☐	☐	☐	☐	☐

How many years altogether do (did) you smoke daily? If less then 12 months, put 00.

| _ | _ | Years

How many cigarettes do (did) you smoke daily on average per day?

Number cigarettes per day | _ | _ |

At what age did you begin to smoke daily?

Age | _ | _ |

Question for respondents who gave up smoking.

When did you give up smoking?

| _ | _ | Years ago

If during the last 12 months:

Less than 1 month ago ☐ 1-6 months ago ☐

6-12monthes ago ☐

Psychological health, stress

Estimate the level of stress during last year?

High ☐ Moderate ☐ Low ☐

Have you felt depressed during last year?

Not at all	☐
Not more than before	☐
Somewhat more than before	☐
Much more than before	☐
Don't know, no answer	☐

Have you been feeling tense, stressed or under a lot of pressure during the last month (30 days)?

Not at all	☐
Yes – somewhat but not more than is usual for people in general.	☐
Yes-more than is usual for people in general	☐
Yes –my life is nearly unbearable	☐
Don't know, no answer	☐

Please, tell me how satisfied you are with quality of your life in general?

Very satisfied	☐
Somewhat satisfied	☐
Neither satisfied nor dissatisfied	☐
Somewhat dissatisfied	☐
Very dissatisfied	☐
Don't know, no answer	☐

Medical worker .....

Interviewer .....

Thank you for taking part in!

Laboratory data

The question on seasonal variations in fish consumption (initial version of the questionnaire) was asked to the first 73 participants from Arkhangelsk city.

Russian version

Пожалуйста, укажите, в какое время года Вы едите ту или иную рыбу.

	Никогда/ редко	Одно и то же количество	Время года			
			Зима	Весна	Лето	Осень
Треска, пикша, сайда	☐	☐	☐	☐	☐	☐
Зубатка, камбала, морской окунь	☐	☐	☐	☐	☐	☐
Лосось (сёмга), форель	☐	☐	☐	☐	☐	☐
Скумбрия	☐	☐	☐	☐	☐	☐
Сельдь	☐	☐	☐	☐	☐	☐
Другая рыба	☐	☐	☐	☐	☐	☐

Напишите, какая именно другая рыба: .....

.....

English translation

Please indicate in which seasons you eat the different kinds of fish.

	Never/seldom	Same amount	Season			
			Winter	Spring	Summer	Autumn
Cod, haddock, saithe	☐	☐	☐	☐	☐	☐
Wolffish, flounder, redfish	☐	☐	☐	☐	☐	☐
Salmon (semga), trout	☐	☐	☐	☐	☐	☐
Mackerel	☐	☐	☐	☐	☐	☐
Herring	☐	☐	☐	☐	☐	☐
Other fish	☐	☐	☐	☐	☐	☐

Specify what kind of other fish: .....

.....

Appendix II

Errata

Paper I

The sentence “We assessed fish availability with two additional questions:
"How often do you or members of your family go fishing? 1) Weekly 2) Once a month 3) 1-11 times a year 4) Never…" should read “We assessed fish availability with two additional questions: "How often do you or members of your family go fishing? 1) Weekly 2) 1-3 times per month 3) 1-11 times per year 4) Never…”.

Table IV. Overall value for oily fish consumption in men should read 44.7±47.3(32.7). Overall value for whitefish consumption in men should read 24.9±36.9(24.9).

The sentence “The rural Nenets Autonomous Okrug was characterized in 2008 as an area with very low life expectancy (48.2 y for men and 65.9 y for women), high mortality rate from accidents, alcohol poisoning, murders, suicides, drowning (432.8 per 100 000) and a high infant mortality rate (14.6‰)” should read “The rural Nenets Autonomous Okrug was characterized as an area with very low life expectancy (48.2 y for men and 65.9 y for women in 2007), high mortality rate from accidents, alcohol poisoning, murders, suicides, drowning (432.8 per 100 000) and a high infant mortality rate (14.6‰) in 2008”.

PAPER I

Petrenya N, Dobrodeeva L, Brustad M, Bichkaeva F, Menshikova E, Lutfalieva G, Poletaeva A, Repina V, Cooper M, Odland JØ (2012) Fish consumption and socio-economic factors among residents of Arkhangelsk city and the rural Nenets autonomous area. Int J Circumpolar Health. 2011 Feb;70(1):46-58. Epub 2011 Feb 16.

PAPER II

Natalia Petrenya, Magritt Brustad, Marie Cooper, Liliya Dobrodeeva, Fatima Bichkaeva, Gulnara Lutfalieva and Jon Øyvind Odland (2012). Serum apolipoproteins in relation to intakes of fish in population of Arkhangelsk County

J Nutrition and Metabolism, accepted for publication, 17.04.2012

PAPER III

Natalia Petrenya, Liliya Dobrodeeva, Magritt Brustad, Fatima Bichkaeva, Gulnara Lutfalieva, Marie Cooper, Jon Øyvind Odland (2012)

Obesity and metabolic risk in Nenets and Russian women

General and central obesity and obesity-associated cardiometabolic risk in women from the rural Nenets Autonomous Area compared to Russian urban counterparts

J BMC Public Health, submitted, under review)