TUVSHINJARGAL CHIMED

Socioeconomic Determinants of Noncommunicable Disease Risk Factors in Rapidly Changing Societies

Multi-country analysis of six countries of the former Soviet Union

ACADEMIC DISSERTATION
To be presented, with the permission of
the Board of the School of Health Sciences of the
University of Tampere,
for public discussion in the Auditorium of
School of Health Sciences, T-building, Medisiinarinkatu 3, Tampere,
on November 7th, 2014, at 12 o'clock.

UNIVERSITY OF TAMPERE

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Acta Universitatis Tamperensis 1976
Tampere University Press
Tampere 2014

TAMPEREEN
YLIOPISTO

ACADEMIC DISSERTATION
University of Tampere, School of Health Sciences
Doctoral Programs in Public Health (DPPH)
Finland

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The originality of this thesis has been checked using the Turnitin OriginalityCheck service in accordance with the quality management system of the University of Tampere.

Distributor:
kirjamyynti@juvenes.fi
http://granum.uta.fi

Cover design by
Mikko Reinikka

Layout by
Sirpa Randell

Acta Universitatis Tamperensis 1976
ISBN 978-951-44-9577-9 (print)
ISSN-L 1455-1616
ISSN 1455-1616

Acta Electronica Universitatis Tamperensis 1463
ISBN 978-951-44-9578-6 (pdf)
ISSN 1456-954X
http://tampub.uta.fi

Suomen Yliopistopaino Oy – Juvenes Print
Tampere 2014

441 729
Painotuote

To my mother Zagdaa and daughter Anne-Maria

CONTENTS

ABBREVIATIONS

BMI	Body Mass Index
CI	Confidence Intervals
CIS	Commonwealth of Independent States
CSDH	Commission on Social Determinants of Health
DALY	Disability Adjusted Life Year
DHS	Demographic and Health Surveys
EU	European Union
FCTC	Framework Convention on Tobacco Control
FSU	Former Soviet Union
HiT	Health systems in Transition
IPAQ	International Physical Activity Questionnaire
LLH	Living Conditions, Lifestyles and Health
LRT	Likelihood Ratio Test
MET	Metabolic Equivalent
MRF	Multiple Risk Factors
NCD	Noncommunicable Disease
OR	Odds Ratio
PCA	Principal Components Analysis
SDI	Sample Deviation Index
SEP	Socioeconomic Position
SES	Socioeconomic Status
TTC	Transnational Tobacco Company
UN	United Nations
USSR	Union of Soviet Socialist Republics
WHO	World Health Organization
WHS	World Health Survey

SUMMARY

Socioeconomic determinants play a substantial role in the distribution of noncommunicable disease (NCD) risk factors, and this can be specifically critical in countries of the former Soviet Union (FSU) due to the rapid changes in society. The collapse of the Soviet Union in 1991 has brought immense social, political and economic changes with damaging consequences on the population health and health sector, and a rapid rise in social inequalities in health in this particular part of the world. The transition process of the region and its consequences on health have given important insights into health determinants such as smoking, alcohol, diet and others. Although general picture of these nations is similar, some countries are doing better than the rest while some are still struggling much.

The aim of this dissertation was to examine the socioeconomic determinants of noncommunicable disease risk factors in rapidly changing societies and their implications for noncommunicable disease prevention and control programmes. To achieve this aim, the data from the World Health Survey (2002-2004) was used which covered 15 501 adults from six countries of the FSU, namely: Estonia, Georgia, Kazakhstan, Latvia, Russia and Ukraine. The NCD risk factors were smoking, heavy alcohol use, overweight and obesity, low fruit and vegetable intake, and physical inactivity. Additionally, co-occurrence of these five risk factors were studied by creating a new variable 'multiple risk factors' for people with none to all risk factors. Socioeconomic status was measured by education, current job and wealth quintile. All analyses were stratified by sex as the prevalence and patterns of NCD risk factors varied by sex. Multivariable logistic regression analyses were performed, employing a general modelling approach in favour of the study results to be comparable.

The prevalence of low fruit and vegetable intake, male smoking, and overweight and obesity was high in this population, while that of heavy alcohol use and physical inactivity was lower than expected. Moreover, the level of multiple risk factors was very high in both sexes, but men had a higher number of co-occurring risk factors. The most common co-occurring combinations were low fruit and vegetable intake, overweight and obesity, and also smoking for men.

From studied SES indicators, wealth quintile and current job were the most significant predictors of NCD risk factors rather than education. Educational level was not related to all NCD risk factors and multiple risk factors for females; whereas for males, it was associated with only smoking and multiple risk factors. Better educated men had lower

likelihoods of smoking and three or more risk factors. On the contrary, wealth was associated with the majority of risk factors for both sexes. Wealthier males were less likely to be smokers, had higher intake of fruit and vegetables, and yet were more overweight and obese. Those from poor and the richest quintiles had lower likelihoods of multiple risk factors. Similarly to men, wealthier women were more likely to have adequate amount of fruits and vegetables. Rural women from the richest quintile had sedentary lifestyle, while wealth quintile was not significant for urban women. Likewise in men, wealthier women had more excess weight but it was only relevant for those women aged 45 and above. Wealth had some protective effect for heavy alcohol use among females, but not among males. Females working for pay, except those working for government, smoked more than those not working. Employers from both sexes had higher consumption of fruit and vegetables, in addition to government employees and self-employed men. All government employees and as well those males who are non-government employees or self-employed were at higher level of physical activity. Self-employed men from urban areas were more likely to have excess weight.

Based on the study results, following conclusions can be drawn: 1) To tackle effectively certain public health problems, it is important to consider and understand the history and background of the society in regards to their social, economic and political context. 2) It is crucial to use all three dimensions of socioeconomic status (education, occupation, and wealth or income) in health inequality studies to detect the true picture for any particular population. Thus, it is advisable to gather all essential demographic and socioeconomic indicators in any data for health. 3) Finally, this thesis highlights the importance of socioeconomic determinants of NCD risk factors in these transition or rapidly changing countries with inadequate health systems. Health policies should address high levels of NCD risk factors by providing population-wide and individual-based preventive measures and policies, explicitly targeting those who are most vulnerable and poor, in addition to the implementation of multiple-intervention strategies that will achieve greater health gains targeting the most common co-occurring combinations of NCD risk factors.

1 INTRODUCTION

Socioeconomic determinants have been recognised to play a considerable role in the distribution of noncommunicable disease risk factors in both developed and developing countries. This can be especially critical in rapidly changing countries or countries in transition due to the immense changes in society. The breakup of the Soviet Union in 1991 has brought massive political, social and economic changes, from which health sector and health of people were not spared (Figueras et al. 2004; Stillman 2006). The abrupt social change, which was connected to a rapid fall in gross domestic product, financial instability, a breakdown of social institutions, prompt mass privatization, and unemployment, also caused a swift surge in income inequality (Rechel et al. 2013). All these changes adversely affected health and led to the rapid rise in social inequalities in health.

During the 1990s, the former Soviet Union (FSU) was the one of only two regions in the world where life expectancy at birth was decreasing, in addition to sub-Saharan Africa (McMichael et al. 2004). A decade later, life expectancy was generally increasing and yet many of these countries continue to display very low life expectancy, especially males. According to the latest development, Rechel et al. (2013) noted that countries of the FSU, except Baltic States, still have mortality rates far in excess of those in Western Europe. This poor health situation is related to numerous factors acting at different levels and dimensions with many of the well-known risk factors connected to noncommunicable diseases (Figueras et al. 2004; Stillman 2006).

The transition process of the region has given important insights into health determinants such as alcohol, smoking, nutrition and others. Hazardous alcohol consumption has been a major determinant of mortality among working age men in Russia, accounting for almost half of all deaths for this age group (Leon et al. 2007; Zaridze et al. 2009; Tomkins et al. 2012). Smoking is another concern which is changing rapidly with the entry of multinational tobacco companies with aggressive marketing policies (Gilmore & McKee 2004). Subsequently, cigarette consumption has increased almost exponentially in the FSU countries (Gilmore & McKee 2005; Perlman et al. 2007; Stickley & Carlson 2009).

The stress of communism's collapse and its aftermath made many people to shift to cheaper food products, which explains some variations in health and disease (Jahns, Baturin & Popkin 2003; Huffman & Rizov 2007; Hinote, Cockerham & Abbott 2009b). The

Soviet diet has been dependent on seasonal availability of the food with high consumption of animal fat and low level of micronutrients (Figueras et al. 2004). Although transition to a free-market economy and growth of international trade brought some positive notes in terms of the diversity of food offered (Figueras et al. 2004), it also encouraged a Western high-fat and high-sugar diet (Webber et al. 2012). There was a rapid increase in overweight and obesity in many countries of Eastern Europe after the economic transition (Ulijaszek & Koziel 2007). Possible reasons for this obesity pattern are declines in physical activity and increased consumption of goods which contribute to physical inactivity such as cars, televisions and computers. Although sedentary lifestyle has contributed to the obesity increase, dietary change and an economic transition could be the key causes in case of Russia (Rtveladze et al. 2012).

Though general picture of these countries is similar, some countries are doing better off than others while some are still struggling hard (Rechel et al. 2013). Several studies have been conducted on health issues of these countries: health system reforms, health service utilization, health promotion challenges, health inequality, smoking, alcohol use, health behaviour and preferences. This thesis is particularly looking into socioeconomic determinants of the most common risk factors of noncommunicable diseases, and how these vary across six former Soviet countries. At my best knowledge, this work is the first study which brings together five noncommunicable disease risk factors by using reliable cross-country comparable data for the studied countries.

2 LITERATURE REVIEW

2.1 The former Soviet Union (FSU)

2.1.1 The Soviet Union and its collapse

The Union of Soviet Socialist Republics (USSR or Soviet Union) was created in 1922 following the Bolshevik revolution of 1917 (*Reform, Coup and Collapse: The end of the Soviet State; Fall of the Soviet Union; Dissolution of the Soviet Union*; Gilmore 2005). It was ruled by single party, the Communist Party, and had highly authoritarian political system. Despite the fact that the Soviet Union achieved much after the post-war period, its development began to fall during 1960s. Long-term decline of the economic growth, policy failures and other social needs made change indispensable by the mid 1980s. In March 1985, Mikhail Gorbachev assumed the leadership of the USSR and introduced a large number of radical reforms which had a great impact for future directions of the country. The reforms were slow to bring results and the economic situation got worse creating more frustrated people and nationalist movements. On Christmas Day 1991, the Soviet red flag was lowered from the Kremlin symbolizing the collapse of the USSR and the start of the new era in world history.

2.1.2 Countries of the former Soviet Union

The disintegration of the USSR led to the emergence of fifteen new independent states (Figure 1). Today, the former Soviet Union consists of three Baltic States (Estonia, Latvia and Lithuania), eleven countries of the Commonwealth of Independent States (CIS) and Georgia (Mackenbach, Karanikolos & McKee 2013). The CIS was created to connect 12 countries of the FSU, but Georgia has left it already. Initially, all these countries were also called by the World Health Organization (WHO) and others as Newly Independent States. All FSU countries belong to the WHO European Region.

The FSU countries can be divided by geographical location into three regions: the central Asian states (Kyrgyzstan, Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan), the Caucasian (Armenia, Azerbaijan, Georgia) and the European (Estonia, Latvia, Lithuania, Russia, Ukraine, Belarus and Moldova). Then the European countries additionally can be divided into the Baltic States and the remaining.

The Baltic States joined the European Union (EU) in 2004 and are benefiting from their integration, while the remaining FSU countries face shared challenges such as failures of governance, corruption, huge inequalities, high burdens of diseases and premature mortality (Mackenbach, Karanikolos & McKee 2013; Rechel et al. 2013). After the collapse, the economies of some countries like Russia, Kazakhstan and Azerbaijan are revived mainly due to natural resources. At the same time, others as Kyrgyzstan, Tajikistan, Armenia, and Moldova are along with the poorest countries in Europe.

Source: http://coldwarevents.wikispaces.com/
NATO+and+the+Warsaw+Pact Accessed 22.06.2013

Figure 1. A map of countries included in the former Soviet Union

This study covers 6 countries of the former Soviet Union: Estonia, Georgia, Kazakhstan, Latvia, Russia, and Ukraine. By development categories (World Bank 2011), they belong into following income groups: high (Estonia and Latvia), upper middle (Kazakhstan and Russia), and lower middle (Georgia and Ukraine). During the period of data collection for this study, Estonia and Latvia were categorized as upper middle income and the remaining four countries as lower middle income economies (World Bank 2004). Size of the populations varies from 1.3 to 142.8 million, from Estonia to Russia. Female populations in these countries comprise about 52–54% of the total. Among all, the population of Kazakhstan is considerably younger than the rest. Some selected demographic, socioeconomic and health expenditure indicators for these countries are presented in Table 1.

Table 1. Demographic, socioeconomic and health expenditure indicators in the study countries, 2010

	Estonia	Georgia	Kazakhstan	Latvia	Russia	Ukraine
Mid-year population	1 340 160	4 469 200	16 323 287	2 239 008	142 849 472	45 690 384
% of females	53.9	52.4	51.8	53.8	53.8	53.9
% of 0–14 years	15.2	17.0	24.4	13.8	15.2	14.2
% of 65+ years	17.0	13.8	6.7	17.4	12.8	15.5
Urban population (%)	69.5	52.8	58.5	67.7	73.2	68.8
Unemployment rate (%)	16.9	13.8*	5.8	18.7	7.5	8.1
Gross national income, US$ per capita	14 180	2 680	7 500	11 850	9 880	2 990
Gross domestic product, US$ per capita	14 045.1	2 613.7	9 069.7	10 723.4	10 481.4	2 974.0
Total health expenditure as % of GDP	6.0	10.1	4.3	6.7	5.1	7.7
Total health expenditure US$ PPP per capita	1 226	522	541	1 093	998	519

Sources: WHO Health for all database; Health systems in transition (HiT) series
* from 2005

2.1.3 Transition and health

2.1.3.1 Transition and health sector

After the collapse of communist regime, countries of the former Soviet Union have undergone huge political, social and economic changes where health sector and health of people were not spared (Figueras et al. 2004; Stillman 2006). The last two decades, these countries are reforming their health sectors to adjust to the new needs and currently many reforms are still in development and health sectors are called 'in transition' (Antoun, Phillips & Johnson 2011).

The health reforms involved various aspects such as decentralisation, upgrading health system management, healthcare financing and insurance coverage, expansion of private providers, changing methods of payment for providers, reduction in size of the hospital sector, improving public health and quality of care (Figueras et al. 2004; Rechel & McKee 2009; Antoun, Phillips & Johnson 2011). So far, the reforms had brought different results with successes in some countries and failures in some (Rechel & McKee 2009; Antoun, Phillips & Johnson 2011; Balabanova et al. 2012; Rechel et al. 2012; Rechel et al. 2013). In the CIS countries, major challenges remain same, for instance underdeveloped systems for improvement of quality of care and recurrent private out-of-pocket payments for health services (Rechel et al. 2013). Generally, there is still much work to be done in favor of having well established and adequate health systems in many of these former Soviet countries.

Public health services

Public health services in the Soviet Union were based on a network of sanitary-epidemiological (san-epid) stations which had a highly centralized management (Figueras et al. 2004; Gotsadze et al. 2010; Maier & Martin-Moreno 2011). They mainly focused on the control of communicable diseases and some types of environmental hazards with enforcement of sanitary regulations. Initially, this system was successful, especially in combating communicable diseases through vaccination programmes and improvement of sanitary conditions throughout the countries. Nevertheless, it was not capable of dealing with growing challenges of noncommunicable diseases and other modern public health threats. In line with health sector reforms, countries of the former Soviet Union have started to implement reforms to tackle issues facing the public health.

Public health reforms in these countries took three different directions: 1) preserving the san-epid structure of the Soviet time; 2) expanding the san-epid system with additional structures and institutes; 3) building a completely new public health structure (Maier & Martin-Moreno 2011). Reforms were more extensive in the Baltic States (Estonia, Latvia and Lithuania) than in other countries of the FSU which mostly retained the san-epid system except Georgia (Gotsadze et al. 2010).

Regardless the reform directions, many of these countries encounter similar challenges in provision of public health services such as prevention of noncommunicable diseases, health promotion and intersectoral collaboration (Maier & Martin-Moreno 2011). Compared to the well-developed immunization programmes, the early detection and prevention of noncommunicable diseases are non-existent or underdeveloped in the majority of FSU countries. Health promotion activities have started to take place only in some countries, while intersectoral collaboration is still very weak with few exceptions. Likewise to health sector, there is a need of more to be done in public health areas in addition to evaluations of public health reforms and researches on public health functions (Gotsadze et al. 2010; Maier & Martin-Moreno 2011).

2.1.3.2 Health status

The effects of transition on health status can be well described by life expectancy, which fell rapidly after the breakup of the Soviet Union (Figures 2 and 3). At the beginning of transition period, the life expectancies at birth varied from 72 to 76.5 among women and from 63.8 to 69 among men in the FSU countries, which are considerably less than in the European Union. Thereafter it started to decline reaching the lowest points around 1994 with greater extends for men, except in Georgia.

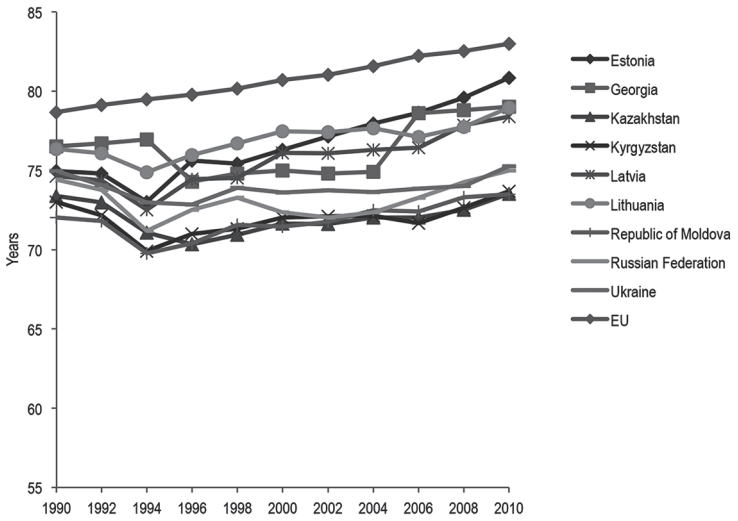
The life expectancy for men has the most dramatic picture and could resonance the situation of poor health leading to premature deaths in the countries of the former Soviet Union. After the decline, the life expectancy in men started to increase slowly and at the beginning of the second decade of transition, three countries (Ukraine, Kazakhstan and

Russia) fell far behind than others. Throughout these two decades, Russian men's life expectancy was the worst except in shorter period of being better than that of Kazakhstan men and had another decline in 1998. In 2010, Russian men had still the lowest life expectancy (63) compared to the rest of the FSU and it did not reach even the level of 1990. In contrast, men from the Baltic States and Georgia had higher life expectancies. Nevertheless, there is a big gap between life expectancies of men in the FSU and the EU.

In women, the changes in life expectancy were less dramatic although they depicted somehow similar picture as in men. After the decline of 1994, life expectancies started to grow and from the beginning of the second decade, the FSU countries started to be divided in two distinct groups in terms of life expectancy. Thus at the end of the second decade, the Baltic States and Georgia had higher life expectancies in women led by Estonia (80.8), which was about 2 years less than in the EU. The remaining FSU countries had much lower life expectancies in women ranging from 73.5 to 75.3 years. Sex differences in life expectancy were large in these countries especially in Russia reaching 12 years in 2010.

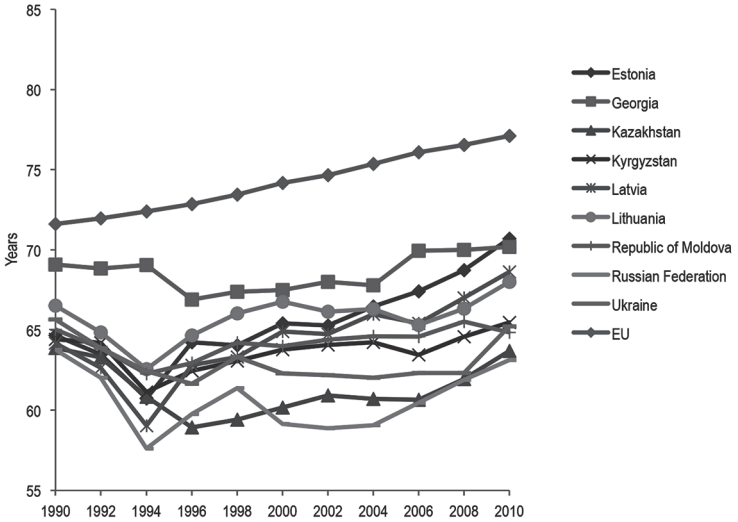
The situation of poor health and possible reasons behind the low life expectancy in the FSU countries have been studied relatively well although it has a quite complex nature. Much of changes in mortality were due to deaths of young and middle-aged men, from accidents, violent deaths, alcohol poisoning and cardiovascular diseases (Leon et al. 1997; Stillman 2006). Particularly; those men with lower social, economic and educational resources were most vulnerable among the all (McKee & Shkolnikov 2001; Plavinski, Plavinskaya & Klimov 2003). The majority of deaths occurred during 1990s were attributable to hazardous alcohol consumption which itself could be seen as part of a broader social malaise steered by difficult economic conditions (McKee 2002). Poor health status in the countries of the former Soviet Union is deeply connected to the underlying social problems (Figueras et al. 2004). Post-communist mortality crisis was studied in connection with rapid mass privatization as an economic transition strategy, and results showed that mass privatization and increased unemployment rates during this period were associated with adult mortality (Stuckler, King & McKee 2009). Figueras and co-authors (2004) summarize that the transition has brought winners and losers, and the health effects of transition during the first decade were mostly negative in these countries.

Although in general life expectancy was increasing in the second decade, many of these FSU countries have very low life expectancy, especially among men. The 1998 economic crisis following the devaluation of the Russian rouble had another toll on population health and life expectancies started to fall in these countries except in the Baltics (Figueras et al. 2004). The aftermath of this crisis can be well seen by trend of Russian men's life expectancy (Figure 3). Meanwhile, alcohol still has a major role in continuing mortality crisis in Russian men (Leon, Shkolnikov & McKee 2009). On the other hand, when countries with better life expectancies (the Baltic States) were compared to Finland, researchers found that regardless the reduced gaps in life expectancy; the achieved improvements have been fragile, predominantly in Latvia and Lithuania (Karanikolos et al. 2012).



Source: WHO Health for all database

Figure 2. Life expectancy at birth in selected countries of the former Soviet Union and European Union (EU), females



Source: WHO Health for all database

Figure 3. Life expectancy at birth in selected countries of the former Soviet Union and European Union (EU), males

A recently published paper states that countries of the Commonwealth of Independent States still have very high mortality rate compared to western European countries (Rechel et al. 2013). Main causes of deaths are cardiovascular diseases, injuries and violence primarily

affecting working age people. Proximal causes of high mortality are hazardous drinking, smoking, poor diet and inadequate health care; whereas, poverty and rapid societal change play roles at distance level. Further in this thesis, health of the FSU countries will be discussed in the context of noncommunicable diseases and their risk factors. Those interested to read more on health of these countries, please refer to *Highlights on health series* (WHO 2006) and *Health systems in transition* (HiT) series published by the European Observatory on Health Systems and Policies.

2.1.3.3 Health lifestyles

Unhealthy lifestyles are the principal social determinant of low life expectancy in the former socialist countries (Cockerham, Snead & DeWaal 2002). Soviet-style socialism promoted the development of a passive orientation towards healthy living through its negation of individuality and personal initiative in health related matters. In addition, dietary options were limited based on seasonal availability, voluntary leisure-time exercising was uncommon for the majority of the population, and male socializing centered on high level of alcohol consumption and smoking. Habitual drinking was considered as a normative behavior for men in these countries (Cockerham, Hinote & Abbott 2006), while for women, drinking was not particularly common under communism as society expected women to conform to its ideal of accepted behavior – sobriety a symbol of femininity (Hinote, Cockerham & Abbott 2009a).

After the collapse of Soviet system, unhealthy lifestyles continued accompanied with drastic reductions in social welfare programs and reduced living standards due to economic downturn (Dmitrieva 2001; Cockerham, Snead & DeWaal 2002, Cockerham et al. 2006). The condition of chronic disease risk factors, including both behavioral and physiological, has generally deteriorated in the Republic of Karelia, Russia during ten-year period from 1992 to 2002 (Vlasoff et al. 2008). There is a big challenge to change lifestyles deeply embedded in the culture added by the situation where preventive work and policies are not in favor. Thus, a reliable monitoring of risk factors and effective interventions are in a great need (Laatikainen et al. 2002a; Vlasoff et al. 2008).

Alcohol use

Hazardous alcohol consumption has been a major determinant of mortality among working age men in Russia, accounting for almost half of all deaths for this age group (Leon et al. 2007; Zaridze et al. 2009; Tomkins et al. 2012). Leon and colleagues (2009) reported that alcohol is a continuing crisis in Russian mortality, particularly among working age men. Hazardous drinking is most prevalent among economically disadvantaged and lower educated people, partially because some of the available sources of ethanol are inexpensive and easy to obtain.

There was observed a sharp, temporary fall of heavy drinking, and a steady and persistent upsurge of home distilled spirit consumption linked to abrupt economic decline in late 1990s Russia (Perlman 2010). The study of Pomerleau et al. (2008) confirmed the widespread use of privately made alcohol drinks in the countries of the FSU and concluded that alcohol policies in the region must address this issue, as well as hazardous drinking patterns. Surrogate alcohols are also consumed in Estonia and it could be the end-point of downward spiral of alcoholism, and reducing consumption of these substances should be part of any strategy to tackle the alcohol-related burden in the country today (Pärna & Leon 2011).

Rahu and others (2009) studied alcohol related mortality in two historically different time periods: Soviet Estonia and free Estonia in transition to a market economy. They concluded that rapid societal changes had profound effects on alcohol related mortality with steady increase of alcohol related deaths during the transition period and more notably in women. In Lithuania, alcohol intake has increased similarly over postcommunist transition period, particularly among females (Klumbiene et al. 2012). In the study of eight post-Soviet states, researchers found that women started to drink more alcohol after the communism as an overt rejection of traditional Soviet norms and values (Hinote, Cockerham & Abbott 2009a).

Smoking

Since the breakup of the Soviet Union, the region's cigarette industry had undergone immense changes with privatizations of state-owned tobacco monopolies and substantial investments of transnational tobacco companies (Gilmore & McKee 2004). As a result, already widespread during the Soviet time, cigarette consumption has increased almost exponentially in the FSU countries (Gilmore & McKee 2005; Perlman et al. 2007, Stickley & Carlson 2009). High consumption was fuelled by aggressive marketing strategies targeted particularly at women, young people and residents in urban areas, added on weakening tobacco control legislations actively lobbied by the industry.

Between 1992 and 2003, the prevalence of smoking doubled in Russian women from 6.9% to 14.8% and faced further rise from already high level of 57.4% to 62.6% among Russian men (Perlman et al. 2007). This increase was most prominent among the least educated, especially for women. As the industry planned to expand their activities to other regions of Russia after the initial targeting of cities, the rate of increase over time was significantly greater in rural areas regardless relatively smaller prevalence of smoking in women compared to urban settings. In Ukraine, on average, 3-4% of men and 1.5-2% of women join the smoking population each year (Andreeva & Krasovsky 2007). Similarly to alcohol, smoking in the FSU is situational norm for men; while women smoke more to express their freedom, independence and high locus of control during post-Soviet period (Stickley & Carlson 2009).

There were some positive changes observed in smoking prevalence in 8 countries (Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, and Ukraine) of the FSU between 2001 and 2010 (Roberts et al. 2012). The prevalence seems to have stabilized and might be decreasing in younger age groups, especially for men. These could be due to intensified tobacco control measures over the past 5 to 10 years, although these measures still are relatively weak in many parts of the region. Regardless of some declines, smoking among men is still persistently high with an average of 49% compared to an average of around 27% in Western Europe. In women, smoking rates remain lower with an average of 9% compared to 21% in Western Europe.

Diet, physical activity and overweight/obesity

A period of 1992–2000 was the time of great change in dietary habits in Russia, with both a reduction of the household budget for foodstuffs and a change in the food market through the impact of liberalisation (Walters & Suhrcke 2005). The stress of communism's collapse and its aftermath made many people to shift to cheaper food products, which explains some variations in health and disease (Jahns, Baturin & Popkin 2003; Huffman & Rizov 2007; Hinote, Cockerham & Abbott 2009b). Traditional Soviet diet is high in animal fat and less in fresh fruit and vegetables due to seasonal availability (Figueras et al. 2004). Transition to a free-market economy and growth of international trade brought some positive notes in terms of the diversity of food offered and access to year-round fruit and vegetables, though the access is still uneven. However, it also encouraged a Western high-fat, high-sugar diet and supermarketization of food availability (Webber et al. 2012).

Generally according to Parizkova (2000), the overall situation concerning nutritional status and dietary habits in the Central and Eastern European countries has deteriorated during the transition period. There is good evidence suggesting that the high-distressed middle-aged and elderly citizens, the unmarried, divorced, or widowed, and those living in poverty with limited resources were at the highest risk of unhealthy dietary practices in the FSU countries (Hinote, Cockerham & Abbott 2009b). A study from Kazakhstan and Kyrgyzstan indicated that males, working class respondents along with older people have the least healthy diets (Cockerham et al. 2004). Animal fat and butter were consumed daily by about 32% of the study sample, fresh fruit and vegetables were consumed 3 or less times per week by 60–73% of the sample, and about 54% were overweight or obese in studied countries of the FSU (LLH project report 2004).

There was a rapid increase in overweight and obesity in many countries of Eastern Europe after the economic transition (Ulijaszek & Koziel 2007). Authors state that possible reasons for this obesity pattern are declines in physical activity and increased consumption of goods which contribute to physical inactivity such as cars, televisions and computers. As one of the transition countries, Russia is facing the most severe obesity which increased from 20.3% to 28% during 1994–2004 (Huffman & Rizov 2007). This rise of obesity could be explained by further worsening of the existing diet situation, unhealthy lifestyle

such as high alcohol consumption among particular groups and technological progress affecting the supply and demand for calories via the increased opportunity cost of exercising. Rtveladze et al. (2012) suggested that dietary change and an economic transition could be the key causes for obesity growth in Russia, in addition to the contribution of the sedentary lifestyle.

Recent development shows that about 47.6% of males and 47.9% of females were overweight or obese in 9 countries of the FSU (Azerbaijan, Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, and Ukraine) studied by Watson and others (2013). The prevalence of obesity in this region is now becoming comparable to countries in Western Europe but not yet reaching the levels of the USA or UK. Regarding the nutritional status, some beneficial changes were observed in Lithuanian population with higher use of vegetable oil in cooking and greater consumption of fresh vegetables (Kriaucioniene et al. 2012). Meanwhile, Abe et al. (2013) found notable variations occurred in fruit and vegetable intake causing a slight overall deterioration in diet between 2001 and 2010. The inadequate consumption of these food groups among the majority of the population in many FSU countries highlights the urgent need for a greater attention on nutrition policies to avoid diet-related diseases.

2.2 Noncommunicable diseases and their risk factors

In this part of the literature review, the magnitude or burden of noncommunicable diseases and their risk factors are discussed. In addition, the burden of disease assessed by disability-adjusted life-year (DALY) was presented whenever it is applicable. DALY is a summary measure that combines the impact of morbidity, disability and mortality on population health (WHO 2013). The DALY enables cross-country comparisons, and it can be broken down and linked to underlying risk factors and interventions to evaluate risk, effectiveness and efficiency. Generally countries of the former Soviet Union had the highest total DALYs lost in the European Region in 2004, led by Russia and Kazakhstan (WHO 2013). This indicates that these countries have the worst health status in the region.

2.2.1 Noncommunicable diseases

Global level

Noncommunicable diseases (NCDs) are the leading causes of death worldwide (WHO 2011a). In 2008, from total of 57 million deaths occurred globally, 36 million (63%) were due to noncommunicable diseases. These were mainly due to cardiovascular diseases, cancers, diabetes and chronic respiratory diseases. Eighty percent of all NCD deaths occurred in low and middle income countries, and about 29% was occurring under the age

of 60 in these countries compared to 13% in high-income countries. According to WHO projections, NCD deaths are estimated to rise by 15% globally between 2010 and 2020.

In terms of NCD morbidity, reliable data are not available in many countries (WHO 2011a). Based on available information, cancer is going to be an increasingly important cause of morbidity and mortality worldwide in the coming decades. With projected population ageing and current global cancer rates, the estimated incidence of 12.7 million new cancer cases in 2008 will increase to 21.4 million by 2030. Approximately two thirds of these cancers will be occurring in low and middle income countries. There are great variations in cancer frequency, case fatality and in major types of cancer in the world. The highest incidence for all forms of cancer was observed in the WHO Regions of Europe and the Americas.

Regional and country levels

In the WHO European Region, NCDs are the leading cause of mortality, morbidity and disability (WHO 2012a). Almost 86% of deaths and 77% of the disease burden are attributed to noncommunicable diseases. Cardiovascular disease mortality has the largest share in this death toll which is nearly 50% of all deaths (WHO 2012b). However, this varies across the Region reaching the highest percentage in the CIS countries (65%). Next major causes of mortality are cancer followed by injury and poisoning, 20% and 8% of all deaths respectively (WHO 2013).

In countries of the former Soviet Union, by 2008 estimates, NCDs account for 73-91% of all deaths except in Tajikistan which is 59% (WHO 2011b). The majority of these deaths are due to cardiovascular diseases, cancers, chronic respiratory diseases and diabetes resembling similar patterns of global NCD mortality. Premature mortality is quite a high concern in these countries, especially among males. Twenty to thirty four percent of all NCD deaths were estimated to occur in men under age 60; while in Kyrgyzstan, Kazakhstan and Turkmenistan, percentages were even higher (40-50%). In women, NCD premature mortality was estimated to be 9–25%, being highest in Turkmenistan (32%).

2.2.2 Noncommunicable disease risk factors

Noncommunicable diseases have common risk factors and are largely preventable by the reduction of their four main behavioral risk factors: tobacco use, harmful use of alcohol, unhealthy diet and physical inactivity (WHO 2011a). In turn, these behavioral risk factors lead further to four metabolic/physiological changes: overweight/obesity, raised blood pressure, hyperlipidemia and hyperglycemia.

Particularly, the focus of this study was on the following five modifiable risk factors for NCD, namely: smoking, heavy alcohol use, low fruit and vegetable intake, physical

inactivity, and overweight/obesity. In addition, 'multiple risk factors', which is the combination of these five risk factors, was studied.

2.2.2.1 Smoking

Global and Regional levels

Smoking tobacco is the most common form of tobacco use worldwide (WHO 2011a). At least 4 000 chemicals are found in smoking tobacco and about 50 of them are recognized to be carcinogenic. Direct consumption of tobacco and exposure to second-hand smoke are attributable to about 6 million deaths every year in the world. These are estimated to rise to 7.5 million by 2020, accounting for 10% of all deaths in that year. Approximately 71% of all lung cancer deaths, 42% of chronic respiratory diseases and 10% of cardiovascular diseases are caused by smoking.

In 2008, the estimated overall prevalence of daily smoking varied greatly among the six WHO regions with the highest (29%) in the European Region and the lowest (8%) in the African Region (WHO 2011a). European men had the second highest prevalence (38%) in the world, while women had the highest (20%). The DALYs lost due to tobacco use was about 17.7 million in the European region for 2004, which make it the biggest cause to burden of disease, comprising about 12% of total DALYs (WHO 2009a). More than two thirds of these DALYs were in low and middle income countries of Europe.

Countries of the FSU

In the FSU countries by 2008 estimation, the prevalence of current daily smoking in men was mostly around 37–65.5% except in Uzbekistan it was 17% (WHO 2011b). The smoking prevalence in women was around 0.4–19.7% being lowest in Azerbaijan. Among the FSU countries, Russian men and women smoked the most. In the study of 8 FSU countries (Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, and Ukraine), smoking rates varied between 43.3%–65.3% among men for 2001 (Gilmore et al. 2004). Smoking among women was about 9.3%–15.5% in Belarus, Ukraine, Kazakhstan and Russia; while it remains uncommon in Armenia, Georgia, Kyrgyzstan, and Moldova (2.4%–6.3%). Similar results were found in separate study in Belarus by Gilmore and colleagues (2001). In Uzbekistan, prevalence of current smoking among men was 19.6% (Usmanova et al. 2012).

The prevalence of current daily smoking and of other noncommunicable disease risk factors for the study countries is displayed in Table 2, which is compiled from different WHO and World Health Survey (WHS) reports covering the period of 2003–2008 based on data availability. In the six countries of this study, the prevalence of smoking was considerably high among men especially in Ukraine and Russia, 58.8% and 65.5% respectively. The prevalence in women was the lowest in Georgia and Kazakhstan (3.7–6.6%), while in other countries it was around 14–19.7%. According to DALYs in 2002,

the relative contribution of tobacco use to burden of disease was high in men for the study countries and it was about 15.1–20.5% of total DALYs, with highest in Russia (WHO 2006). In women, the tobacco use had a share of 2.5–6.2% from total DALYs.

Smoking prevalence was explored considerably well in the study countries, in addition to other FSU countries. Russia was leading by smoking prevalence among males (66.2%), in comparison with 27 countries of the European Union including three Baltic States based on data from 2001–2004 (Zatonski et al. 2012). In Baltics, the prevalence was ranging from 44.1%–56.2%, being the highest in Latvia which places it in the second place after Russia. On the contrary; smoking rates among females (13.2%–21.7%) in these countries were lower than in the majority of the EU nations. Helasoja et al. (2006a) stated similar smoking rates for Baltic States in 2002, whereas much higher rates were found by Boniol and Autier (2010) for the same period.

An analysis of the World Health Survey data from 2002–2004, which covers also same countries as current study, produced smoking rates of 52.0%–64.7% in males and of 6.4%–25.1% in females (Hosseinpoor et al. 2011). Others reported that smoking prevalence in Russia varied from 56% to 66% for men and from 15% to 27% for women (Zabina et al. 2001; Bobak et al. 2006; Perlman et al. 2007; Vlasoff et al. 2008; Stickley & Carlson 2009). In Ukraine, the prevalence was reported as 57%–67% in men and 10%–20% in women (Gilmore et al. 2001; Andreeva & Krasovsky 2007; Storr et al. 2010). More recent studies in the FSU countries gave still high smoking prevalence, especially among men, and yet it shows some sign of stabilizing of rates (Giovino et al. 2012; Roberts et al. 2012).

Table 2. Prevalence (%) of noncommunicable disease risk factors in the six study countries, by sex

	Estonia		Georgia		Kazakhstan		Latvia		Russia		Ukraine	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Current daily smoking*	39.2	17.3	49.4	3.7	37.0	6.6	44.6	14.0	65.5	19.7	58.8	18.3
Physical inactivity*	16.6	22.1	21.3	24.2	30.9	31.2	29.2	36.5	22.9	22.4	20.7	19.1
Overweight*	59.0	49.4	…	…	55.2	56.0	60.7	55.0	56.2	62.8	50.5	56.0
Obesity*	20.9	20.4	…	…	19.1	27.6	22.4	27.0	18.6	32.9	15.9	25.7
Heavy episodic drinking†	15.7	2.1	19.4	1.2	9.6	2.3	20.0	2.9	15.7	2.9	21.2	2.8
Low fruit/vegetable intake‡	84.2	78.0	79.1	76.1	91.3	89.3	73.9	77.3	81.8	83.6	58.2	55.0

Sources: *WHO 2011b, data from 2008; †WHO 2010, data from 2003; ‡World Health Survey country reports, data from 2003

Definitions: 1) Current daily smoking: the percentage of the population aged 15 or older who smoke tobacco on a daily basis;
2) Physical inactivity: the percentage of the population aged 15 or older engaging in less than 30 minutes of moderate activity per week or less than 20 minutes of vigorous activity three times per week, or the equivalent;
3) Overweight: the percentage of the population aged 20 or older having a body mass index (BMI) ≥ 25 kg/m^2;
4) Obesity: the percentage of the population aged 20 or older having a body mass index (BMI) ≥ 30 kg/m^2;
5) Heavy episodic drinking: had at least 60 grams or more of pure alcohol on one occasion in the past 7 days, among 18 years old and above
6) Low fruit and vegetable intake: less than 5 servings of fruit/vegetables per one typical day, 18 years and above.

2.2.2.2 Heavy alcohol use

Global and Regional levels

Alcohol is a central nervous system intoxicant and can cause alcohol-related injuries and harms depending on the lifetime volume consumed, the frequency and the amount per use, the personality characteristics of user together with underlying socio-cultural circumstances where drinking is occurring (WHO 2010). Injurious and harmful consequences of alcohol are numerous including such as violence, suicide and homicide, drink-driving related morbidity and mortality, alcohol-related disorders, alcohol dependency, poisoning, liver cirrhosis, coronary heart disease and cancer.

The harmful use of alcohol is largely responsible for premature mortality and disabilities worldwide (WHO 2011a). In 2004, globally about 2.3 million deaths or 3.8% of all deaths were due to hazardous and harmful drinking. Out of these deaths, more than half occurred because of noncommunicable diseases like liver cirrhosis, cardiovascular diseases and cancers. By DALYs, the harmful use of alcohol accounts for 4.5% of the global burden of disease. In 2008, estimated adult per capita consumption of pure alcohol varied greatly around the world, from 0.6 litres in the Eastern Mediterranean Region to 12.2 litres in the European Region.

The highest rates of alcohol-related morbidity and mortality occur in the European Region of the world (WHO 2010). More than one fifth of the adult population are reporting heavy episodic drinking; defined as five or more drinks on one occasion, or 50g alcohol, at least once a week. After smoking, alcohol use is the next most important risk factor in contributing to burden of disease in the region (WHO 2009a). In 2004, 17.3 million DALYs lost due to alcohol use which is 11.4% of total DALYs. Nearly 82% of these DALYs were in low and middle income countries of Europe.

Countries of the FSU

Alcohol use was extensively studied in countries of the FSU, specifically in Russia. Nevertheless as in general, researchers often utilize different measures of alcohol consumption, which makes it difficult to compare results or summarize them. Pomerleau and colleagues (2008) conclude that heavy episodic alcohol drinking is frequent in men throughout the region in 2001, 23% on average. Whereas in women; it was quite rare about 2% only, which could be due to underreporting as well. About 20%–22% of Kazakhstan women and men were frequent drinkers in 2001, while that of in Kyrgyzstan were about 6% and 15% respectively (Cockerham et al. 2004).

The prevalence of heavy episodic drinking based on 2003 data for the study countries is shown in Table 2. The heavy episodic drinking, in this case, was defined as having at least 60 grams or more of pure alcohol on one occasion in the past 7 days (WHO 2010). The prevalence in men varied from 9.6% in Kazakhstan to 21.2% in Ukraine. Among women, the prevalence was much lower and it was about 1.2–2.9% in these six countries. Out of total DALYs, 9.9–22.8% were attributable to alcohol use for men and 1.2–6.8% for women

in 2002 (WHO 2006). For both sexes, the lowest DALYs lost due to alcohol were in Georgia, while the highest were in Russia. In the study countries, alcohol and tobacco use were the most important risk factors in men by their contributions to burden of the disease. However, Georgia was an exception due to a lower share of alcohol use to the total burden.

A research from the Baltic Republics found that 41%–61% of males and 8%–26% of females were consuming alcohol weekly with the highest rates in Estonia for both sexes in 1997 (McKee et al. 2000). Pärna et al. (2010) came to similar results based on 1994–2006 data, where Estonia was compared with Finland. Prevalence trend analysis in Lithuania showed some decrease in regular drinking of any alcohol over the years, and yet it was still high in 2010, about 56.2% for men and 22.2% for women (Klumbiene et al. 2012). In Russia, Zabina et al. (2001) reported that binge drinking was about 14% among males and almost absent among females in 2000. According to Jukkala et al. (2008), that became 30% for men and 6% for women in 2004. In Ukraine, 38.7% of males and 8.5% of females were heavy alcohol users (Webb et al. 2005).

2.2.2.3 Overweight and obesity

Global and Regional levels

Globally, overweight and obesity cause nearly 2.8 million deaths every year (WHO 2011a). It is estimated that 2.3% of global DALYs are attributable to these conditions. Overweight and obesity are measured by body mass index (BMI) that is the body mass of individuals in kilograms divided by the square of their height in meters. Increase of BMI leads to steady increase of risks for type 2 diabetes mellitus, coronary heart disease, ischaemic stroke and several types of cancers.

In 2008, 35% of adults were overweight (BMI $\geq$ 25 kg/m^2) and 12% were obese (BMI $\geq$ 30 kg/m^2) in the world (WHO 2011a). The prevalence for both conditions was highest in the WHO Region of the Americas and lowest in the South-East Asia. In the European Region, about 55% were overweight and 22% were obese, much higher than global level. European men were more likely to be overweight than women, while in regards to obesity, women were more often obese compared with men.

From the five studied NCD risk factors, overweight and obesity were the third most important risk factor for the burden of disease in Europe (WHO 2009a). In 2004, about 11.8 million DALYs were attributable to overweight and obesity which make 7.8% of total DALYs. Nearly 73% of these lost DALYs were in low and middle income countries of Europe.

Countries of the FSU

Large-scale studies from countries of the FSU found that 54% of the sample were overweight or obese in 2001 (LLH project report 2004), and that was about 48% in 2010 (Watson et al. 2013). Males were more likely to be overweight (35.3% vs. 29.3%) than females, and the

latter ones were more likely to be obese, about 18.3% versus 12.6% (Watson et al. 2013). Mishra et al. (2006) reported that 26% of men and 21% of women were overweight; and 5% of men and 7% of women were obese in Uzbekistan for 2002.

In the study countries, the prevalence of overweight men including obese were from 50.5% to 60.7%, while that of obese men were from 15.9–22.4% based on 2008 data (Table 2). For both overweight and obesity, the highest prevalence was in Latvia and the lowest in Ukraine for men. Among these countries, Estonian women were the least overweight (49.4%) and obese (20.4%), while Russian women were the most overweight and obese. The percentage of overweight including obese women reached 62.8% in Russia, and roughly half of them were obese (32.9%). Out of total DALYs, 6.2–10.7% were caused by high BMI in men and 8.9–13.3% in women for the study countries (WHO 2006). The highest DALYs lost due to high BMI were in Georgia and the lowest in Kazakhstan for both sexes. In these countries, out of the five NCD risk factors, high BMI was the most important risk factor by its contribution to burden of disease for women.

Moore and colleagues (2010) explored global status of excess weight including six countries covered by this thesis. In these 6 countries; prevalence of overweight varied from 28.3% to 45.0% in men and from 25.4% to 28.3% in women, while that of obesity was around 5.7%–9.6% in men and 9.0%–16.5% in women. In three Baltic States, proportion of overweight men was about 30.7%–38.4% and about 25.7%–29.9% for women, being the highest in Lithuania for both sexes including obesity (Boniol & Autier 2010). The proportion of obese men was about 9.3%–13.6% and that of in women was 14.8%–17.5%. Similar results were obtained by separate studies in some Baltic countries for the same time period, around 2000–2004 (Grabauskas et al. 2003; Klumbiene et al. 2004; Tekkel, Veideman & Rahu 2010). In Russia, 35.0%–38.1% of men and 31%–34.6% of women were overweight, while 13%–16.3% of men and 32%–36.6% of women were obese (Vlasoff et al. 2008; Huffman & Rizov 2007).

2.2.2.4 Low fruit and vegetable intake

Global and Regional levels

Worldwide, about 1.7 million deaths or 2.8% of all deaths are attributable to low fruit and vegetable intake which account for 1% of total DALYs (WHO 2011a). Having sufficient amount of fruit and vegetables decreases the risk for cardiovascular diseases, stomach and colorectal cancers. It is estimated that globally 14% of gastrointestinal cancer deaths, nearly 11% of ischaemic heart disease deaths and about 9% of stroke deaths are caused by low intake (WHO 2009a).

The prevalence of low fruit and vegetable intake, defined as less than five servings or 400g per day, was 67% around the world, in 2004 (WHO 2009a). In the European Region, it was about 56% with highest percentage of being in low and middle income countries of the region (69%). Approximately 3.6 million DALYs are lost due to low fruit and vegetable

intake which is 2.4% of total DALYs in Europe. From these, about 85% were in low and middle income countries of Europe.

Countries of the FSU

Low fruit and vegetable intake was relatively less studied in the FSU countries, and oftentimes researchers study the consumption of fruit and vegetables taken them together or separately. Throughout this region, notable changes occurred in fruit and vegetable intake causing a slight overall deterioration in diet since 2001 (Abe et al. 2013). By 2010, about 40% of the population in six countries was having fruit once weekly or less, whereas it was about in excess of 20% for vegetables in eight of the nine studied countries. According to Cockerham et al. (2004), 30%–41% of males and females had daily vegetable consumption, while that of for fruits was about 14%-19% in Kazakhstan for 2001. In Kyrgyzstan, the prevalence was somewhat higher than in Kazakhstan, especially for daily fruit consumption.

The prevalence of low fruit and vegetable intake in the study countries based on 2003 data is displayed in Table 2. In general, the prevalence was very high in all countries. It varied from 58.2% to 91.3% for men, while in women; it was between 55–89.3%. The lowest prevalence among women and men were in Ukraine and the highest in Kazakhstan. By its relative contribution to burden of disease in 2002, low fruit and vegetable intake had similar DALYs lost for both sexes with slightly higher in women, and it ranged from 5.3–8.6% of total DALYs (WHO 2006). Among these countries, Kazakhstan had the lowest DALYs lost due to low fruit and vegetable intake and Ukraine had the highest.

Hall and colleagues (2009) explored global variability in fruit and vegetable consumption inclusive six countries covered by this study. Prevalence of low fruit and vegetable consumption was around 55.5%–92.3% in men and 50.3%–88.5% in women among the six study countries, with the lowest in Ukraine and the highest in Kazakhstan for both sexes. In Moscow and other cities of Russia, two thirds of respondents or even more had insufficient intake of fruit and vegetables in 2000–2002 (Zabina et al. 2001; Petrukhin & Lunina 2012). A study from Russian Karelia reported that very rare use of vegetables, fruits and berries for males were about 30%–36% for each category separately for 1997, while same numbers for women were about 23%–24% separately for each as well (Laatikainen et al. 2002a). More recent data from 2007 were given by Paalanen et al. (2011) and they showed that daily consumption of fresh vegetables were for men (24%) and for women (35%) in Russian Karelia. Daily consumption of fruits was about 31% and 50% for men and women; while, consumption of berries at least 2 times per week were about 15% and 22% for men and women respectively.

2.2.2.5 Physical inactivity

Global and Regional levels

Physical inactivity or insufficient physical activity causes about 3.2 million deaths each year (WHO 2011a). Nearly 2.1% of global DALYs are attributable to physical inactivity which is defined as less than five times 30 minutes of moderate activity per week, or less than three times 20 minutes of vigorous activity per week, or equivalent. Insufficient physical activity can increase the risk of all-cause mortality by 20–30%. It is estimated that physical inactivity can cause about 30% of ischaemic heart disease burden, 27% of diabetes and around 21–25% breast and colon cancer burden (WHO 2009a).

In 2008, approximately 31% of adults aged 15 and above were physically inactive worldwide (WHO 2011a). The highest prevalence of physical inactivity was in the WHO Region of the Americas and the Eastern Mediterranean Region followed by the European Region. In Europe, the prevalence was about 36% with women being more physically inactive than men. According to DALYs, 8.3 million or 5.5% of total DALYs were lost due to physical inactivity in Europe (WHO 2009a). Almost three fourths of these lost DALYs were in low and middle income countries of Europe.

Countries of the FSU

Physical inactivity in the FSU countries is explored relatively less and available few studies utilized different domains of physical activity. The majority of these studies were about leisure-time physical activity. Thirty two percent of Estonian men and women exercised frequently during their leisure-time based on data from 1998, while the corresponding numbers were about 35% and 30% in Lithuania (Puska et al. 2003). About 67% of men and 71% or women were inactive during their free time in the Republic of Karelia in Russia for the period of 1997–2002 (Laatikainen et al. 2002a; Vlasoff et al. 2008); whereas, these were slightly higher in Russian cities according to Petrukhin and Lunina (2012).

Cockerham et al. (2004) studied physical activity at work, and found that Kazakhstan men (28.3%) and women (13.4%) engaged in physically demanding works twice more than their counterparts in Kyrgyzstan for 2001. Meanwhile, the percentage of total physical inactivity for men ranged from 4.2% in Estonia to 13.6% in Kazakhstan among studied countries of the FSU in 2002–2003, where Ukraine, Russian Federation and Georgia were placed somewhere in between (Guthold et al. 2008). For women, it varied from 3.5% in Ukraine to 11.9% in Kazakhstan. Zabina et al. (2001) reported that approximately 25% of surveyed population in Russia led the sedentary lifestyle in 2000.

The prevalence of physical inactivity for the six study countries, based on data from 2008, is displayed in Table 2. Among these countries, Estonian men were the least physically inactive (16.6%) and men from Kazakhstan were the most inactive (30.9%). Women were slightly more inactive than men, and the prevalence was ranging from 19.1% in Ukraine to 36.5% in Latvia. According to DALYs in 2002, the relative contribution of physical inactivity to burden of disease was similar for both sexes, and it varied from 3.3–6.4% of

total DALYs (WHO 2006). In these countries, Kazakhstan had the lowest DALYs lost due to physical inactivity, while Georgian men and Ukraine women had the highest.

Combined burden of the five NCD risk factors

In summary, the combined burden of these five NCD risk factors have a considerable share in total burden of disease in Europe which claim about 39% of total DALYs of the region. Particularly in the six study countries, the combined burden of the five risk factors was much higher in men and it varied from 47.6% to 61.7% of total DALYs. However in women, the share of these risk factors was comparatively lower and yet it was between 28% and 33.7% of total DALYs.

2.2.2.6 Multiple noncommunicable disease risk factors

Diseases are almost always caused by multiple risk factors and multi-causality indicates that a range of interventions can be applied for disease prevention (ed. Ezzati et al. 2004, 2167). People with multiple health behavior risks have the highest risks for noncommunicable disease, disability and premature death (Prochaska 2008). Unhealthy behaviors such as smoking, alcohol abuse, physical inactivity and poor diet often co-occur; therefore, aiming change in multiple risk behaviors provides the potential of added health benefits, maximized health promotion and reduced health care costs (Prochaska, Spring & Nigg 2008; Prochaska, J.J. & Prochaska, J.O. 2011; Prochaska et al. 2010).

Multiple behavioral risk factors are studied by two major approaches in respect to analytical techniques: co-occurrence and clustering (McAloney et al. 2013). Co-occurrence approach is focused on concurrent but independent behaviours, engagement in two or more health-related behaviors. These analyses are exhibited by prevalence of different behavioral combinations and/or by summing behaviors into risk indexes. Clustering approach explores underlying associations between the concurrent behaviors, where clustering identified by divergences in observed and expected prevalence of combinations or through more advanced statistical methods like cluster analysis, latent class analysis and factors analysis. Although these advanced methods offer a number of advantages over co-occurrence analyses, there are some challenges and subjectivity in cluster techniques. Additionally, the policy message from studies of clustering conveys more complexity. There is a lack of consistency in the terminology describing above-mentioned two statistical approaches between studies and with multiple risk behaviors moving up the public health agenda, clarity of terminology is crucial.

Multiple health behavior researches are either directed at healthy or unhealthy behaviors, and often they use different numbers or choice of behaviors. Studies in USA found that only 3% of total study population (Reeves & Rafferty 2005), 10.8% of adults and 12.8% of seniors (Pronk et al. 2004) had healthy lifestyles in regards to all healthy behaviors included in each study. Ford et al. (2010) found that adults meeting all four low-

risk lifestyle factors such as not smoking, exercising, consuming fruits and vegetables, and healthy body mass index in USA slightly decreased from 8.5% in 1996 to 7.7% in 2007. In New Zealand, about 29% of adults were enjoying by a healthy lifestyle comprised of non-use of tobacco, non- or safe use of alcohol, sufficient physical activity and adequate fruit and vegetable intake (Tobias et al. 2007). There are several studies on multiple unhealthy behaviors which are also called as multiple chronic disease or multiple NCD risk factors. Approximately 7.5% in the Belgian study (Drieskens et al. 2010), 17% of the sample in the USA (Fine et al. 2004), 20% of the Dutch respondents (Schuit et al. 2002), 55% in the Scottish study (Lawder et al. 2010), and about 70% of the largely rural populations in five Asian countries (Ahmed et al. 2009) had three or more behavioral risk factors.

Prevalence of different behavioral combinations is presented by all possible co-occurring patterns of included behaviors. Lawder et al. (2010) examined five risky behaviors and among them diet low in fruit and vegetables had the highest prevalence. For people with two and more co-occurring risk factors, the most common combinations were 'diet low in fruit and vegetables and physically inactive', 'diet low in fruit and vegetables, physically inactive and high BMI', and 'diet low in fruit and vegetables, physically inactive, high BMI and smoking'. Analogous co-occurring patterns were observed by Fine et al. (2004) and Schuit et al. (2002) except they involved only four risky behaviors. There were some differences between women and men in terms of the most prevalent risk factor, but behavioral combinations were mainly same for both sexes (Poortinga 2007; Berrigan et al. 2003).

In the countries of the FSU, very little is available on this topic. However, some studies were conducted in three Baltic States and Russian Karelia in conjunction with Finland. They approached multiple risk factors analysis based on whether one particular risk factor of interest is associated with other NCD risk factors by using separate logistic regression models (Klumbiene et al. 2004; Grabauskas et al. 2003; Pomerleau et al. 2000a), or using correlation analyses (Matilainen et al. 1994).

2.3 Socioeconomic determinants

2.3.1 Social determinants of health

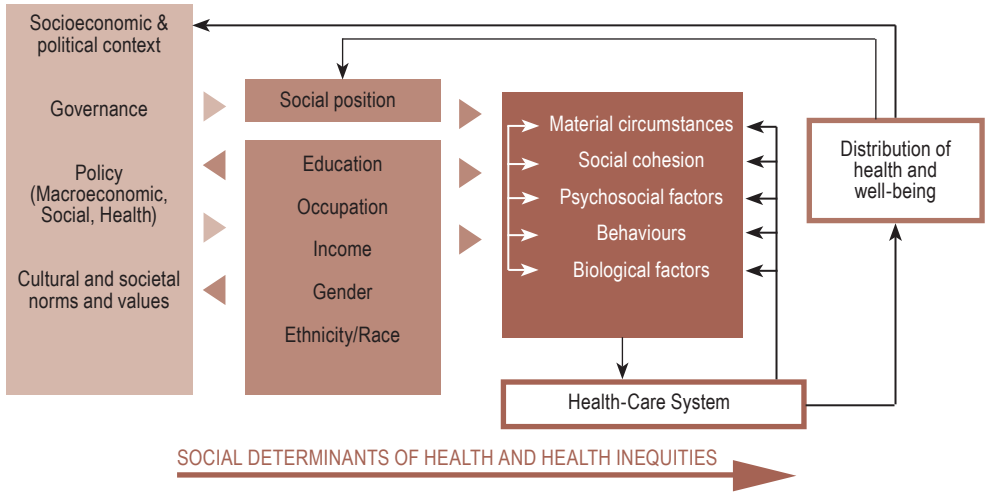
The social determinants of health are described as 'the circumstances in which people are born, grow up, live, work and age, and the systems put in place to deal with illness. These circumstances are in turn shaped by a wider set of forces: economics, social policies, and politics.' (*Social Determinants of Health: Key concepts*, WHO). The social determinants of health are largely responsible for health inequities within and between countries. In order to address issues on health inequities, the Commission on Social Determinants of Health was set up by the WHO in 2005 (CSDH 2008). The Commission's conceptual framework

for action on the social determinants of health was developed by Solar and Irwin (2007) and is displayed in Figure 4.

The primary purpose of the framework is to support the Commission in identifying the levels of intervention to promote health equity through policy (Solar & Irwin 2007). It comprises three wide-ranging elements such as socioeconomic and political context, social position of individuals and intermediary determinants of health which have an impact on equity and health (Figure 4). Looking from left to right direction of the diagram, socioeconomic and political context influences social position of individuals which in turn can also affect aspects of the context. Based on their social positions, individuals can have different or unequal distribution of health and well-being mediated through specific intermediary determinants.

The main categories of intermediary determinants of health are material circumstances, social cohesion, psychosocial factors, behaviours and biological factors that are interrelated with health-care system. Thus the model assumes that people from lower socioeconomic positions live in less favorable material circumstances, engage more often in health risking behaviours but less in health-promoting activities compared to those from higher social positions. In this model, the health system is considered as a social determinant of health and it demonstrates the ability of the health sector to influence the process of generating health equity. Finally, it is highlighted that health and illness can have feedback effects on individual social position and commonly prevalent diseases may affect key institutions within socioeconomic and political context.

Figure 4.1 Commission on Social Determinants of Health conceptual framework



Source: Amended from Solar & Irwin, 2007

Figure 4. Reproduced from CSDH 2008.

In line with this framework, the purpose of this thesis can be translated into the study of how social positions of individuals are associated with unhealthy behaviours in the social, economic and political context of transition countries with still reforming and not well-established health systems. Putting in this framework helps to understand the significance of the study, its implications for prevention and control, and future actions. As other points were discussed in relevant parts, further literature review will be focused on measurement of socioeconomic position and socioeconomic determinants of NCD risk factors followed by socioeconomic determinants in prevention and control.

2.3.2 Measurement of socioeconomic status

Although this thesis is using a term 'socioeconomic status or SES' to describe and measure socioeconomic conditions, the term 'socioeconomic position or SEP' was used by authors of main references and it was kept for relevant parts of the writing.

Each society has different social hierarchy or social stratification due to unequally distributed material and other resources (Solar & Irwin 2007). Individuals attain various positions in the social hierarchy based on their educational achievement, occupational status, income level and social class which can be summarized as their socioeconomic position (SEP). Several indicators are used for SEP, but the most important ones are occupational status, education and income level. It is advisable to use all three at the same time as each covers a different feature of social stratification. If information on these is not available, then it is necessary to use proxy measures; for instance, indicators of living standards.

In studies on health inequalities, the most commonly used indicators for current socioeconomic status are educational attainment, occupational social class, and income (Lahelma et al. 2004). Each of these indicators is likely to reflect both common and specific impacts of a ranking in social hierarchy. Education is often attained in early adulthood, and it is likely to give knowledge to promote healthy lifestyles. As well, it provides qualifications to get certain occupation and therefore income. Occupational social class points to power, status and material conditions related to payment. Household and individual income is derived predominantly from paid employment and provides necessary material resources including resources needed to maintain good health. Thus education is typically attained first in one's lifetime, and then it contributes to occupational class and through this to income. Moreover, an intergenerational transmission of economic advantage from parents to children should be considered as evidences suggest that they do exist at varying degrees in different countries (Ermisch, Jäntti & Smeeding eds. 2012).

Searching for a single 'best' indicator of SEP is not useful or theoretically compelling (Galobardes, Lynch & Smith 2007; Lahelma et al. 2004). Use of different indicators can better capture variations in the association between SEP and health, and in addition, it is important in evaluating the full contribution of confounding by socioeconomic

conditions (Galobardes, Lynch & Smith 2007; Laaksonen et al. 2005; Schaap, van Agt & Kunst 2008). Even though education, occupational class and income are correlated, they measure different phenomena and take into different causal pathways (Geyer et al. 2006). Furthermore, the association between socioeconomic status and health can be different for different indicators as Duncan et al. (2002) stated that the economic indicators of SES were more strongly related to mortality than completed schooling and occupation. Therefore these indicators cannot be used interchangeably. The association of SEP and health occurs in all levels of the social stratification; not only those in poverty have poorer health, but also those from the highest level have better health compared to those just underneath (Solar & Irwin 2007).

Education

Education is the most commonly used SEP indicator and it captures the knowledge-related assets of an individual (Galobardes, Lynch & Smith 2007; Solar & Irwin 2007). Knowledge and skills acquired by education make person more receptive to health promotion messages, more able to communicate with and avail appropriate health services. Additionally, it is an indicator for the ability to use knowledge more or less effectively to cope with potentially stressful situations (Osler et al. 2001). Generally formal education is attained during young adulthood; therefore it reflects parental characteristics and measures the transition from childhood SEP to one's own (Galobardes, Lynch & Smith 2007; Solar & Irwin 2007). As well, educational achievement is a strong determinant of individual's future opportunities for employment and income.

The main advantages of education are that it can be obtained from everyone regardless the age or employment situations and it is comparatively easy to measure in self-administered questionnaires producing high response rates (Galobardes, Lynch & Smith 2007). Usually education does not change throughout person's adult life and has a high validity and reliability (Liberatos, Link & Kelsey 1988).

Occupation

Occupation based indicators are broadly used, but not all of them have been updated to capture today's occupational structure (Galobardes, Lynch & Smith 2007). Although different occupational schemes measure specific aspects of SEP, they all comprise the generic mechanisms that connect SEP with health. As occupation is strongly related to income, any association of occupation and health may represent a relationship between material resources and health (Galobardes, Lynch & Smith 2007; Solar & Irwin 2007). Additionally occupational class is closely related to educational achievements, and therefore it mediates the effect of education on income (Lahelma et al. 2004).

Occupation can be viewed as a reflection of an individual's position in society in regards to their income, intellect and social standing (Solar & Irwin 2007). It can also identify working relations such as domination and subordination between employers and

employees. The social standing or status reflected by occupation might be related to health outcomes due to certain privileges including easier access to quality health care for those of higher standing (Galobardes, Lynch & Smith 2007; Solar & Irwin 2007).

In describing adult socioeconomic position, studies often use the current or longest employed occupation of individuals (Solar & Irwin 2007). The most important disadvantage of occupation based indicators is that they cannot be readily allocated to people who are not currently working; consequently if used as the only source of SEP, socioeconomic differences can be underestimated by excluding retired, disabled, working at home, unemployed individuals and so forth.

Income and wealth

Income and wealth are indicators which most directly measure material resources of individuals (Galobardes, Lynch & Smith 2007). They affect health outcomes by the way of providing health-promoting environments, use of health-enhancing commodities such as food and exercise, and of facilitating access to health care. Additionally, higher income can provide self-esteem, social standing and more participation in society. However, the association of income and health can have reverse causality, where poor health leads to a loss of income. Income can change in a relatively short period of time and it captures the resources available at particular time, while wealth measures the accumulation of these resources. Wealth covers financial and physical assets that one own, in addition to income.

Income, expenditure and consumption are direct measures of material living standards (O'Donnell et al. 2008, 69–82). As it is costly and difficult to collect information on these; often many useful data sources such as large scale surveys lack direct measures of living standards. Therefore, a proxy measure can be utilized to make the best use of existing data. One of approaches is to employ principal components analysis to develop a wealth index based on housing characteristics and household ownership of durable assets. When there are no data on income or consumption, asset indicators can be used and they provide a viable method for measuring inequality (McKenzie 2005). This enables numerous research applications; for instance, the Demographic and Health Surveys (DHS) and other similar data sources could be used to assess the effect of inequality on many health related outcomes. The DHS contain more than 170 surveys throughout 70 developing countries. Another large scale survey, the World Health Survey (WHS), purposively asked about asset indicators rather than income to get a comparable measure of permanent income across countries.

This study used WHS data and education, current job, and wealth quintile derived from asset indicators were used as socioeconomic determinants.

2.3.3 Socioeconomic determinants of noncommunicable diseases

The distribution and impact of NCDs and their risk factors are highly inequitable, disproportionately affecting low and middle income countries and people of lower socioeconomic positions (WHO 2011a). Socially disadvantaged people get sicker and die sooner as a result of NCDs compared to people of higher social positions. The main factors of social positions are gender, ethnicity, education, occupation and income.

NCDs and poverty create a vicious cycle where poor are more exposed to NCD risk factors and resulting NCDs may become an important key to drive them and their families more into poverty. The NCDs cause huge burden to household budgets as in many developing countries most health care costs must be paid by patients out-of-pocket. It is estimated that 100 million people each year are pushed into poverty as a consequence of direct payments for health services. NCD related health care costs do not only affect individuals and families but also health systems, businesses and governments. According to economic analysis, every 10% increase in NCDs is associated with 0.5% lower rates of annual economic growth.

As mentioned previously, NCDs are the leading causes of morbidity and mortality in the European region and as well in countries of the FSU. In the study of 22 European countries, researchers found that people of lower socioeconomic status had substantially higher death rates and poorer self-assessments of health in almost all studied countries (Mackenbach et al. 2008). However, inequalities in mortality varied among countries and were very large in most countries in the eastern and Baltic regions. Large differences in mortality seen in central and eastern Europe were from cardiovascular disease, cancer, and injuries due to greater inequalities in smoking, excessive alcohol use and inadequate health care (Mackenbach, Karanikolos & McKee 2013).

Educational inequalities in mortality avoidable by medical care were observed in all 16 European countries studied by Stirbu and colleagues (2010), and these inequalities were especially pronounced in Central Eastern European and Baltic countries. The sociodemographic patterning of health in three Baltic countries were studied in comparison with Finland and authors concluded that the lower educated have worse health (Helasoja et al. 2006b). In their review of socioeconomic inequalities in health for Central Eastern Europe and the CIS, Walters and Suhrcke (2005) summarized that there is a strong inverse relationship between education and NCDs in case-control, cohort and cross-sectional studies in the region.

2.3.4 Socioeconomic determinants of NCD risk factors

Since the 1980s, behavioral factors have been recognized as one of the main explanations for health inequalities (Smith, Bartley & Blane 1990; Macintyre 1997). A substantial part of educational differences in mortality was attributed to various health behaviors, although

education itself was strongly associated with mortality (Laaksonen et al. 2008; Perlman & Bobak 2008).

The adoption of risky health behaviors tends to shift from people of higher to lower socioeconomic strata as countries develop more: higher socioeconomic groups adopt early new behaviors and discard them rather quickly upon learning of the related health consequences, whereas lower socioeconomic groups incline to take up these behaviors later (Blakely et al. 2005). During the current century numerous risk factors like excessive drinking, tobacco use and obesity may become most dominant among the deprived people within poor regions. Besides, an increasing burden of noncommunicable disease risk factors among lower socioeconomic groups will be a global trend as countries become more urbanized (Fleischer, Diez Roux & Hubbard 2012).

2.3.4.1 Socioeconomic determinants of smoking

"Tobacco use is a marker of social inequity (David et al. 2010:214)". Tobacco use disproportionately affects males and disadvantaged people all around the world, more increasingly in poorer parts. In low income countries, poor households carry a heavy burden from tobacco use with substantial health, educational, housing and economic opportunity costs. Many studies showed a common pattern of higher smoking prevalence among lower socioeconomic groups (Schaap & Kunst 2009; Hosseinpoor et al. 2012). In their review paper, Schaap and Kunst (2009) report as well that lower socioeconomic groups start smoking at a younger age, smoke more cigarettes a day, and less often quit smoking compared to better off people.

Educational level is an important determinant of smoking; moreover, other SEP indicators such as occupational class, accumulated wealth, and housing tenure are found to be also related to smoking (Schaap & Kunst 2009; Schaap, van Agt & Kunst 2008). Sex is a very strong predictor of tobacco use status; and the prevalence of tobacco use is generally greater among urban, less educated, low economic groups, and individuals with less knowledge about smoking harms (Palipudi et al. 2012). However, in some countries, increased education and wealth were not associated with decreased tobacco use.

Other studies revealed that there is a diversity of sociodemographic associations with smoking across the countries (Storr et al. 2010; Hosseinpoor et al. 2011). According to Hosseinpoor et al. (2011), some factors were quite stable throughout the countries; for instance, people with little or no education were more likely to smoke irrespective of their sex, or resided in a low or a middle income country. At the same time, other factors such as age and wealth had varying effects on smoking.

In the former Soviet Union, sex is also very strong determinant of smoking status. Besides, associations of smoking with socioeconomic factors were considerably different between females and males. Overall for women, there was no clear relationship between disadvantage and smoking (Pomerleau et al. 2004) or no associations in a majority of cases.

In studies which employed multivariable analyses with several variables on socioeconomic status (SES), education was not associated with smoking (Stickley & Carlson 2009; Cockerham, Hinote & Abbott 2006; McKee et al. 1998; Gilmore, McKee & Rose 2001; Pudule et al. 1999; Pärna, Rahu, K. & Rahu, M. 2002). Economic situation and income were generally not related to smoking, except two studies gave opposing results: women suffering material deprivation were more likely to smoke (McKee et al. 1998) and women from lower income group were less likely to smoke (Pudule et al. 1999). Females with high locus of life control and top managers had higher tendencies of smoking (Stickley & Carlson 2009; Cockerham, Hinote & Abbott 2006). In some other studies, occupation generated conflicting results (Gilmore et al. 2001; Gilmore, McKee & Rose 2001; Pärna, Rahu, K. & Rahu, M. 2002).

On the contrary to women, higher educated men were less likely to smoke (Cockerham, Hinote & Abbott 2006; Pomerleau et al. 2004; Pudule et al. 1999; Pärna, Rahu, K. & Rahu, M. 2002); nevertheless, some studies gave non-significant results as well (Stickley & Carlson 2009; McKee et al. 1998; Gilmore, McKee & Rose 2001; Usmanova et al. 2012). In terms of economic situation and income, similar results to education were observed. While there were no associations in some studies (Gilmore et al. 2001; Gilmore, McKee & Rose 2001; Cockerham, Hinote & Abbott 2006; Pärna, Rahu, K. & Rahu, M. 2002); in others, men with better economic situation were less likely to smoke (Stickley & Carlson 2009; Pomerleau et al. 2004; McKee et al. 1998; Pudule et al. 1999). Having high locus of life control was not important factor for smoking in men (Stickley & Carlson 2009). Those in higher ranking of occupational positions had a lower tendency of smoking compared to unskilled workers (Cockerham, Hinote & Abbott 2006). Two studies found that unemployed were more likely to smoke (Gilmore et al. 2001; Gilmore, McKee & Rose 2001). A study from Uzbekistan showed that government employees and self-employed men smoked more than students (Usmanova et al. 2012). Males who report their social position got worse in last five years were more likely to smoke (Gilmore et al. 2001).

Furthermore, trend variance by SES indicators was explored in several studies in the FSU. Roberts et al. (2012) conclude that smoking appears to be entrenched among men from lower socioeconomic groups over the 10-year period between 2001 and 2010. However, there was no such socioeconomic patterning for women and this could be explained by their being in the early stages of the tobacco epidemic compared to men in these countries. Similar results as for men were found also by other researchers (Perlman et al. 2007; Bobak et al. 2006; Helasoja et al. 2006a), except Andreeva and Krasovsky (2007) observed smoking increase for men with secondary education and medium deprivation level. Results for women were more contradictory like in some studies higher socioeconomic groups had a greater increase in smoking (Bobak et al. 2006; Andreeva & Krasovsky 2007); whereas in the study of Perlman et al. (2007), the least educated females had the most increase.

2.3.4.2 Socioeconomic determinants of heavy alcohol use

People from low socioeconomic positions face a higher burden of alcohol-attributable disease, often regardless of lower overall consumptions (Schmidt et al. 2010). Higher socioeconomic groups are more likely to drink and have more light to moderate drinking occasions compared to lower socioeconomic strata; whereas, the latter ones have greater proportions of occasions with binge drinking. Similar results were found by Rehm et al. (2009) reporting that low income countries and underprivileged populations have a larger disease burden per unit of alcohol consumption than high income countries and populations.

Patterns in the distribution of social inequalities in alcohol consumption and alcohol-related problems are not universal (Bloomfield et al. 2006). Social inequalities in alcohol use differ across gender and groups of countries, depending on alcohol measure used. In eight European countries, heavy drinking episodes were higher in men with lower education, while there were no differences found for women (Kunst et al. 1996). Bobak and colleagues (1999) conclude that due to the absence of substantial socioeconomic differences, alcohol consumption seems spread rather uniformly in Russia, especially among males. Malyutina et al. (2004) showed that education related differences of alcohol use reduced for men in Russia from 1985 to 1995; and socioeconomic patterning for women is not yet statistically observable.

Studies from Baltic countries found that sociodemographic patterning of heavy drinking and regular alcohol drinking was more consistent or evident in women than in men (Helasoja et al. 2007; Klumbiene et al. 2012). Educational achievement and economic situation were not associated with hazardous alcohol drinking in eight countries of the FSU (Pomerleau et al. 2008). Nevertheless, the unemployed were less likely to engage in heavy drinking. According to Helasoja et al. (2007), heavy drinking was more common among younger, urban and higher educated men and women in Estonia, Lithuania and Finland.

Some studies from the FSU, which used two or more SES variables and multivariable analyses, gave also quite conflicting results. But it is important to note that studies usually use somewhat different measures of alcohol consumption which could potentially affect the results related to SES. Webb et al. (2005) reported that men with lower education were more heavy drinkers; Jukkala et al. (2008) wrote that those with secondary education had a higher risk of binge drinking, and highly educated men were more likely to consume alcohol at least once a week according to McKee et al. (2000). While financial status was not associated with heavy alcohol use for both sexes (Webb et al. 2005), men with several economic problems were more likely to binge drink (Jukkala et al 2008). In addition, men and women with higher income were more likely to consume alcohol at least once a week (McKee et al. 2000). In regards to employment status, those in the labor force whether employed or unemployed were more likely to be heavy drinkers (Webb et al. 2005).

Tomkins and others (2007) utilized a novel range of indicator variables for hazardous drinking in Russian men. These hazardous drinking behaviours were not only highly prevalent among working-age men, but also had very clear socioeconomic patterns. Education was strongly associated with indicators of hazardous drinking: males with the lowest level of education compared to the highest had an odds ratio of surrogate drinking of 7.7, of zapoi (episodes of extended periods of drunkenness during which the participant withdraws from normal life) of 5.2 and of frequent hangover of 3.7. Similarly, these indicators were also strongly associated with being unemployed and with levels of household wealth. Authors conclude that at least in the Russian context, conventional approaches to examining hazardous drinking should go beyond collecting information on the frequency and amount of consumption of beer, wine and spirits as they are less prevalent and show much weaker associations with socioeconomic status.

2.3.4.3 Socioeconomic determinants of overweight/obesity, low fruit and vegetable intake and physical inactivity

Obesity is unequally distributed between and within countries around the globe (Friel, Chopra & Satcher 2007). In Europe, about 20–26% of the obesity in men and 40–50% of the obesity in women were attributable to inequalities in SES (Robertson, Lobstein & Knai 2007). Moreover except some Eastern European countries, there is a continuing and widening gap between SES groups in obesity trend, with lower socioeconomic groups having higher prevalence.

Generally the association between wealth and obesity is positive in low income countries, while it flattens out in middle income countries and then transforms to a negative association in high income countries, where obesity risk is higher among disadvantaged people (Law et al. 2007; McLaren 2007). McLaren (2007) gave additional understanding of SES and obesity in her large scale review of the topic stating that the above association varied by SES variables and gender. In highly developed countries, negative associations found in women were most common with education and occupation. However in medium and low development countries, positive associations for women were mostly observed with material possessions and income. For men in highly developed countries, negative associations were more common with education but there were positive associations observed in regards to income. The latter one was also apparent in men from medium developed countries. Overall, the associations for men were less consistent than those for women.

A study on multiple socioeconomic determinants of weight gain using a longitudinal design reported that current economic difficulties for both sexes and low education for women were related to weight gain in Finland (Loman et al. 2013). There were some studies conducted in the FSU countries which employed several socioeconomic determinants to study excess weight. Pomerleau et al. (2000b) concluded that obesity in the Baltics is rather generalized health problem due to the lack of association between obesity and

most socioeconomic, demographic and behavioural factors. The change in obesity level was strongly affected by age and education among women in Estonia, but apart from that the effect of other socioeconomic factors on obesity was largely non-significant (Tekkel, Veideman & Rahu 2010). On the other hand, higher education had a protective effect on women's weight in Russia, while it was not significant for men (Huffman & Rizov 2007). Being employed was positively associated with men's weight, but not for women. Those with higher household income had an increased risk of excess weight. Walters & Suhrcke's (2005) review summarizes that the picture of obesity in countries of central and eastern Europe and the CIS is not straightforward with results of a clear positive association with wealth in some countries; and an inverse or U-shaped relationship in other countries where the rich and the poor are both at higher risk. Nevertheless, it seems that these countries follow the pattern of shifting obesity burden towards the poorer parts of the population as country develops (Walters & Suhrcke 2005; Watson et al. 2013).

To tackle the SES difference in overweight and obesity, the main focus should be on food and sedentary behaviours (Borodulin et al. 2012). Extended hours of daily sitting, low levels of leisure-time physical activity, irregular intake of fruits and vegetables contributed to the excess weight among people with a lower level of education and income. Lower socioeconomic groups have greater risk of positive energy balance: foods consumed by them are higher in energy and lower in micronutrients, and they have more sedentary lifestyle compared to higher socioeconomic groups (Robertson, Lobstein & Knai 2007). People from higher SES tend to have a healthier diet with greater consumption of fruits and vegetables and less consumption of fats, but this reflects an individual's income and economic capacity to buy these products which are more expensive than less nutritious foods (McLaren 2007; Drewnowski & Specter 2004).

The role of availability and affordability in the SES variation in food habits was demonstrated by some studies (e.g., Paalanen et al. 2011); and in fact, the lower availability and affordability was linked to SES difference in the Northern European countries where educational level was positively associated with vegetable consumption (Prättälä et al. 2009). In low income French population, the impact of economic difficulties is critical, as is the perception of affordability of fruits and vegetables (Bihan et al. 2010). However when it becomes available and affordable, the highest educational groups were the first to take the opportunity to purchase fruits and vegetables and eventually followed by lower socioeconomic groups sometime later on (Paalanen et al. 2011).

A systematic review of studies on socioeconomic inequalities in dietary intakes associated with overweight/obesity found only consistent evidence in regards to fruit and vegetables which may make an important contribution to inequalities in weight status across European regions (Giskes et al. 2010). People from lower socioeconomic groups were less likely to consume fruit and vegetables and this finding was also supported from an earlier systematic review conducted by Irala-Estevez et al. (2000).

A study on global variability in fruit and vegetable consumption in 52 countries including six FSU countries participated in the WHS came to similar conclusion in case of income (Hall et al. 2009). Several other studies were conducted in the FSU and Finnish Karelia on this topic. Regardless what SES variable they used, all these studies gave consistent results where lower socioeconomic groups consumed less fruit and vegetables compared to better off people (Cockerham et al. 2004; Kriaucioniene et al. 2012; Luksiene et al. 2011; Petrukhin & Lunina 2012; Paalanen et al. 2011; Abe et al. 2013). Although there was some heterogeneity, in general, healthy food habits were positively associated with higher education, occupational position and fewer economic difficulties in Russia, Czech Republic, Poland and Finland (Boylan et al. 2011). From the studied SES indicators, economic difficulties had the most consistent relations with food habits. Thus in the future, multiple measures of SES must be considered in studies of dietary behaviors.

Socioeconomic inequalities in physical activity vary greatly by domain of physical activity (Beenackers et al. 2012; McNeill, Kreuter & Subramanian 2006). Higher SES individuals engage more in leisure-time physical activities and sports compared to lower SES people who are more likely to engage in job-related physical activities and walking. The first systematic review conducted in Europe additionally found that inconsistent results of total physical activity with SES indicators could be partly due to contrasting socioeconomic patterns for leisure-time and occupational physical activities (Beenackers et al. 2012). Therefore, total physical activity may not be a proper summary measure to examine inequalities in physical activities (Beenackers et al. 2012; Finger et al. 2012). However in terms of population health, total physical activity has an important role for prevention of overweight/obesity and noncommunicable diseases (IPAQ, n.d.; WHO 2011a).

Based on study findings, leisure-time physical activity should be an important focus for improvement of physical activity levels and reduction of observed inequalities (Beenackers et al. 2012). Even so, physically demanding work or potentially higher levels of occupational physical activity among lower socioeconomic groups must be acknowledged for interventions aiming at increasing their leisure-time physical activities (Beenackers et al. 2012; Finger et al. 2012). Furthermore, leisure-time physical activity increased among those from higher occupational classes and decreased among manual workers at follow-up, thus ageing employees and especially manual workers should be encouraged to be physically active during leisure time (Seiluri et al. 2011). As well, promotion of competitive sports among lower educated individuals could be positive move towards the adoption of life-long physically active lifestyle among this population group (Mäkinen et al. 2010).

There were very few studies from the FSU on inequalities of physical activity and they mainly covered leisure-time or work-related domains. Leisure-time sedentary behavior is a public health problem in the Baltics and it was more common among lower educated people and men with lower income (Pomerleau et al. 2000a). However, leisure-time physical activity was not associated with obesity in these countries (Pomerleau et al. 2000b). In Russia, people with higher education and income level were more likely to engage in leisure-

time physical activity; and on the contrary, unemployed individuals were more physically active during their leisure time compared with employed ones (Cockerham 2000). For countries undergoing economic and social transitions; measuring all domains of physical activity is essential as the domains, such as work and active transport, are important in preventing obesity in developing countries (Bauman et al. 2011).

2.3.4.4 Socioeconomic determinants of multiple risk factors

Socioeconomic determinants of multiple risk factors are studied relatively less than any single risk factor for NCD. Studies used either one SES variable mainly education or several variables such as education, poverty index, household income, deprivation, economic activity status, household tenure, occupational social class and social class.

Young adults, especially males, who have not graduated from college, were more likely to have three or more risk factors in the USA (Fine et al. 2004; Pronk et al. 2004; Berrigan et al. 2003). Likewise in Belgium, lower educated men were the most at risk (Drieskens et al. 2010). Results indicated a polarization between the lowest and the highest educational attainments of multiple risk factors among males from 2001 to 2004. This could be due to the fact that multiple risk behavior in the lowest level is worsening and in the highest level of education is improving. Although the prevalence of multiple risk factors is getting worse among lower educated women, the socioeconomic differences were less pronounced compared with men. On the contrary to these results, extensive co-occurrence of risk factors was observed with advancing age and increasing educational achievements in five Asian countries (Ahmed et al. 2009).

Socioeconomic determinants appear to be associated with multiple risk factors at both the individual and area-level (Lawder et al. 2010). Low educational achievement and residence in a deprived community were the most important determinants of having four or five risk factors in the Scottish population. Generally studies used simultaneously several SES variables concluded that lower socioeconomic groups had the worst condition in terms of multiple behavioral risk factors (Schuit et al. 2002; Poortinga 2007; Li et al. 2009; Lawder et al. 2010). Additionally mostly males, those divorced, separated or widowed, and in some cases, singles were highly likely to have more number of risk factors for NCD.

2.3.5 Socioeconomic determinants in NCD prevention and control

Noncommunicable diseases are essentially a development and socioeconomic issue, affecting all levels of society but with greater ill-health and detrimental consequences on the poor (WHO 2011a). The increasing burden of NCDs in low and middle income countries is speeded by the adverse effects of globalization, swift unplanned urbanization and sedentary lifestyles. People in these countries are more often eating high energy density foods and are being bombarded by junk food, tobacco and alcohol advertisements with ever

increasing supply of these products. Many governments face challenges to address these issues, overwhelmed by the speed of growth and expanding needs for actions to protect their populations from NCDs.

Major policy developments and strategic initiatives were introduced at the global and regional levels in order to support countries to tackle this ever growing NCD epidemic and its burden. The political declaration from the United Nations High-level Meeting on NCDs acknowledged the contribution of political, environmental, socioeconomic and behavioral factors on the rising incidence and prevalence of NCDs; and called for monitoring of exposure to risk factors and their socioeconomic determinants (UN 2011). The WHO 2008–2013 Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases highlighted that global and national actions should be taken to respond to the social and environmental determinants of NCDs, promoting health and equity (WHO 2008). Policies and plans for the prevention and control of NCDs must pay special attention to dealing with gender, ethnic and socioeconomic inequalities. A focus on equity was also emphasized in the European strategy for the NCD prevention and control (WHO 2012a) and in broader perspective, in the WHO European review of social determinants of health and the health divide (Marmot et al. 2012).

A comparative analysis of health policy performance in 43 European countries was conducted covering the field of tobacco; alcohol; food and nutrition; hypertension detection and treatment; cancer screening; road safety; air pollution; fertility, pregnancy, and childbirth; child health and infectious diseases (Mackenbach & McKee 2013; McKee & Mackenbach 2013). Overall, the best performing countries were Sweden, Norway, Iceland and Finland followed by the remaining western European countries. Countries of the former Soviet Union had the worst performance scores led by Ukraine, Russian Federation and Armenia. The Baltic States and Belarus were doing a little bit better than the other countries in the FSU.

Petrukhin and Lunina (2012) reported that the proclamation of the prevention of cardiovascular diseases and other NCDs in Russia has been predominantly declarative in nature; and the country needs to increase investment in health to reduce poverty and health inequalities. There are many existing barriers which include: lack of adequate legislation; lack of consistency in the development of health systems and policy making; lack of leadership and coordination in the Ministry of Health; lack of interest and political commitment among key stakeholders and policy makers; contradicting interests of partners; vague financial responsibility; existence of monopolies in the trade, media, advertising and so forth; lack of professionals and expertise in the NCD prevention and control; lack of resources and materials; competing priorities in treatment versus prevention; lack of comprehensive guidelines for planning, implementation and evaluation of prevention and control.

3 AIM OF THE STUDY

The aim of the study is to examine the socioeconomic determinants of noncommunicable disease risk factors in six countries of the former Soviet Union during 2002–2004 and their implications for noncommunicable disease prevention and control programmes.

Objectives:

1. To assess socioeconomic determinants of risk factors for NCD; smoking, heavy alcohol use, overweight and obesity, low fruit and vegetable intake, and physical inactivity.

2. To study co-occurrence of noncommunicable disease risk factors and to assess the relationship between SES and multiple NCD risk factors of people with none to all risk factors.

3. To consider the implications for noncommunicable disease prevention and control programmes in the context of the underlying socioeconomic determinants.

4 MATERIALS AND METHODS

4.1 The World Health Survey

This study used data from the World Health Survey (WHS), a cross-sectional household survey which was implemented in 70 countries between 2002 and 2004 (WHO 2012c; Ustun et al. 2003, 797–808; Ustun et al. 2005, 199–230). It was initiated by the World Health Organization to obtain valid, reliable and comparable information on population health and on health systems which will provide evidence for policy-making, strategic planning, programme management, monitoring and evaluation. The WHS is the first large survey programme with explicit attention to cross-national comparability in instrument development, in addition to careful consideration about validity and reliability. The survey methods and instruments were developed and improved through extensive consultations with international experts, scientific review of literature and expansive pilot testing in more than 63 countries and 40 languages. Countries were selected from all regions of the world based on national interests to enhance survey capacity and improve data quality via collaborations and partnerships of WHO with its Member States. More detailed information about WHS, including all questionnaires and related documents, can be accessed on its official website (WHO 2012c).

4.2 Survey methodology

4.2.1 Sampling strategy

The WHS employed a sampling strategy with a known non-zero selection probability for any individual included in the study which makes it possible to generalize the data to the whole population. The sampling frame aimed to cover 100% of the eligible population in the studied country and had an acceptable level of 90% coverage of all key subgroups. The target population comprised any male or female aged 18 and above living in private households, who were currently residing in that country.

A multistage stratified cluster sampling technique was utilized and probability weights were used for each stage of sampling. First, countries were divided into strata which were as homogenous as possible within and as heterogeneous as possible between. Variables sex, age and settings (rural/urban) were used for stratification (Cifuentes et al. 2008; Sembajwe

et al. 2010). Then the multistage cluster sampling was conducted in each stratum. Primary level clusters were counties; secondary level clusters were enumeration areas, units with clear administrative level and non-overlapping boundaries. As clusters often had unequal size, probability proportional to size sampling was used so that sampling units with larger population have a greater chance of being chosen. From a complete list of all households in the enumeration areas, nationally representative households were selected at random. In some countries including Russian Federation, samples were subnational. Finally, one adult from each household was selected randomly to respond to the individual level questionnaire. Thus, the total selection probability for the respondent was derived from multiplication of all the probabilities within each stage of sampling.

4.2.2 Weights

The complexity of survey sampling design (stratification, clustering, and unequal selection probability) requires weighting of each observation in the analysis to generate unbiased population estimates with correct standard errors (O'Donnell et al. 2008, 13–28; UN 2005; WHO 2012c). Therefore, weights for the WHS were calculated and provided within the dataset. The weights are equal or proportional to the inverse of the selection probability. Consequently, the weight for certain individual expresses the number of represented individuals from the population. In addition, the weights were adjusted for the unit non-response and post-stratification. The unit non-response is related to response rate which was defined as the number of completed interviews among eligible population (Ustun et al. 2003, 797–808; WHO 2012c). Whereas, the post-stratification makes survey counts to correspond to census data assuming that the latter one has more accurate information than any single survey (WHO 2012c).

4.2.3 Modular design

The WHS has a modular design to enhance the survey utility with possibilities of using each module alone or in any combinations depending on need of countries. The modules are organized in two sections: the household questionnaire and the individual questionnaire. The household questionnaire has modules such as roster of all individuals in the household, household health intervention coverage, health insurance, health expenditure, indicators of permanent income, and health occupations. Whereas, the individual questionnaire contains modules on socio-demographics, health state description, health state valuation, risk factors, mortality, coverage of health interventions, health system responsiveness, health system goals and social capital, and interviewer observations. Administration of all modules will take average 90 minutes of interview; shorter version will take about 30

minutes. The short version was developed for countries with limited resources and it is nested within the long version to facilitate a direct comparison of collected data.

4.2.4 Survey administration

The main mode of administration of surveys was face-to-face interviews using paper and pencil questionnaires with exception of some countries using short version of interview by telephone or interviews assisted by computer. Interviewers were at least high-school educated people with adequate training and supervision. The survey questionnaires were developed following review of existing instruments, extensive expert consultations and field-testing before launching the actual survey. Translation of the questionnaires was done by bilingual groups with both translation and back–translation followed by independent reviews of bilingual experts. Participation in the survey was voluntary and informed consent was obtained from each respondent. Ethical procedures were reviewed and approved by the institutional review boards of collaborating partners in all participating countries.

4.3 Data

4.3.1 Data quality

Data quality checks were done according to "WHS survey metrics" as a part of survey quality assurance procedures (Ustun et al. 2005, 199–230; Ustun et al. 2003, 797–808). These procedures were done systematically throughout each step of the survey in order to avert unacceptable practices and to minimize data collection errors. The WHS metrics provides several indicators for data quality such as sample deviation index (SDI), response rate, rate of missing data, reliability coefficients for test-retest interviews.

The SDI is the indicator of the quality of the sample data in regards to their representativeness and shows whether the proportion of sex and age strata in the sample is comparable to the population from an independent source (WHS used the United Nations population database). The response rate expresses the completion rate of interviews in the chosen sample. Although a response rate of 60% is generally regarded as the minimum acceptable, the WHS targeted to get a response rate of at least 75%. The rate of missing data indicates the proportion of missing items in a respondent's interview. The reliability coefficients for test-retest interviews show how well interviews administered in two separate occasions are yielding the same results. Information on these indicators was included in each country reports whenever it is applicable. As an essential feature of the quality assurance for the final output in terms of reporting the data, the country reports consisted from basic descriptive statistics were produced and published in WHS website.

4.3.2 Data for current study

The World Health Survey data became accessible for public from the end of 2006. Researchers interested to use data for public health good can contact World Health Organization following procedures given in the WHS website (WHO 2012c). The data for current study was received from WHO on May 2009. The WHS has data for six countries of the former Soviet Union: Estonia, Georgia, Kazakhstan, Latvia, Russian Federation and Ukraine. Response rates for households varied between 87% and 99% with exception in Ukraine which was 61%. Whereas, response rates for individuals were from 89% to 99%. In initial study population, total number of households was 16 686 and that of individuals was 16 391 ranging from 856 participants in Latvia to 4 496 in Kazakhstan (Table 3). This study population was largely representative of the overall population of countries by sex and age, although there was some overrepresentation of older age groups in Georgia, Latvia and Russia, of oldest males in Estonia, and of middle aged females at the expense of oldest age group in Kazakhstan (WHO 2012c). By urban and rural settings, the study population was also well representing the overall population of these countries with the exception of overrepresentation of urban over rural population in Russia (GeoHive 2014). This could be due to the sample of Russia being subnational compared to the rest of countries in this study.

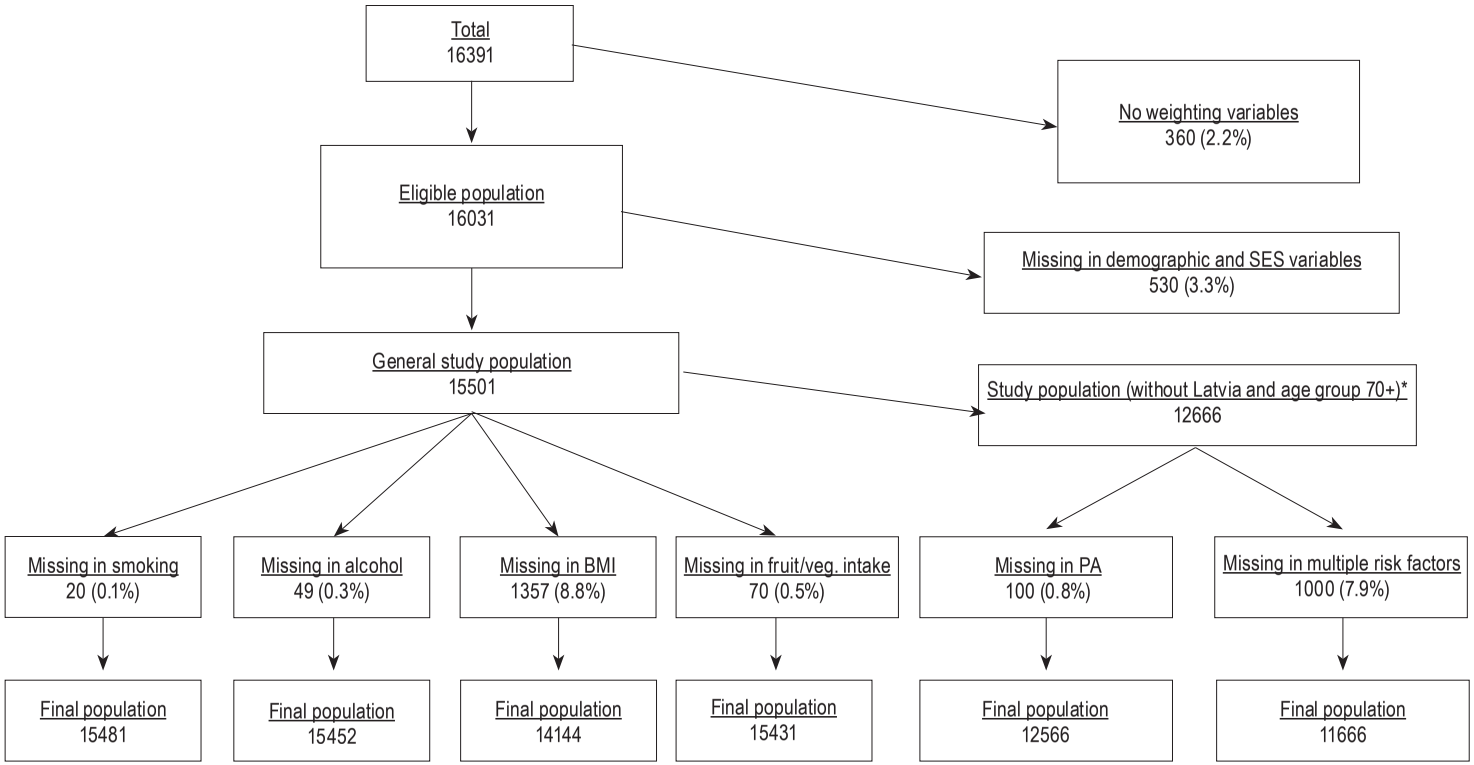
Table 3. Number (%) of households and individuals of initial study population by country

Country	Households		Individuals	
	N	%	N	%
Estonia	1021	6.1	1012	6.2
Georgia	2950	17.7	2755	16.8
Kazakhstan	4499	27.0	4496	27.4
Latvia	929	5.6	856	5.2
Russia	4427	26.5	4422	27.0
Ukraine	2860	17.1	2850	17.4
TOTAL	16686	100	16391	100

4.4 Data management and final study population

4.4.1 General

For purposes of this study, variables from the following modules were used; indicators of permanent income, socio-demographics, and risk factors. In addition, weighting variables for household and individual levels were used whenever it is relevant. Individuals without weighting variables (2.2%) or missing in demographic and socioeconomic variables (3.3%) were excluded comprising general study population of 15 501 (Figure 5).



*Latvia did not collect information on physical activity (PA); the IPAQ questionnaire for PA is valid only for adults 18-69 years old

Figure 5. Selection of the final study population

4.4.2 Demographic and socioeconomic characteristics

Demographic characteristics were sex, age, settings (rural and urban), marital status (never married, married/cohabiting, divorced/separated, and widowed) and country. Russia was taken as a reference group for 'country' variable as the main country of the former Soviet Union. Socioeconomic status was measured by three variables: education, current job and wealth quintile.

Education

Education was measured by question: "What is the highest level of education that you have completed?" Responses were any of following: 1) no formal schooling; 2) less than primary school; 3) primary school completed; 4) secondary school completed; 5) high school (or equivalent) completed; 6) college/pre-university/university completed; 7) postgraduate degree completed. For this study, first three groups of education were combined.

Current job

Current job was defined as any activity of more than one hour that the person engaged in for pay during the last two weeks (WHO 2012c). If the person is involved in more than one type of activity, then he or she should report that activity from which they derived the most income. Possible categories for responses were: 1) government employee; 2) non-government employee; 3) self-employed; 4) employer; 5) not working for pay.

Government employees are all people who receive pay from the government, while non-government employees are all others who receive pay from an employer. Those who earn an income from activities that do not involve hiring people from outside the household are listed as self-employed. Employers are individuals who earn their income through business activities that include hiring and paying anyone from outside the household.

Wealth quintile

The WHS had necessary information to create wealth quintile by using household level data. A multivariate statistical technique, principal components analysis (PCA) was used to calculate an asset index based on household possession of certain assets as indicative for permanent income (O'Donnell et al. 2008, 69–82; Vyas & Kumaranayake 2006). Total of 20 permanent income indicators (such as televisions, telephones, refrigerators, washing machines, cars, bicycles, and so forth) were collected specific for each country. From this set of correlated indicators, PCA produced uncorrelated components, where each component is a linear weighted combination of the initial indicators and measures different dimension in the data. The first principal component describes the largest possible variability in the original data, and typically it is assumed to be the asset index (McKenzie 2005).

The actual construction of the wealth quintile has been conducted for each country separately as follows. PCA gives more weight for variables with unequal distribution

across households because they have more roles in differentiating socioeconomic status (McKenzie 2005). Whereas, variables with low standard deviation carry a low PSA weight and therefore have less differentiating roles between households. Thus, at first, descriptive analysis was performed for all indicator variables to derive frequencies, means, and standard deviations. Variables with high missing values and low standard deviations were identified to be excluded from further steps as they have no or less effect on SES differentiation. As a result, 16 to 20 indicator variables were chosen for the PCA and the percentages of households with missing values were considerably low (varied from 0.4% to 2.2%). With the application of PCA for these variables, households in each country were ranked by the asset index and divided into quintiles from poorest to richest (quintile 1 to quintile 5).

4.4.3 Noncommunicable disease risk factors

Smoking

Smoking status was measured by question: "Do you currently smoke any tobacco products such as cigarettes, cigars or pipes?" Possible answers were daily; yes, but not daily; and no, not at all. Respondents were defined as current smokers if they answered positively (daily or yes but not daily). From 15 501 individuals, only 20 (0.1%) had missing information on smoking. Thus final data for smoking outcome consisted of 15 481 observations (Figure 5).

Heavy alcohol use

Alcohol use was collected through several questions concerning frequency and quantity. Participants were shown an alcohol card tailored for each country where types of alcohol beverages and definition of standard drinks can be referred. A standard drink defined as "the amount of ethanol contained in standard glasses of beer, wine, fortified wine such as sherry, and spirits" (WHO 2012c). These amounts will vary from 8 to 13 grams of ethanol depending on country to reflect local patterns of alcohol use. At first, life-time abstainers and ever drinkers were identified by question: "Have you ever consumed a drink that contains alcohol (such as beer, wine, etc.)?" Then ever drinkers were asked: "During the past 7 days, how many standard drinks of any alcoholic beverage did you have each day?" with answers for Monday to Sunday. Heavy alcohol use was created from these responses and those who are drinking at least "1–2 days with 5 or more standard drinks per week" or more were considered as heavy drinkers (WHO 2012c; Dawson 2003). Finally, alcohol use was categorized into three groups: 1) non-heavy drinkers; 2) life-time abstainers; and 3) heavy drinkers. Missing data for alcohol use occurred in 49 (0.3%) and final study population became 15 452 (Figure 5).

Overweight and obesity

Weight status was assessed by measures of self-reported height (in either meters and centimeters or feet and inches) and weight (in either kilograms or pounds). After

necessary conversion of measures, body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared (kg/m^2) (WHO 2009b). The International Classification was used to categorize individuals into following groups based on their BMI: 1) underweight (<18.5); 2) normal weight (18.5–24.9); 3) overweight (25.0–29.9); and 4) obese (≥30.0) (WHO 2009b). For this study objective, first two groups were combined creating outcome variable with three levels. To avoid the statistically outlying height and weight self-reports, respondents with BMI below 11.3 and above $63.2kg/m^2$ were excluded (Moore et al. 2010). There were 1 357 (8.8%) missing values and final data for this outcome became 14 144 (Figure 5).

Low fruit and vegetable intake

Fruit and vegetable intake was measured by two questions using the 24-hour dietary recall data as the gold standard. Questions were: "How many servings of fruit do you eat on a typical day?" and "How many servings of vegetables do you eat on a typical day?" Respondents were shown a nutrition card with the best examples of fruits and vegetables available in the country and serving sizes. The nutrition card categorized one serving of fruit into one of three groups: 1) one medium size piece of fruit, such as an apple, banana, or orange; 2) one-half cup chopped, cooked or canned fruit; and 3) one-half cup fruit juice, not artificially flavoured. Whereas, one serving of vegetables was any of three groups: 1) one cup of raw green leafy vegetables such as spinach or salad; 2) one-half cup of other vegetables cooked or chopped raw, such as tomatoes, carrots, pumpkin, corn, Chinese cabbage, fresh beans or onions; and 3) one-half cup vegetable juice (WHO 2012c). Low fruit and vegetable intake was defined by the WHO as consuming fewer than five servings (equivalent of 400g) of fruits and/or vegetables daily, and this amount was used as the cut-off for creating the outcome variable (WHO 2003). Final study population was 15 431 after excluding 70 individuals with missing data on fruit and vegetable intake (Figure 5).

Physical inactivity

Questions from the short version of the International Physical Activity Questionnaire (IPAQ) were used to assess physical activity (IPAQ, n.d.). Participants were requested to report the number of days and the duration (minutes and/or hours) of the vigorous-intensity, moderate-intensity, and walking activities they did during the past seven days. These are activities undertaken at work, at home and in garden, to get from places to place, and in spare time for recreation, exercise and sport. Each activity must last at least 10 minutes at a time in order to be beneficial for health. Illustration cards of culturally relevant examples for various physical activities representing a particular intensity were shown to participants in addition to brief explanations of what is meant by vigorous and moderate activity. Vigorous physical activity demands hard physical effort and makes one breath much harder than normal such as heavy construction, digging, running and others.

Moderate activity involves moderate physical effort which makes one to breathe rather harder than normal like cleaning, farming, swimming and so forth.

A person considered as physically inactive if did not meet any of these criteria: 1) 3 or more days of vigorous activity during the last week, consisting of at least 20 minutes per day; or 2) 5 or more days of moderate-intensity activity or walking during the last week, consisting of at least 30 minutes per day; or 3) 5 or more days of any combination of walking, moderate-, or vigorous-intensity activities during the last week, achieving a minimum of at least 600 metabolic equivalent-minutes (MET-minutes) per week (IPAQ, n.d.). According to definition, one MET is considered as the energy spent during quiet sitting and is equivalent of (4.184 kJ) × kg^{-1} × h^{-1} (Ainsworth et al. 2000). Reported weekly minutes for different intensity activities were multiplied by 3.3 METs for walking, by 4 METs for moderate, and by 8 METs for vigorous activities. Then these three components were summed to attain energy expenditure per person (IPAQ, n.d.). Data were processed following the IPAQ recommendations (IPAQ, n.d.). Individuals aged 70 and above were excluded as the IPAQ is valid only for adults up to 69 years old. As well Latvia did not collect information on physical activity, hence study population became 12 666. Missing data for this outcome was 100 (0.8%) and final study population was 12 566 (Figure 5).

Multiple noncommunicable disease risk factors

Multiple noncommunicable disease risk factors were studied by creating a new variable derived from summation of bivariate classification of above-mentioned five risk factors as having or not having that particular risk factor (Fine et al. 2004; Reeves & Rafferty 2005; Pronk et al. 2004; Berrigan et al. 2003; Ahmed et al. 2009). Multiple risk factors (MRF) had scores ranged from 0 to 5 where 0 is the absence of all risk factors and 5 is the presence of all risk factors. Further this variable was categorised into three levels, that is, 0 to 1, 2, and 3 to 5 risk factors. Total study population was the same as for physical inactivity (12 666) due to exclusion of Latvia and people aged 70 and above. Missing data for multiple risk factors was 1 000 (7.9%) giving final study population of 11 666 individuals (Figure 5).

4.5 Statistical analyses

Analyses were performed using STATA version 8 (Stata Corporation, College Station, TX, USA) software. To check representativeness of the final study population with high missing data, its baseline characteristics were compared with that of general study population and of population with missing data respectively. There were two noncommunicable disease risk factors with high missing data: overweight and obesity, and multiple risk factors (Figure 5). All analyses were stratified by sex as the prevalence and patterns of NCD risk factors varied between females and males. Depending on the purposes, analyses were conducted by using country-specific or combined data.

4.5.1 Country-specific analyses

The purpose of country-specific analyses was to describe the actual prevalence of all five NCD risk factors in the population by individual countries and how they differ from each other. The data were weighted and it showed the estimates adjusted by the individual probability of being selected, non-response and post-stratification which will facilitate the generalization of the study results.

4.5.2 Combined analyses

Methods of analysis

Main analyses of this study were conducted by using combined data of six countries. At first, descriptive statistics were performed to produce unweighted pooled prevalence of NCD risk factors by demographic and socioeconomic variables. For the study objective 2, prevalence of having multiple NCD risk factors and prevalence of all possible co-occurring patterns of the five risk factors were calculated in addition. Then corresponding regression analyses were performed depending on the type of outcome variable.

Weighting for combined data

The weighting was not applied for regression analyses since the objective was to look for the possible associations between socioeconomic variables and NCD risk factors but not to make an inference about the population parameters (UN 2005; WHO 2012c; Guthold et al. 2008; Hall et al. 2009). Moreover, as the regression models included design-related (stratifying) variables such as sex, age, and settings, the sample design will not have an effect on the analysis. In addition, countries had different weighting variables which made it impossible to use weighting for combined data.

Choice of regression analyses

A logistic regression was used for all binary outcomes (smoking, low fruit and vegetable intake, and physical inactivity). Whereas, for unordered categorical outcome, 'heavy use of alcohol', a multinomial logistic regression was applied. Ordered categorical outcomes, 'overweight and obesity' and 'multiple risk factors', were tested for proportional odds assumption to perform an ordinal logistic regression. As the assumption was not met for both, these outcomes were treated as nominal and were analysed by the multinomial logistic regression. In further sections of thesis, results of analyses of all binary outcomes were presented first, followed by results of categorical outcomes.

Modelling approach

In favour of the study results to be comparable, a general modelling approach was followed for all outcomes. Initially four different models were developed presenting: 1) crude odds

ratios; 2) odds ratios adjusted for main confounders (age and country); 3) odds ratios adjusted for all confounders (age, country, settings and marital status); 4) odds ratios adjusted for all confounders and for socioeconomic variables which were the main exposures of interest. From the fourth model, the variables which were statistically significant or considered relevant were carried forward.

The test of departure from linear trend was performed to assess whether ordered explanatory variables, age and wealth, had a linear effect on the studied outcome. For this purpose, a likelihood ratio test (LRT) was employed to test the null hypothesis 'the association between exposure and outcome is linear'. Further interactions were tested between all exposures, and between all exposures and confounders by using LRT test. The level for statistical significance was set at $P<0.01$ as several statistical tests were performed using a large sample size.

5 RESULTS

5.1 Smoking

A total number of 15 481 individuals were included in the smoking analyses, of which 9 850 (63.6%) were females and 5 631 (36.4%) were males.

5.1.1 Results of country-specific analyses

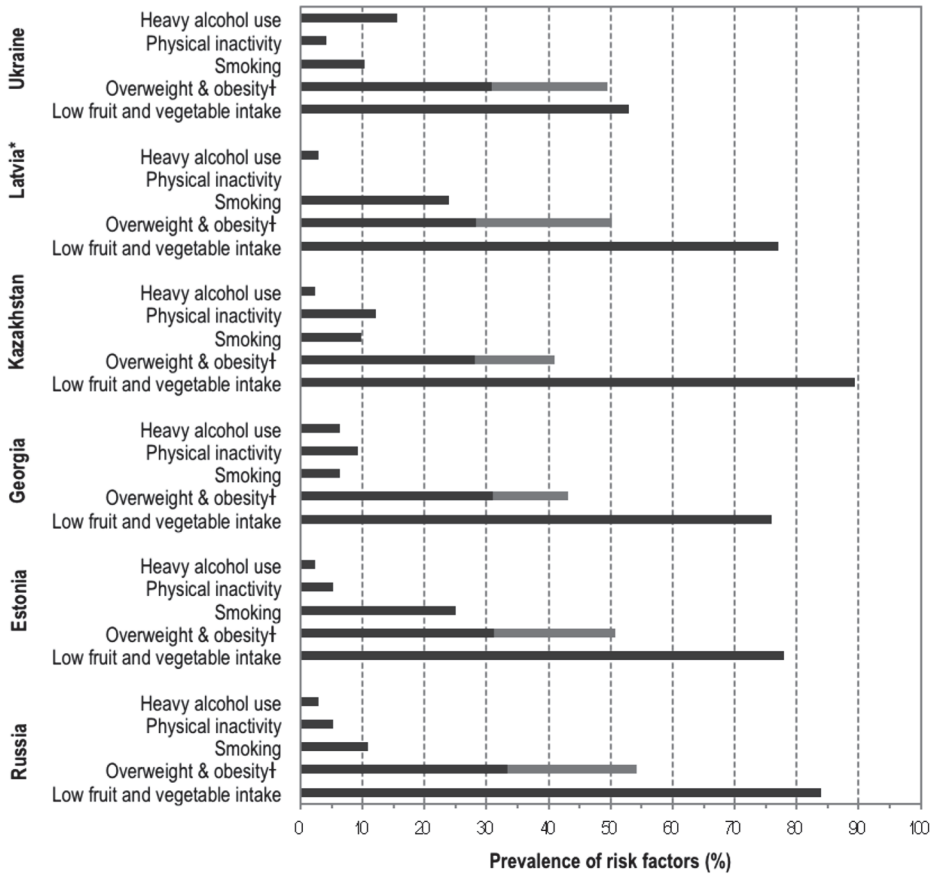
The results of country-specific analyses by sex are shown in the Appendix 1 (Tables 1, 2). The corresponding figures summarizing the results of all 5 noncommunicable disease risk factors are presented in the main text as Figures 6 and 7.

Prevalence of smoking in females by countries

The prevalence of smoking was the highest among Estonian (25.1%) and Latvian (24%) females; and the lowest in Georgian (6.3%) females. The prevalence among Russian, Kazakhstan and Ukraine females was about 10–11%. Overall, younger and middle aged women smoked more. The prevalence according to settings was higher among urban women except in Russia and Estonia. In all countries except Estonia, never married and divorced or separated women had a high smoking prevalence. In Estonia, married or cohabiting women smoked as much as never married in addition to high smoking among divorced and separated. Women with better education smoked more in Russia, Georgia and Ukraine. In others, there was no clear general picture and the smoking prevalence varied by educational level across the countries. Generally people who do not work had a lower prevalence of smoking with few exceptions. In four countries, wealthier women smoked more: Russia, Georgia, Kazakhstan, and Ukraine.

Prevalence of smoking in males by countries

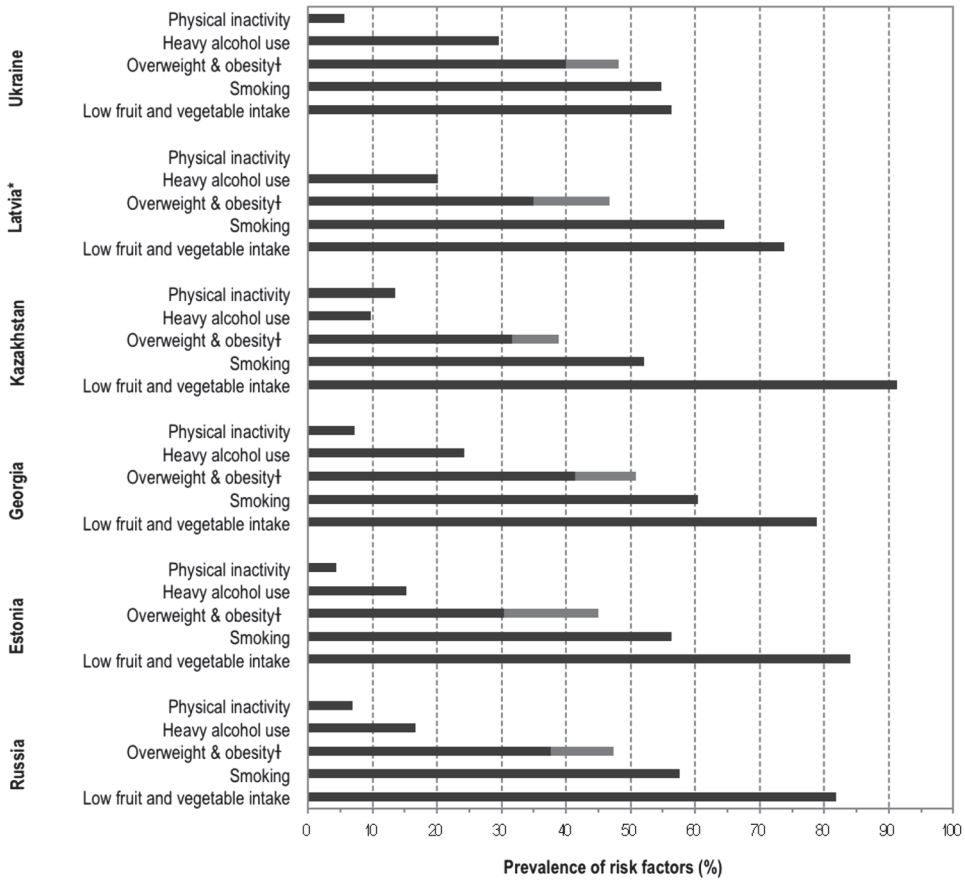
The prevalence of smoking in males ranged from 52.1% to 64.5% with the lowest in Kazakhstan and the highest in Latvia. Generally young and middle aged men smoked more than others with some exceptions in Kazakhstan and Latvia. Although urban men had more tendencies to smoke, the prevalence by settings varied across the countries. By marital status, the most common feature was that divorced or separated men had a high



* Latvia did not collect information on physical inactivity; † darker colour for overweight (BMI = 25.0–29.9), lighter colour for obesity (BMI ≥ 30.0)

Figure 6. Prevalence of noncommunicable disease risk factors by countries in females

prevalence of smoking. The prevalence by education varied much across the countries; moreover, there were too few or no observations in some categories of education. In overall, not working men had a lower smoking prevalence. Additionally in some countries, men who were self-employed or employers smoked less than others. The smoking prevalence varied greatly across different wealth quintiles in all 6 countries.



* Latvia did not collect information on physical inactivity; † darker colour for overweight (BMI = 25.0-29.9), lighter colour for obesity (BMI ≥ 30.0)

Figure 7. Prevalence of noncommunicable disease risk factors by countries in males

5.1.2 Results of combined analyses

5.1.2.1 Results of descriptive analyses

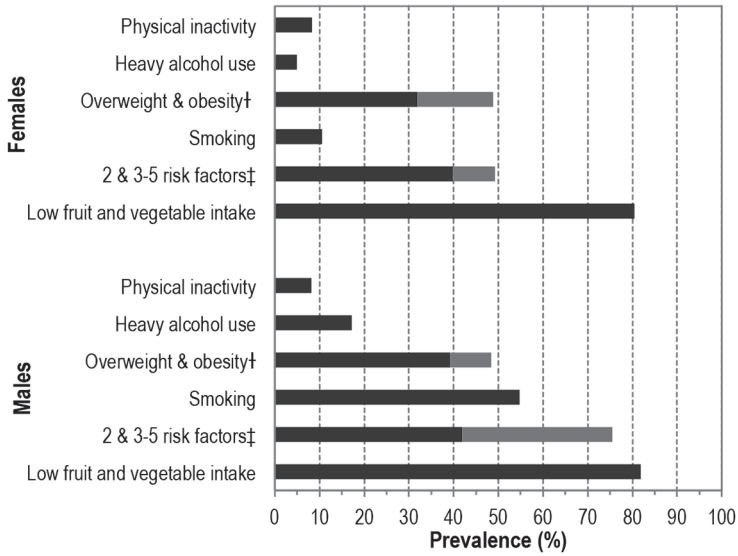
Characteristics of study participants

Table 4 shows distribution of characteristics and prevalence of smoking for females and males separately in the combined data. As smoking data had very low missing values (0.1%), it can describe characteristics of general study population stratified by sex (Figure 5). There were 9 850 females and 5 631 males in total. For both sex groups, there were more respondents from Russia and Kazakhstan, less from Estonia and Latvia. About 55% of males and females were within the age range of 30 to 59 years. The remaining were considerably evenly distributed in other age groups with the lowest percentage of males in 70 and plus

group (11.6%). A majority of participants lived in urban settings. A high number of men and women reported being married or cohabiting. The percentage of respondents with lowest and highest levels of education was low for both sexes, while a majority of them were high school, college or university graduates (76%). About 38–48% of men and women reported as not working. There were more poor women than men.

Smoking prevalence in females and males

The overall prevalence of smoking in females was 10.6%, while in males it reached 54.8% (Table 4). Figure 8 shows prevalence of smoking by sex together with prevalence of other noncommunicable disease risk factors. The prevalence was twice as high in women from Estonia and Latvia compared to the overall prevalence, and was the lowest in Georgian women (5.2%). The smoking prevalence in men varied from 52.1% in Kazakhstan to 58% in Latvia. In both men and women, the smoking decreased with increase of age being lowest, 1.9%, among women aged 70 years and above. Urban respondents smoked more. The highest percentage of smoking was among divorced or separated men and women, 65.9% and 19.0% respectively. People with the lowest and the highest education smoked less than others. The prevalence was lowest among men and women not working, and among working people the highest prevalence was observed in employers reaching as twice as high among females. Women smoked more the wealthier they are, while in men there was no such tendency observed.



† darker colour for overweight (BMI = 25.0–29.9), lighter colour for obesity (BMI ≥ 30.0)
‡ darker colour for 2 risk factors, lighter colour for 3–5 risk factors

Figure 8. Prevalence of noncommunicable disease risk factors and multiple risk factors in females and males

Table 4. Distribution of characteristics and prevalence of smoking in females and males

	Females			Males		
	Characteristics		Prevalence	Characteristics		Prevalence
	N	%	%	N	%	%
Country						
Russia	2756	28.0	11.8	1544	27.4	56.7
Estonia	629	6.4	24.5	357	6.3	53.5
Georgia	1533	15.6	5.2	1122	19.9	56.7
Kazakhstan	2912	29.6	6.6	1531	27.2	52.1
Latvia	561	5.7	22.1	283	5.0	58.0
Ukraine	1459	14.8	11.5	794	14.1	53.2
Age						
18–29	1613	16.4	18.3	1108	19.7	57.9
30–44	2949	29.9	13.7	1724	30.6	63.1
45–59	2453	24.9	10.1	1417	25.2	56.7
60–69	1332	13.5	5.0	727	12.9	49.0
70+	1503	15.3	1.9	655	11.6	30.1
Settings						
Rural	2853	29.0	6.0	1859	33.0	52.6
Urban	6997	71.0	12.4	3772	67.0	55.9
Marital status						
Never married	1395	14.2	15.2	1016	18.0	54.7
Married/cohabiting	4987	50.6	10.0	3800	67.5	54.2
Divorced/separated	1286	13.1	19.0	454	8.1	65.9
Widowed	2182	22.2	4.1	361	6.4	47.4
Education						
No/primary	757	7.7	6.5	393	7.0	46.3
Secondary	1350	13.7	12.0	776	13.8	58.8
High school	3918	39.8	10.5	2254	40.0	58.3
College/University	3529	35.8	11.1	2056	36.5	52.3
Postgraduate	296	3.0	9.1	152	2.7	38.2
Current job						
Not working	4742	48.1	7.5	2122	37.7	49.3
Govern. employee	2224	22.6	12.3	1176	20.9	56.7
Non-govn. employee	2135	21.7	14.3	1436	25.5	58.5
Self-employed	625	6.4	12.6	752	13.4	58.8
Employer	124	1.3	21.0	145	2.6	61.4
Wealth quintile						
Quintile 1	2133	21.7	7.7	987	17.5	58.9
Quintile 2	2073	21.1	8.2	1051	18.7	52.9
Quintile 3	1961	19.9	11.1	1109	19.7	53.9
Quintile 4	1879	19.1	11.6	1207	21.4	56.8
Quintile 5	1804	18.3	15.2	1277	22.7	52.0
Total	9850	100	10.6	5631	100	54.8

5.1.2.2 Results of regression analyses

Results of regression analyses for females

Table 5 shows odds ratios (OR) for the likelihood of smoking in relation to demographic and socioeconomic determinants in females. In model I, results of the crude odds ratios showed that all variables were significantly associated with smoking. Estonian and Latvian women were twice as likely to smoke compared to Russian (reference group), while Kazakhstan and Georgian women had about 47-59% lower likelihoods of smoking. The youngest age group smoked more than others, and with increase of age odds ratios were decreasing from OR=0.71 to OR=0.09. Women living in urban settings were twice as likely to smoke as those in rural areas. Married or cohabiting women and widowers were less likely to smoke (38% and 76% less likely) than never married; whereas, divorced or separated women smoked by 31% more. Women with lowest and highest levels of education smoked less than others. Working women had a higher likelihood of smoking than those not working with the highest likelihood observed among employers (OR=3.26). Women were more likely to smoke with increase of wealth.

In adjusted models (Model II–Model IV), the results of smoking by demographic factors remained generally similar with slight changes in the odds ratios except marital status. Only divorced or separated women had a significantly higher odds of smoking (OR=1.73) than others. From socioeconomic factors, current job remained significant after adjusting for other factors.

Table 5. Odds ratios (99% CI) of the relation of smoking with demographic and socioeconomic determinants in females (N=9850)

	Model I – Crude model	† Model II	‡Model III	Model IV – Full model
Country				
Russia	1	1	1	1
Estonia	2.43 (1.83; 3.22)**	2.23 (1.66; 3.00)**	2.64 (1.95; 3.58)**	2.47 (1.79; 3.43)**
Georgia	0.41 (0.29; 0.57)**	0.35 (0.25; 0.49)**	0.48 (0.34; 0.69)**	0.45 (0.31; 0.66)**
Kazakhstan	0.53 (0.41; 0.67)**	0.34 (0.27; 0.44)**	0.41 (0.32; 0.54)**	0.35 (0.26; 0.47)**
Latvia	2.12 (1.57; 2.87)**	2.24 (1.63; 3.09)**	2.50 (1.80; 3.46)**	2.20 (1.56; 3.10)**
Ukraine	0.97 (0.75; 1.26)	0.83 (0.63; 1.08)	0.90 (0.68; 1.17)	0.92 (0.69; 1.22)
Age				
18-29	1	1	1	1
30-44	0.71 (0.57; 0.88)**	0.73 (0.59; 0.92)**	0.73 (0.57; 0.93)*	0.73 (0.57; 0.95)*
45-59	0.50 (0.39; 0.64)**	0.44 (0.34; 0.57)**	0.42 (0.32; 0.56)**	0.44 (0.33; 0.59)**
60-69	0.24 (0.16; 0.34)**	0.18 (0.12; 0.26)**	0.19 (0.13; 0.29)**	0.20 (0.13; 0.30)**
70+	0.09 (0.05; 0.15)**	0.06 (0.04; 0.11)**	0.07 (0.04; 0.13)**	0.07 (0.04; 0.13)**
Settings				
Rural	1	1	1	1
Urban	2.21 (1.77; 2.77)**	1.96 (1.54; 2.50)**	1.92 (1.51; 2.45)**	1.97 (1.54; 2.52)**
Marital status				
Never married	1	1	1	1
Married/cohabiting	0.62 (0.49; 0.77)**	0.83 (0.64; 1.08)	0.84 (0.65; 1.10)	0.85 (0.65; 1.12)
Divorced/separated	1.31 (1.00; 1.70)*	1.72 (1.26; 2.35)**	1.70 (1.25; 2.33)**	1.73 (1.26; 2.37)**
Widowed	0.24 (0.17; 0.34)**	0.78 (0.52; 1.18)	0.79 (0.53; 1.20)	0.78 (0.51; 1.17)
Education				
No/primary	1	1	1	1
Secondary	1.97 (1.27; 3.05)**	1.08 (0.66; 1.78)	1.04 (0.63; 1.73)	1.04 (0.63; 1.74)
High school	1.70 (1.13; 2.54)*	0.91 (0.56; 1.48)	0.82 (0.50; 1.33)	0.81 (0.49; 1.33)
College/University	1.81 (1.20; 2.71)**	0.97 (0.60; 1.58)	0.84 (0.51; 1.38)	0.86 (0.52; 1.42)
Postgraduate	1.45 (0.76; 2.76)	0.93 (0.46; 1.91)	0.84 (0.41; 1.74)	0.86 (0.41; 1.80)
Current job				
Not working	1	1	1	1
Govern. employee	1.73 (1.39; 2.15)**	0.85 (0.66; 1.09)	0.79 (0.61; 1.02)	0.81 (0.62; 1.04)
Non-govn. employee	2.05 (1.66; 2.54)**	1.44 (1.12; 1.86)**	1.30 (1.01; 1.67)*	1.31 (1.01; 1.69)*
Self-employed	1.78 (1.26; 2.50)**	1.83 (1.26; 2.66)**	1.81 (1.25; 2.64)**	1.80 (1.23; 2.63)**
Employer	3.26 (1.81; 5.85)**	2.25 (1.20; 4.19)*	2.36 (1.25; 4.46)*	2.32 (1.22; 4.41)*
Wealth quintile				
Quintile 1	1	1	1	1
Quintile 2	1.07 (0.79; 1.43)	0.87 (0.64; 1.18)	0.87 (0.64; 1.19)	0.88 (0.65; 1.21)
Quintile 3	1.49 (1.13; 1.98)**	0.91 (0.68; 1.23)	0.92 (0.68; 1.24)	0.93 (0.69; 1.26)
Quintile 4	1.57 (1.18; 2.07)**	0.84 (0.62; 1.13)	0.87 (0.64; 1.18)	0.90 (0.65; 1.22)
Quintile 5	2.16 (1.65; 2.83)**	1.06 (0.79; 1.42)	1.10 (0.82; 1.49)	1.09 (0.80; 1.48)

*p<0.01; **p<0.001

† ORs adjusted for age and country

‡ ORs adjusted for age, country, settings and marital status

Non-government employees, self-employed women and employers were 1.3 to 2.3 times as likely to smoke as those who were not working. Thus the results of full model (Model IV) shown that among these countries, women from Estonia and Latvia were more likely to smoke, while Georgian and Kazakhstan women smoked less than their Russian counterparts. Moreover, being younger, urban, divorced or separated, non-government

employee, self-employed, and being employer was associated with a higher likelihood of smoking. The tests for trend and interaction were not statistically significant.

Results of regression analyses for males

Table 6 presents odds ratios of the relation of smoking with demographic and socioeconomic determinants for males. In the model I, country and settings were not associated with smoking. Men from age group 30–44 years smoked more than the youngest, while smoking was less common among men aged 60 years and above. Divorced or separated men had a higher likelihood of smoking compared to never married. Men with secondary or high school levels of education were more likely to smoke compared to least educated. Working men were more likely to smoke than those who do not work. By wealth, men from second and fifth quintiles had a significantly lower likelihood of smoking compared to men from first, the poorest quintile.

In contrast to crude model, the results of adjusted models (II–IV) became more significant in terms of demographic factors. By country, Kazakhstan men smoked less than others. The significance has changed by categories of age with results showing men 45 and older were less likely to smoke than younger ones. Settings became significant only in the full model adjusted for all the variables in the table 6. By marital status, all men except never married had a higher likelihood of smoking. In regards to socioeconomic factors; current job became not associated with smoking after adjusting, while there were some changes observed in the significance and magnitude of the association by education level and wealth quintile. Therefore when all factors were taken simultaneously in the regression models, Kazakhstan men were 30% less likely to smoke than Russian men. Men aged 45 and above were significantly less likely to smoke compared to younger men, odds ratios were decreasing with increase of age reaching lowest in the oldest group (from 0.74 to 0.16). Urban males were 25% more likely to smoke than males from rural settings. Married or cohabiting, divorced or separated, and widowed men had 1.5–2.1 times higher likelihood of smoking compared to never married. Men who completed college and higher degrees were less likely to smoke. Similar tendency was observed with wealth quintile: wealthier men were less likely to smoke compared to poorer (about 24–39% less likely). The results of the test for trend showed that the association of age with smoking had no linear trend. However, wealth had a linear effect on smoking ($p=0.182$). Tests for the interactions did not yield any significant results.

Table 6. Odds ratios (99% CI) of the relation of smoking with demographic and socioeconomic determinants in males (N=5631)

	Model I – Crude model	† Model II	‡ Model III	Model IV – Full model
Country				
Russia	1	1	1	1
Estonia	0.88 (0.65; 1.19)	0.88 (0.64; 1.20)	0.94 (0.68; 1.29)	0.84 (0.60; 1.18)
Georgia	1.00 (0.82; 1.23)	0.98 (0.80; 1.21)	1.12 (0.89; 1.41)	1.17 (0.91; 1.50)
Kazakhstan	0.83 (0.69; 1.00)	0.66 (0.54; 0.80)**	0.71 (0.58; 0.88)**	0.70 (0.55; 0.88)**
Latvia	1.05 (0.75; 1.48)	1.07 (0.75; 1.51)	1.12 (0.79; 1.60)	0.97 (0.67; 1.40)
Ukraine	0.87 (0.69; 1.09)	0.82 (0.65; 1.03)	0.86 (0.68; 1.09)	0.86 (0.67; 1.10)
Age				
18-29	1	1	1	1
30-44	1.24 (1.02; 1.52)*	1.28 (1.05; 1.57)*	1.07 (0.84; 1.35)	1.04 (0.82; 1.33)
45-59	0.96 (0.78; 1.18)	0.95 (0.77; 1.17)	0.75 (0.59; 0.97)*	0.74 (0.57; 0.95)*
60-69	0.70 (0.55; 0.90)**	0.67 (0.52; 0.86)**	0.51 (0.38; 0.68)**	0.46 (0.34; 0.63)**
70+	0.31 (0.24; 0.41)**	0.29 (0.22; 0.38)**	0.20 (0.14; 0.28)**	0.16 (0.11; 0.23)**
Settings				
Rural	1	1	1	1
Urban	1.14 (0.99; 1.32)	1.13 (0.96; 1.33)	1.12 (0.95; 1.33)	1.25 (1.05; 1.48)*
Marital status				
Never married	1	1	1	1
Married/cohabiting	0.98 (0.82; 1.17)	1.38 (1.10; 1.74)**	1.38 (1.10; 1.74)**	1.47 (1.16; 1.86)**
Divorced/separated	1.60 (1.18; 2.16)**	1.98 (1.41; 2.80)**	1.97 (1.40; 2.78)**	1.94 (1.37; 2.76)**
Widowed	0.74 (0.54; 1.02)	2.20 (1.48; 3.27)**	2.20 (1.48; 3.27)**	2.14 (1.44; 3.20)**
Education				
No/primary	1	1	1	1
Secondary	1.65 (1.20; 2.28)**	1.04 (0.72; 1.48)	1.02 (0.71; 1.46)	1.04 (0.73; 1.49)
High school	1.62 (1.22; 2.15)**	0.84 (0.60; 1.18)	0.82 (0.58; 1.15)	0.87 (0.62; 1.22)
College/University	1.27 (0.96; 1.69)	0.65 (0.46; 0.91)*	0.61 (0.43; 0.87)**	0.68 (0.48; 0.97)*
Postgraduate	0.72 (0.43; 1.18)	0.37 (0.21; 0.64)**	0.34 (0.20; 0.59)**	0.39 (0.22; 0.69)**
Current job				
Not working	1	1	1	1
Govern. employee	1.35 (1.11; 1.62)**	0.82 (0.66; 1.02)	0.79 (0.63; 0.99)*	0.93 (0.74; 1.17)
Non-govn. employee	1.45 (1.21; 1.73)**	1.02 (0.83; 1.27)	0.99 (0.80; 1.23)	1.13 (0.90; 1.41)
Self-employed	1.46 (1.17; 1.83)**	1.01 (0.79; 1.29)	0.98 (0.77; 1.26)	1.04 (0.81; 1.34)
Employer	1.63 (1.04; 2.57)*	1.06 (0.66; 1.69)	1.04 (0.65; 1.67)	1.26 (0.78; 2.04)
Wealth quintile				
Quintile 1	1	1	1	1
Quintile 2	0.78 (0.62; 0.99)*	0.76 (0.60; 0.96)*	0.77 (0.61; 0.99)*	0.80 (0.63; 1.02)
Quintile 3	0.82 (0.65; 1.03)	0.68 (0.54; 0.87)**	0.69 (0.54; 0.88)**	0.74 (0.58; 0.94)*
Quintile 4	0.92 (0.74; 1.15)	0.69 (0.54; 0.87)**	0.70 (0.55; 0.89)**	0.76 (0.60; 0.98)*
Quintile 5	0.76 (0.61; 0.94)*	0.55 (0.43; 0.69)**	0.54 (0.43; 0.69)**	0.61 (0.47; 0.78)**

*p<0.01; **p<0.001

† ORs adjusted for age and country

‡ ORs adjusted for age, country, settings and marital status

5.2 Low fruit and vegetable intake

Analyses for the low fruit and vegetable intake included a total of 15 431 individuals, in particularly 9 813 (63.6%) females and 5 618 (36.4%) males.

5.2.1 Results of country-specific analyses

The results of these analyses are presented in Tables 3 and 4 of the Appendix 1. The related figures including all 5 risk factors are shown in Figures 6 and 7.

Prevalence of low fruit and vegetable intake in females by countries

The prevalence of low fruit and vegetable intake in women was high in all countries ranging from 52.9% in Ukraine till 89.3% in Kazakhstan. In general, older women had a higher prevalence of low intake. In four countries (Estonia, Georgia, Latvia and Ukraine), women from urban settings had a high prevalence. While Russian women residing in rural areas had a higher prevalence, there was no difference between the two settings in Kazakhstan. By marital status, a high prevalence of low intake was observed among never married in Kazakhstan and Ukraine, among divorced or separated (Estonia, Georgia, Latvia, and Ukraine), among widowed in all countries except Kazakhstan. Generally women from lower educational levels had a higher prevalence of low intake. In some countries women with highest level of education also had a high prevalence; however, there were too few observations in certain categories of education. The prevalence by current job varied much across the countries, although there was some tendency of a higher prevalence of low intake among not working and employer women. In all countries, poor women had a high prevalence of low fruit and vegetable intake in addition to Russian and Latvian women from richer quintiles.

Prevalence of low fruit and vegetable intake in males by countries

The prevalence of low fruit and vegetable intake in men was high, with variations from 56.3% in Ukraine to 91.3% in Kazakhstan. Overall, men from middle and older age groups had a high prevalence of low intake. Men from rural areas had a higher prevalence of low intake in three countries (Russia, Georgia and Kazakhstan). Urban men had a high prevalence in Estonia and Ukraine, while there was no difference between the two settings in Latvia. Widowed men had a higher prevalence of low intake except Georgian and Ukraine men. There was a tendency of high prevalence of low intake among less educated men. Additionally, similar results were observed in men with higher education in some countries. However, there were too few or no observations in certain categories of education. Not working men were leading with high prevalence of low fruit and vegetable

intake with some exceptions. Poor men had a higher prevalence of low intake in majority of countries.

5.2.2 Results of combined analyses

5.2.2.1 Results of descriptive analyses

Characteristics of study participants

Table 7 presents characteristics of study population and prevalence of low fruit and vegetable intake by sex. In total, there were 9 813 females and 5 618 males and only 0.5% of the general study population lacked data on low fruit and vegetable intake (Figure 5). Therefore, characteristics of this study population were similar to the characteristics of the study population for 'smoking' outcome (Table 4).

Prevalence of low fruit and vegetable intake in females and males

The overall prevalence of low fruit and vegetable intake was equally high among females and males reaching 80.5–81.9% (Table 7). Figure 8 displays prevalence of all NCD risk factors where low fruit and vegetable intake was leading risk factor for both sexes. Generally, the prevalence of low intake by demographic and socioeconomic determinants had very similar picture among females and males. The prevalence ranged from 54.2% to 91.8% with the lowest in Ukraine females and the highest in Kazakhstan males. Older people had a higher prevalence of low intake. Females from rural areas had moderately smaller prevalence of low intake, while males had nearly similar prevalence for both settings. Never married had comparatively lower prevalence, while widowed women and men had a higher prevalence of low intake especially men. Participants with lower and the highest levels of education had a high prevalence. The prevalence was high among not working men, in addition to non-government employee men and women. Poor people had the highest prevalence of low intake, and it decreased with increase of wealth.

Table 7. Distribution of characteristics and prevalence of low fruit and vegetable intake in females and males

	Females			Males		
	Characteristics		Prevalence	Characteristics		Prevalence
	N	%	%	N	%	%
Country						
Russia	2756	28.1	85.6	1545	27.5	86.1
Estonia	628	6.4	77.2	356	6.3	83.7
Georgia	1531	15.6	78.2	1124	20.0	79.9
Kazakhstan	2912	29.7	90.6	1531	27.3	91.8
Latvia	561	5.7	79.9	283	5.0	73.9
Ukraine	1425	14.5	54.2	779	13.9	59.3
Age						
18-29	1612	16.4	74.1	1107	19.7	78.2
30-44	2945	30.0	80.3	1719	30.6	82.6
45-59	2439	24.9	81.1	1414	25.2	81.5
60-69	1323	13.5	81.6	725	12.9	83.5
70+	1494	15.2	85.9	653	11.6	85.5
Settings						
Rural	2850	29.0	78.6	1857	33.1	82.6
Urban	6963	71.0	81.3	3761	67.0	81.6
Marital status						
Never married	1388	14.1	79.1	1015	18.1	79.6
Married/cohabiting	4976	50.7	79.6	3793	67.5	82.0
Divorced/separated	1278	13.0	81.3	451	8.0	82.0
Widowed	2171	22.1	82.9	359	6.4	87.7
Education						
No/primary	753	7.7	85.7	390	6.9	84.6
Secondary	1345	13.7	82.4	774	13.8	85.1
High school	3904	39.8	79.5	2251	40.1	80.6
College/University	3515	35.8	79.5	2051	36.5	81.1
Postgraduate	296	3.0	84.5	152	2.7	88.8
Current job						
Not working	4721	48.1	80.3	2115	37.7	84.1
Govern. employee	2215	22.6	76.9	1174	20.9	76.0
Non-govn. employee	2130	21.7	85.4	1434	25.5	84.6
Self-employed	624	6.4	81.6	750	13.4	81.3
Employer	123	1.3	64.2	145	2.6	75.2
Wealth quintile						
Quintile 1	2123	21.6	86.0	983	17.5	88.6
Quintile 2	2068	21.1	82.6	1050	18.7	84.0
Quintile 3	1953	19.9	80.8	1105	19.7	84.1
Quintile 4	1872	19.1	78.9	1205	21.5	80.3
Quintile 5	1797	18.3	73.0	1275	22.7	74.7
Total	9813	100	80.5	5618	100	81.9

5.2.2.2 Results of regression analyses

Results of regression analyses for females

Table 8 gives odds ratios (OR) for the likelihood of low fruit and vegetable intake in relation to demographic and socioeconomic determinants in women. Model I showed that all variables were significantly associated with low intake. Only Kazakhstan women had a higher likelihood (62% more likely) of low fruit and vegetable intake compared to Russian. Odds ratios were rising with increase of age from OR=1.43 to OR=2.14. Urban women had a slightly higher likelihood of low intake (19% higher likelihood) than rural women. By marital status, widowed women had a significantly higher likelihood of low intake compared to never married women. High school, college or university graduates were 35% less likely to have low intake. Compared to not working women, government employees and employers had lower likelihoods of low fruit and vegetable intake. The odds of low intake decreased with increase of wealth (OR=0.77 to OR=0.44).

The results of adjusted models (Models II–IV) showed that demographic factors remained significantly associated with outcome except marital status. Most noticeable changes were observed in regards to age and settings. Compared to crude model, odds ratios increased among women of 45 years old and above. Settings became more significant and odds ratios increased when variables were added in the models. Of socioeconomic factors, current job and wealth were significantly associated with low fruit and vegetable intake after adjusting for other variables. By current job, only employers were significantly different from those not working with regard to likelihood of low fruit and vegetable intake. The results of wealth quintile were not much affected by adjustments and were similar throughout all models. Consequently, the full model showed that Kazakhstan women were twice as likely to have low intake compared with Russian women, whereas women from other countries had lower likelihoods of low intake except Latvia. Odds of low intake were increasing with age of women reaching highest (OR=2.41) in the oldest group. Urban residents were 1.5 times as likely to have low intake as rural ones. Employers were 53% less likely to have low fruit and vegetable intake than not working women. The likelihood of low intake decreased from poor to richest quintiles (OR=0.78 to OR=0.45). The results of the trend test showed that both age and wealth quintile had a linear effect on the low intake (p=0.545 and p=0.187 respectively). There were no interactions revealed by tests.

Table 8. Odds ratios (99% CI) of the relation of low fruit and vegetable intake with demographic and socioeconomic determinants in females (N=9813)

	Model I – Crude model	† Model II	‡Model III	Model IV – Full model
Country				
Russia	1	1	1	1
Estonia	0.57 (0.43; 0.75)**	0.60 (0.45; 0.80)**	0.65 (0.49; 0.86)**	0.62 (0.45; 0.83)**
Georgia	0.60 (0.49; 0.74)**	0.63 (0.51; 0.78)**	0.72 (0.57; 0.91)**	0.74 (0.58; 0.94)*
Kazakhstan	1.62 (1.30; 2.00)**	1.92 (1.54; 2.40)**	2.15 (1.71; 2.71)**	2.02 (1.57; 2.61)**
Latvia	0.67 (0.49; 0.90)*	0.66 (0.49; 0.90)*	0.71 (0.52; 0.97)*	0.73 (0.53; 1.01)
Ukraine	0.20 (0.16; 0.24)**	0.21 (0.17; 0.25)**	0.22 (0.18; 0.26)**	0.20 (0.17; 0.25)**
Age				
18–29	1	1	1	1
30–44	1.43 (1.18; 1.72)**	1.29 (1.05; 1.58)*	1.39 (1.12; 1.73)**	1.38 (1.10; 1.72)**
45–59	1.50 (1.23; 1.83)**	1.54 (1.25; 1.90)**	1.66 (1.32; 2.10)**	1.59 (1.26; 2.02)**
60–69	1.55 (1.23; 1.96)**	1.89 (1.48; 2.42)**	2.09 (1.59; 2.76)**	1.87 (1.40; 2.50)**
70+	2.14 (1.68; 2.72)**	2.59 (2.01; 3.33)**	2.89 (2.14; 3.92)**	2.41 (1.73; 3.36)**
Settings				
Rural	1	1	1	1
Urban	1.19 (1.03; 1.37)*	1.37 (1.17; 1.61)**	1.37 (1.16; 1.61)**	1.46 (1.23; 1.72)**
Marital status				
Never married	1	1	1	1
Married/cohabiting	1.03 (0.85; 1.25)	0.82 (0.65; 1.02)	0.82 (0.66; 1.03)	0.89 (0.70; 1.11)
Divorced/separated	1.15 (0.89; 1.48)	0.90 (0.68; 1.21)	0.90 (0.67; 1.20)	0.86 (0.64; 1.16)
Widowed	1.28 (1.02; 1.60)*	0.81 (0.61; 1.08)	0.82 (0.61; 1.09)	0.81 (0.60; 1.09)
Education				
No/primary	1	1	1	1
Secondary	0.78 (0.57; 1.08)	0.78 (0.55; 1.10)	0.76 (0.54; 1.08)	0.80 (0.56; 1.14)
High school	0.65 (0.49; 0.86)**	0.84 (0.60; 1.17)	0.80 (0.58; 1.12)	0.87 (0.62; 1.22)
College/University	0.65 (0.49; 0.87)**	0.81 (0.58; 1.13)	0.74 (0.53; 1.05)	0.86 (0.61; 1.22)
Postgraduate	0.91 (0.56; 1.49)	0.62 (0.36; 1.06)	0.58 (0.34; 0.99)*	0.65 (0.38; 1.12)
Current job				
Not working	1	1	1	1
Govern. employee	0.82 (0.70; 0.96)*	1.08 (0.89; 1.31)	1.05 (0.87; 1.28)	1.14 (0.94; 1.40)
Non-govn. employee	1.44 (1.20; 1.73)**	1.22 (0.97; 1.52)	1.16 (0.93; 1.46)	1.25 (0.99; 1.56)
Self-employed	1.09 (0.82; 1.44)	0.93 (0.69; 1.26)	0.93 (0.69; 1.27)	0.98 (0.72; 1.34)
Employer	0.44 (0.27; 0.72)**	0.40 (0.24; 0.69)**	0.41 (0.24; 0.70)**	0.47 (0.28; 0.81)**
Wealth quintile				
Quintile 1	1	1	1	1
Quintile 2	0.77 (0.62; 0.96)*	0.80 (0.64; 1.01)	0.78 (0.62; 0.98)*	0.78 (0.62; 0.99)*
Quintile 3	0.68 (0.55; 0.85)**	0.74 (0.59; 0.94)*	0.71 (0.56; 0.90)**	0.71 (0.56; 0.90)**
Quintile 4	0.61 (0.49; 0.76)**	0.67 (0.53; 0.85)**	0.64 (0.50; 0.81)**	0.63 (0.50; 0.81)**
Quintile 5	0.44 (0.36; 0.54)**	0.49 (0.39; 0.62)**	0.45 (0.35; 0.57)**	0.45 (0.35; 0.58)**

*p<0.01; **p<0.001
† ORs adjusted for age and country
‡ ORs adjusted for age, country, settings and marital status

Results of regression analyses for males

Table 9 presents odds ratios (OR) of the relation of low fruit and vegetable intake with demographic and socioeconomic determinants in males. In the model I, settings and education were not associated with outcome of interest. Men from Kazakhstan had a

higher likelihood of low intake compared to Russian, while men from other countries had lower likelihoods of low intake except Estonia. Men aged 30–44 years old and above 60 were more likely to have low intake, as well as widowed men. Government employees and employers were less likely to have low fruit and vegetable intake compared to not working men. Odds ratios were decreasing with increase of wealth.

Table 9. Odds ratios (99% CI) of the relation of low fruit and vegetable intake with demographic and socioeconomic determinants in males (N=5618)

	Model I – Crude model	† Model II	‡Model III	Model IV – Full model
Country				
Russia	1	1	1	1
Estonia	0.83 (0.55; 1.26)	0.82 (0.54; 1.25)	0.84 (0.55; 1.28)	0.82 (0.52; 1.28)
Georgia	0.64 (0.49; 0.84)**	0.65 (0.49; 0.85)**	0.66 (0.49; 0.89)**	0.69 (0.50; 0.95)*
Kazakhstan	1.80 (1.33; 2.45)**	1.94 (1.43; 2.64)**	2.00 (1.45; 2.76)**	1.95 (1.37; 2.76)**
Latvia	0.46 (0.31; 0.68)**	0.46 (0.31; 0.68)**	0.46 (0.31; 0.68)**	0.44 (0.29; 0.67)**
Ukraine	0.24 (0.18; 0.31)**	0.24 (0.18; 0.31)**	0.24 (0.19; 0.32)**	0.24 (0.18; 0.32)**
Age				
18-29	1	1	1	1
30-44	1.32 (1.03; 1.70)*	1.14 (0.88; 1.49)	1.20 (0.89; 1.61)	1.19 (0.88; 1.62)
45-59	1.23 (0.95; 1.59)	1.20 (0.92; 1.57)	1.26 (0.91; 1.73)	1.19 (0.86; 1.65)
60-69	1.40 (1.02; 1.93)*	1.54 (1.11; 2.15)*	1.58 (1.08; 2.31)*	1.20 (0.80; 1.79)
70+	1.63 (1.16; 2.30)**	1.83 (1.29; 2.61)**	1.77 (1.17; 2.70)**	1.15 (0.72; 1.83)
Settings				
Rural	1	1	1	1
Urban	0.94 (0.77; 1.13)	1.01 (0.81; 1.26)	1.01 (0.82; 1.26)	1.14 (0.91; 1.43)
Marital status				
Never married	1	1	1	1
Married/cohabiting	1.16 (0.93; 1.46)	0.90 (0.67; 1.20)	0.90 (0.67; 1.20)	1.05 (0.77; 1.42)
Divorced/separated	1.17 (0.80; 1.70)	0.98 (0.64; 1.52)	0.98 (0.64; 1.51)	0.91 (0.58; 1.42)
Widowed	1.83 (1.16; 2.91)*	1.27 (0.73; 2.19)	1.27 (0.73; 2.19)	1.28 (0.73; 2.23)
Education				
No/primary	1	1	1	1
Secondary	1.04 (0.67; 1.63)	0.96 (0.59; 1.55)	0.96 (0.59; 1.55)	1.05 (0.64; 1.70)
High school	0.76 (0.51; 1.11)	0.75 (0.48; 1.17)	0.76 (0.49; 1.19)	0.90 (0.57; 1.42)
College/University	0.78 (0.53; 1.15)	0.73 (0.46; 1.14)	0.73 (0.46; 1.15)	0.97 (0.61; 1.56)
Postgraduate	1.44 (0.68; 3.07)	0.88 (0.39; 1.96)	0.87 (0.39; 1.95)	1.36 (0.60; 3.09)
Current job				
Not working	1	1	1	1
Govern. employee	0.60 (0.47; 0.76)**	0.66 (0.50; 0.87)**	0.67 (0.50; 0.88)**	0.73 (0.55; 0.98)*
Non-govn. employee	1.04 (0.82; 1.33)	0.79 (0.59; 1.05)	0.79 (0.59; 1.07)	0.89 (0.65; 1.20)
Self-employed	0.83 (0.62; 1.10)	0.66 (0.47; 0.91)*	0.66 (0.48; 0.91)*	0.70 (0.51; 0.97)*
Employer	0.57 (0.34; 0.96)*	0.46 (0.27; 0.81)**	0.47 (0.27; 0.82)**	0.56 (0.32; 0.99)*
Wealth quintile				
Quintile 1	1	1	1	1
Quintile 2	0.68 (0.48; 0.95)*	0.63 (0.44; 0.89)*	0.63 (0.44; 0.89)*	0.64 (0.45; 0.91)*
Quintile 3	0.68 (0.49; 0.95)*	0.66 (0.47; 0.93)*	0.66 (0.46; 0.94)*	0.69 (0.48; 0.98)*
Quintile 4	0.53 (0.38; 0.72)**	0.54 (0.38; 0.75)**	0.53 (0.38; 0.75)**	0.55 (0.39; 0.78)**
Quintile 5	0.38 (0.28; 0.52)**	0.37 (0.27; 0.51)**	0.36 (0.26; 0.50)**	0.37 (0.26; 0.53)**

*p<0.01; **p<0.001

† ORs adjusted for age and country

‡ ORs adjusted for age, country, settings and marital status

In the adjusted models, only three variables were associated with low fruit and vegetable intake. The results of multivariable regressions by country were generally similar but with increased odds ratios for Kazakhstan. In addition to government employees and employers, self-employed men were less likely to have low intake. Odds ratios and significance levels by wealth remained similar throughout all models. Thus the results of the full model showed that men from Kazakhstan almost twice as likely to have low fruit and vegetable intake as men from Russia, while others had lower likelihoods of low intake except Estonia. Being government employee, self-employed, employer and being wealthier were all negatively associated with low fruit and vegetable intake. Tests for trend and interaction did not produce any significant results.

5.3 Physical inactivity

A total of 12 566 respondents were included in the analyses of physical inactivity, of which 7 872 (62.6%) were females and 4 694 (37.4%) were males. This outcome did not include respondents from Latvia and individuals aged 70 and above.

5.3.1 Results of country-specific analyses

The results of country-specific analyses for females and males are presented in the Appendix 1 (Tables 5, 6). The corresponding figures including all 5 risk factors are displayed in Figures 6 and 7.

Prevalence of physical inactivity in females by countries

The prevalence of physical inactivity among women was considerably low ranging from 4.2% in Ukraine to 12.1% in Kazakhstan. In all five countries, women of age 60 to 69 years had a higher prevalence, in addition to the youngest age group in Kazakhstan. Women residing in rural areas were less physically inactive except in Ukraine. Generally widowed women had a higher prevalence of inactivity, as well as divorced or separated women in some countries. Lower educated women were more physically inactive, in addition to higher educated women from Georgia and Kazakhstan. There were too few observations in some categories of education and current job. The prevalence of physical inactivity by current job and wealth quintile varied much across countries.

Prevalence of physical inactivity in males by countries

The prevalence of physical inactivity in males was low with variations from 4.4% in Estonia to 13.5% in Kazakhstan. There was a tendency of older men being more physically inactive, although in some countries younger men were more inactive as well. Except Ukraine,

men from rural settings had a lower prevalence of inactivity. Mainly divorced or separated and widowed men were having a higher prevalence with some exceptions. The prevalence by education varied greatly across the countries; in addition there were no or too few observations in some categories of this variable. Even though prevalence by current job had variations among countries, there was a common feature of not working men being more physically inactive in all five countries. In four countries (Russia, Georgia, Kazakhstan and Ukraine), men from richer quintiles were more inactive, in addition to men from poor quintile in Russia. In Estonia, the poorest had the highest prevalence of physical inactivity.

5.3.2 Results of combined analyses

5.3.2.1 Results of descriptive analyses

Characteristics of study participants

Table 10 gives characteristics of study population and prevalence of physical inactivity for both females and males. Physical inactivity data had considerably low missing values (0.8%), thus it can describe characteristics of the study population aged under 70 years excluding Latvia stratified by sex (Figure 5). There were 7 872 females and 4 694 males. The study population consisted of more respondents from Russia and Kazakhstan followed by respondents from Georgia and Ukraine, and less from Estonia. About 64% of women and men were within age range of 30 to 59 years, 20–22% was from the youngest, and 14–16% was from the oldest age groups. A large proportion of respondents was residing in urban settings. There were more married or cohabiting women and men (57–68.9%), and less divorced or separated (8.2%) and widowed (2.8%) men. A large majority of females and males were graduates from high school, college or universities (about 84%). Among respondents, the highest number reported as not working and the lowest reported as being employers. Respondents were relatively wealthier especially males.

Prevalence of physical inactivity in females and males

The overall prevalence of physical inactivity was similar for females and males, and it was only about 8% (Table 10). Figure 8 displays prevalence of all noncommunicable disease risk factors by sex in the combined data. Respondents from Kazakhstan had the highest prevalence compared to the overall prevalence, while Ukraine females and Estonian males had the lowest prevalence. The most physically inactive people were from the oldest age group. The prevalence was lower among respondents from rural settings. Widowed women and divorced or separated men were more physically inactive. Respondents with the lowest level of education and some women and men with higher education had an increased prevalence of physical inactivity. Not working women and men, and self-employed women were more inactive. Respondents belonging to the two poorest and the richest quintiles had a higher prevalence of inactivity.

Table 10. Distribution of characteristics and prevalence of physical inactivity in females and males

	Females			Males		
	Characteristics		Prevalence	Characteristics		Prevalence
	N	%	%	N	%	%
Country						
Russia	2092	26.6	6.9	1287	27.4	7.2
Estonia	533	6.8	4.9	305	6.5	5.3
Georgia	1221	15.5	9.3	950	20.2	5.8
Kazakhstan	2818	35.8	11.3	1480	31.5	12.4
Ukraine	1208	15.4	4.6	672	14.3	5.8
Age						
18–29	1535	19.5	8.1	1038	22.1	7.5
30–44	2801	35.6	7.5	1651	35.2	7.7
45–59	2310	29.3	7.8	1341	28.6	7.9
60–69	1226	15.6	11.6	664	14.2	11.1
Settings						
Rural	2294	29.1	7.8	1556	33.2	6.8
Urban	5578	70.9	8.6	3138	66.9	8.9
Marital status						
Never married	1216	15.5	8.5	938	20.0	6.8
Married/cohabiting	4486	57.0	7.9	3236	68.9	8.3
Divorced/separated	1116	14.2	8.0	387	8.2	10.6
Widowed	1054	13.4	10.6	133	2.8	8.3
Education						
No/primary	185	2.4	10.8	134	2.9	9.7
Secondary	702	8.9	7.6	508	10.8	7.3
High school	3512	44.6	8.4	2033	43.3	7.4
College/University	3194	40.6	8.2	1879	40.0	9.6
Postgraduate	279	3.5	9.3	140	3.0	3.6
Current job						
Not working	3063	38.9	10.1	1385	29.5	10.4
Govern. employee	2079	26.4	4.7	1113	23.7	6.0
Non-govn. employee	2036	25.9	9.0	1351	28.8	8.3
Self-employed	583	7.4	10.8	712	15.2	7.0
Employer	111	1.4	3.6	133	2.8	9.0
Wealth quintile						
Quintile 1	1383	17.6	9.5	725	15.5	9.7
Quintile 2	1534	19.5	9.7	806	17.2	7.6
Quintile 3	1651	21.0	6.7	922	19.6	8.8
Quintile 4	1674	21.3	6.6	1082	23.1	6.2
Quintile 5	1630	20.7	9.5	1159	24.7	9.2
Total	7872	100	8.4	4694	100	8.2

5.3.2.2 Results of regression analyses

Results of regression analyses for females

Table 11 presents odds ratios (OR) of the relation of physical inactivity with demographic and socioeconomic determinants in women. The results of crude model showed that country, age, current job and wealth quintile were significantly associated with the outcome. Kazakhstan women had a 71% higher likelihood of physical inactivity compared with Russians, while Ukraine women had a 36% lower likelihood. Women of age 60 to 69

years were 1.5 times as likely to be inactive as those in the youngest age group. Compared with not working women, government employees had a significantly lower likelihood of physical inactivity (57% less likely). Women from middle and richer quintiles were less likely (about 32%) to be inactive than the poorest.

In adjusted models, some changes in the significance and in the odds ratios for both demographic and socioeconomic factors could be observed. Finally in the full model, the following variables were associated with physical inactivity; country, age, settings and current job. Thus, Kazakhstan women were more likely to be inactive than Russian, while Ukraine women had a lower likelihood. In addition, older women (OR=1.53) and urban residents (OR=1.33) had a higher odds of physical inactivity, whereas government employees had a lower odds (OR=0.53). Although wealth was not significant in the full model, it was significantly associated with outcome when it was tested by likelihood ratio test and therefore it was included in the further steps of analyses. The test for trend revealed that age had a linear association with the outcome (p=0.158). The results of interaction testing showed that wealth was interacting with settings (p=0.009) which led to stratified analysis by rural and urban settings.

The results of stratified analyses by settings in women are displayed in Table 12. Adjusted odds ratios in rural settings showed that only current job and wealth quintile were significantly associated with physical inactivity, while country and age did not have any effects. Particularly for those residing in rural areas, government employees were less likely to be inactive (51% less likely) compared with not working women, and the wealthiest women were 2.3 times as likely to be inactive compared to the poorest. On the contrary in urban settings, country was significantly associated with inactivity in addition to current job, whereas age fell short of statistical significance and wealth was not at all associated with the outcome. Urban women from Georgia and Kazakhstan had a higher likelihood of inactivity compared to Russians, while women from Ukraine were less likely to be inactive. Government employees from urban settings had almost similar odds of inactivity as from rural areas, although the significance has increased.

Table 11. Odds ratios (99% CI) of the relation of physical inactivity with demographic and socioeconomic determinants in females (N=7872)

	Model I – Crude model	† Model II	‡Model III	Model IV – Full model
Country				
Russia	1	1	1	1
Estonia	0.69 (0.39; 1.21)	0.71 (0.40; 1.25)	0.77 (0.43; 1.35)	0.68 (0.37; 1.22)
Georgia	1.37 (0.98; 1.92)	1.40 (0.99; 1.96)	1.58 (1.11; 2.26)*	1.30 (0.88; 1.90)
Kazakhstan	1.71 (1.30; 2.24)**	1.95 (1.48; 2.58)**	2.14 (1.61; 2.85)**	1.83 (1.32; 2.54)**
Ukraine	0.64 (0.42; 0.97)*	0.65 (0.43; 0.99)*	0.68 (0.44; 1.03)	0.63 (0.41; 0.97)*
Age				
18–29	1	1	1	1
30–44	0.93 (0.68; 1.26)	0.87 (0.64; 1.18)	0.89 (0.64; 1.24)	0.98 (0.70; 1.38)
45–59	0.96 (0.70; 1.32)	0.99 (0.72; 1.35)	0.99 (0.70; 1.40)	1.08 (0.76; 1.54)
60–69	1.49 (1.07; 2.08)*	1.76 (1.25; 2.48)**	1.71 (1.16; 2.52)**	1.53 (1.02; 2.31)*
Settings				
Rural	1	1	1	1
Urban	1.12 (0.88; 1.41)	1.36 (1.06; 1.74)*	1.35 (1.05; 1.73)*	1.33 (1.03; 1.72)*
Marital status				
Never married	1	1	1	1
Married/cohabiting	0.92 (0.68; 1.25)	0.89 (0.64; 1.24)	0.90 (0.65; 1.25)	0.87 (0.62; 1.21)
Divorced/separated	0.94 (0.63; 1.38)	0.97 (0.63; 1.47)	0.96 (0.63; 1.46)	0.97 (0.64; 1.49)
Widowed	1.28 (0.89; 1.86)	1.08 (0.70; 1.66)	1.09 (0.71; 1.68)	1.03 (0.67; 1.59)
Education				
No/primary	1	1	1	1
Secondary	0.67 (0.33; 1.37)	0.69 (0.33; 1.44)	0.67 (0.32; 1.41)	0.69 (0.33; 1.44)
High school	0.76 (0.40; 1.42)	0.74 (0.38; 1.44)	0.72 (0.37; 1.41)	0.77 (0.39; 1.52)
College/University	0.74 (0.39; 1.39)	0.75 (0.38; 1.47)	0.70 (0.36; 1.39)	0.80 (0.40; 1.59)
Postgraduate	0.85 (0.38; 1.90)	0.72 (0.31; 1.70)	0.70 (0.30; 1.64)	0.83 (0.35; 1.99)
Current job				
Not working	1	1	1	1
Govern. employee	0.43 (0.32; 0.59)**	0.55 (0.39; 0.77)**	0.54 (0.38; 0.76)**	0.53 (0.38; 0.75)**
Non-govn. employee	0.88 (0.68; 1.13)	0.83 (0.62; 1.11)	0.80 (0.59; 1.08)	0.79 (0.59; 1.07)
Self-employed	1.08 (0.74; 1.57)	1.00 (0.67; 1.48)	0.99 (0.67; 1.47)	0.98 (0.66; 1.46)
Employer	0.33 (0.09; 1.24)	0.34 (0.09; 1.29)	0.36 (0.10; 1.37)	0.34 (0.09; 1.28)
Wealth quintile				
Quintile 1	1	1	1	1
Quintile 2	1.02 (0.74; 1.41)	1.07 (0.77; 1.48)	1.06 (0.76; 1.47)	1.10 (0.79; 1.53)
Quintile 3	0.68 (0.48; 0.97)*	0.78 (0.55; 1.10)	0.77 (0.54; 1.10)	0.81 (0.57; 1.16)
Quintile 4	0.67 (0.48; 0.95)*	0.79 (0.56; 1.12)	0.78 (0.55; 1.12)	0.84 (0.58; 1.21)
Quintile 5	0.99 (0.72; 1.36)	1.21 (0.87; 1.68)	1.18 (0.83; 1.65)	1.26 (0.89; 1.80)

*p<0.01; **p<0.001
† ORs adjusted for age and country
‡ ORs adjusted for age, country, settings and marital status

Results of regression analyses for males

Table 13 gives odds ratios for the likelihood of physical inactivity in relation to demographic and socioeconomic determinants in men. In the crude model, only country, current job and wealth quintile were significantly associated with the outcome. Compared with Russians, Kazakhstan men were 1.8 times as likely to be inactive. Government employees and men from the fourth richest quintile were less likely to be inactive.

In the adjusted models, settings and more categories in the current job became significantly associated with physical inactivity while wealth lost its significance. Thus in the full model, Kazakhstan men were 2.4 times as likely to be inactive compared with Russians, and urban men were 1.5 times as likely to be inactive than rural men. Moreover, government and non-government employees, and self-employed men had a lower likelihood of inactivity compared with those not working (about 40% lower likelihood). The tests for trend and interaction did not alter the above-mentioned results for males.

Table 12. †Adjusted odds ratios (99% CI) of the relation of physical inactivity with demographic and socioeconomic determinants in females, stratified by rural and urban settings

	Rural N=2294	**Urban N=5578**
Country		
Russia	1	1
Estonia	0.38 (0.10; 1.45)	0.76 (0.40; 1.45)
Georgia	0.64 (0.25; 1.62)	1.76 (1.18; 2.64)**
Kazakhstan	1.35 (0.57; 3.20)	1.72 (1.23; 2.40)**
Ukraine	0.84 (0.30; 2.38)	0.54 (0.34; 0.88)*
Age linear		
‡Common odds ratio	1.12 (0.90; 1.40)	1.14 (1.00; 1.30)
Current job		
Not working	1	1
Govern. employee	0.49 (0.24; 0.99)*	0.50 (0.35; 0.72)**
Non-govn. employee	0.74 (0.43; 1.27)	0.77 (0.55; 1.08)
Self-employed	0.71 (0.35; 1.44)	1.08 (0.68; 1.73)
Employer	0.25 (0.04; 1.68)	0.37 (0.06; 2.46)
Wealth quintile		
Quintile 1	1	1
Quintile 2	1.37 (0.76; 2.45)	0.94 (0.63; 1.39)
Quintile 3	0.84 (0.43; 1.62)	0.71 (0.47; 1.08)
Quintile 4	0.76 (0.37; 1.55)	0.73 (0.48; 1.10)
Quintile 5	2.28 (1.23; 4.24)*	0.88 (0.59; 1.32)

*p<0.01; **p<0.001
† Adjusted for all the variables in this table
‡ Odds ratio from one category to the next in 'age' variable

Table 13. Odds ratios (99% CI) of the relation of physical inactivity with demographic and socioeconomic determinants in males (N=4694)

	Model I – Crude model	† Model II	‡Model III	Model IV – Full model
Country				
Russia	1	1	1	1
Estonia	0.72 (0.35; 1.47)	0.69 (0.34; 1.42)	0.79 (0.38; 1.63)	0.73 (0.33; 1.60)
Georgia	0.80 (0.51; 1.26)	0.79 (0.50; 1.24)	1.02 (0.63; 1.65)	0.89 (0.53; 1.49)
Kazakhstan	1.83 (1.30; 2.59)**	1.93 (1.36; 2.74)**	2.33 (1.60; 3.37)**	2.36 (1.55; 3.62)**
Ukraine	0.80 (0.48; 1.33)	0.79 (0.48; 1.32)	0.87 (0.52; 1.46)	0.82 (0.48; 1.40)
Age				
18–29	1	1	1	1
30–44	1.03 (0.70; 1.51)	0.94 (0.64; 1.39)	0.91 (0.58; 1.43)	0.97 (0.61; 1.53)
45–59	1.06 (0.71; 1.58)	1.07 (0.72; 1.60)	1.02 (0.63; 1.65)	1.02 (0.63; 1.66)
60–69	1.54 (0.99; 2.39)	1.72 (1.10; 2.69)*	1.69 (1.00; 2.87)	1.38 (0.78; 2.41)
Settings				
Rural	1	1	1	1
Urban	1.33 (0.98; 1.81)	1.52 (1.09; 2.10)*	1.50 (1.08; 2.08)*	1.51 (1.08; 2.11)*
Marital status				
Never married	1	1	1	1
Married/cohabiting	1.24 (0.85; 1.80)	1.05 (0.66; 1.66)	1.06 (0.67; 1.68)	1.15 (0.72; 1.85)
Divorced/separated	1.62 (0.94; 2.78)	1.67 (0.90; 3.11)	1.63 (0.87; 3.05)	1.69 (0.89; 3.19)
Widowed	1.23 (0.51; 2.96)	0.97 (0.37; 2.51)	0.98 (0.38; 2.57)	1.04 (0.40; 2.73)
Education				
No/primary	1	1	1	1
Secondary	0.73 (0.31; 1.75)	0.69 (0.27; 1.77)	0.65 (0.25; 1.68)	0.71 (0.27; 1.84)
High school	0.74 (0.34; 1.62)	0.67 (0.29; 1.57)	0.62 (0.26; 1.47)	0.72 (0.30; 1.70)
College/University	0.99 (0.45; 2.15)	0.89 (0.38; 2.10)	0.80 (0.34; 1.89)	0.94 (0.39; 2.26)
Postgraduate	0.34 (0.09; 1.39)	0.26 (0.06; 1.09)	0.23 (0.05; 0.97)*	0.28 (0.07; 1.23)
Current job				
Not working	1	1	1	1
Govern. employee	0.55 (0.37; 0.82)**	0.63 (0.41; 0.97)*	0.61 (0.39; 0.94)*	0.60 (0.38; 0.94)*
Non-govn. employee	0.78 (0.55; 1.10)	0.61 (0.42; 0.90)*	0.57 (0.39; 0.85)**	0.57 (0.38; 0.86)**
Self-employed	0.65 (0.42; 1.01)	0.60 (0.37; 0.95)*	0.59 (0.37; 0.95)*	0.59 (0.37; 0.95)*
Employer	0.85 (0.38; 1.92)	0.77 (0.33; 1.77)	0.79 (0.34; 1.83)	0.73 (0.31; 1.71)
Wealth quintile				
Quintile 1	1	1	1	1
Quintile 2	0.77 (0.48; 1.23)	0.76 (0.47; 1.23)	0.78 (0.48; 1.26)	0.82 (0.51; 1.33)
Quintile 3	0.90 (0.58; 1.40)	0.94 (0.60; 1.46)	0.94 (0.60; 1.48)	0.98 (0.62; 1.55)
Quintile 4	0.62 (0.39; 0.98)*	0.67 (0.42; 1.07)	0.68 (0.43; 1.10)	0.72 (0.45; 1.18)
Quintile 5	0.94 (0.62; 1.43)	1.03 (0.67; 1.57)	1.01 (0.65; 1.57)	1.09 (0.69; 1.73)

*p<0.01; **p<0.001
† ORs adjusted for age and country
‡ ORs adjusted for age, country, settings and marital status

5.4 Overweight and obesity

Final study population for the overweight and obesity included a total of 14 144 individuals, of whom 8 959 (63.3%) were females and 5 185 (36.7%) were males.

5.4.1 Representativeness of the final study population

Baseline characteristics of the final study population in comparison with general study population and population with missing in body mass index (BMI) are presented in the Appendix 2, Table 11. There were 15 501 individuals in the general study population, and 1 357 observations with missing data on BMI (Figure 5). For comparison purposes, these data were not sex-stratified. Characteristics of the final study population including sex were mostly similar to that of general study population but had some differences from characteristics of the population with missing in BMI. Particularly there were more Russians, older people, urban residents, widowed, lower educated, not working, and poor people in the population with missing data.

5.4.2 Results of country-specific analyses

The results of country-specific analyses by sex are shown in the Appendix 1 (Tables 7, 8). The related figures including all 5 risk factors are displayed in Figures 6 and 7. In all relevant figures; overweight and obesity are shown as a stacked bar, where darker colour stands for overweight and lighter colour for obesity.

Prevalence of overweight and obesity in females by countries

Combined prevalence of overweight and obesity in females ranged from 40.9% in Kazakhstan to 54.2% in Russia. The prevalence of overweight women was within the range of 28.1–33.4% in these countries, whereas the prevalence of obese ranged from 12.1% to 21.9%. In general, women from age of 45 and above had higher prevalence of overweight and obesity. The prevalence varied greatly by rural and urban settings. By marital status, only never married group had lower prevalence of overweight and obesity. Women with lower and higher levels of education were more overweight and obese. There were too few observations in some categories of education and current job. The main feature by current job was that not working women had higher prevalence of overweight and obesity in all counties except Georgia. The prevalence by wealth quintile varied greatly across the countries.

Prevalence of overweight and obesity in males by countries

Combined prevalence of overweight and obesity in males was lowest in Kazakhstan (38.9%) and highest in Georgia (50.9%). The prevalence of overweight men fluctuated from 30.3% to 41.4%, whereas the prevalence of obese men was around 7.3–14.7%. Although in general men aged 45 and above had higher prevalence of overweight and obesity, in some countries the prevalence was higher starting from younger age. The prevalence by settings varied across the countries. Never married men had lower prevalence of overweight and

obesity. Men with lower and higher levels of education were more overweight and obese except Georgia, while that was true for only higher educated men in Georgia. There were no or too few observations in some categories of education and current job. The prevalence varied greatly across different categories of current job in all six countries. Taken together, men from richer quintiles were more inclined to be overweight and obese in addition to poorer men in some countries.

5.4.3 Results of combined analyses

5.4.3.1 Results of descriptive analyses

Characteristics of study participants

Table 14 presents distribution of characteristics and prevalence of overweight and obesity separately for each sex. A total of 8 959 women and 5 185 men were included in the combined data. About 8.8% of the general study population lacked information on BMI, and this was reflected in the characteristics of the study population for overweight and obesity. There were less Russian respondents and older women compared to the smoking data (Table 4).

Prevalence of overweight and obesity in females and males

Although the combined prevalence of overweight and obesity was similar for both sexes (48%), women were less overweight but more obese compared with men (Table 14). The overall prevalence of overweight women and men was 31.9% and 39.3% respectively, whereas that of obese women and men was 16.9% and 9.1%. Figure 8 shows prevalence of all noncommunicable disease risk factors for females and males. The prevalence of overweight and obesity by sex varied greatly across the countries. Women from age 45 and above were more overweight and obese. Men starting from age of 30 and above were more overweight, while obese men were within age range of 45–69 years. The prevalence by settings did not vary much except men from rural settings of being more obese. Married or cohabiting and widowed women had higher prevalence for both conditions. In men, only never married had a lower prevalence of overweight, whereas married or cohabiting were more obese. Lower educated women were more overweight and obese. Men with better education had higher prevalence of overweight and obesity, in addition to least educated men in case of obesity. Generally not working women and self-employed men had a tendency of being overweight and obese. Women from poor quintiles were more overweight and obese, but it was opposite for men.

Table 14. Distribution of characteristics and prevalence of overweight and obesity in females and males

	Females				Males			
	Characteristics		Prevalence		Characteristics		Prevalence	
			Overweight*	Obesity†			Overweight*	Obesity†
	N	%	%	%	N	%	%	%
Country								
Russia	2198	24.5	34.6	19.6	1215	23.4	42.3	7.7
Estonia	619	6.9	31.7	20.2	354	6.8	32.5	15.3
Georgia	1527	17.0	31.8	11.2	1121	21.6	41.2	9.6
Kazakhstan	2761	30.8	29.5	14.7	1484	28.6	36.2	7.5
Latvia	472	5.3	30.5	24.4	252	4.9	37.7	13.1
Ukraine	1382	15.4	33.3	19.5	759	14.6	41.4	9.4
Age								
18–29	1547	17.3	13.8	3.2	1044	20.1	24.8	2.5
30–44	2784	31.1	28.8	10.8	1635	31.5	41.2	8.0
45–59	2289	25.6	40.1	25.3	1305	25.2	45.8	12.4
60–69	1171	13.1	39.3	28.7	670	12.9	42.7	14.9
70+	1168	13.0	39.9	21.2	531	10.2	41.6	9.6
Settings								
Rural	2685	30.0	30.4	15.0	1811	34.9	37.6	10.8
Urban	6274	70.0	32.6	17.7	3374	65.1	40.2	8.1
Marital status								
Never married	1315	14.7	17.3	6.7	944	18.2	24.9	3.5
Married/cohabiting	4636	51.8	33.3	17.7	3550	68.5	42.7	10.6
Divorced/separated	1168	13.0	31.5	14.0	391	7.5	41.7	8.2
Widowed	1840	20.5	39.1	24.1	300	5.8	41.7	9.7
Education								
No/primary	581	6.5	33.6	25.8	337	6.5	39.2	11.0
Secondary	1094	12.2	32.8	22.9	651	12.6	38.6	8.6
High school	3721	41.5	31.6	15.7	2153	41.5	37.3	8.1
College/University	3278	36.6	31.8	14.8	1900	36.6	41.8	9.7
Postgraduate	285	3.2	30.2	15.4	144	2.8	38.9	11.8
Current job								
Not working	4140	46.2	33.6	19.3	1875	36.2	36.8	9.5
Govern. employee	2078	23.2	33.4	15.9	1076	20.8	41.7	9.4
Non-govn. employee	2023	22.6	27.3	14.2	1355	26.1	39.4	6.7
Self-employed	604	6.7	30.5	13.9	739	14.3	41.1	11.9
Employer	114	1.3	33.3	14.0	140	2.7	42.9	8.6
Wealth quintile								
Quintile 1	1808	20.2	30.3	16.0	857	16.5	35.8	5.8
Quintile 2	1884	21.0	33.9	19.6	951	18.3	36.2	8.5
Quintile 3	1817	20.3	32.2	17.2	1039	20.0	39.5	9.0
Quintile 4	1760	19.7	32.7	15.7	1144	22.1	43.0	9.3
Quintile 5	1690	18.9	30.4	15.9	1194	23.0	40.5	11.7
Total	8959	100	31.9	16.9	5185	100	39.3	9.1

* Overweight (BMI = 25.0–29.9), † obesity (BMI ≥ 30.0)

5.4.3.2 Results of regression analyses

Results of regression analyses for females

Table 15 gives odds ratios for the likelihood of overweight (versus normal) and of obesity (versus normal) in relation to demographic and socioeconomic determinants in women. In the model I, all variables were significantly associated with both overweight and obesity. Georgian and Kazakhstan women had lower likelihoods of overweight and obesity compared with Russians. Odds ratios for overweight and obesity were high except the youngest and tended to peak in age group of 60–69, thereafter started to decline slightly with age. Women from urban settings were more overweight and obese. By marital status, all women except never married were more likely to be overweight and obese. Generally having high school and higher levels of education decreased the likelihoods of overweight and obesity. Non-government employee and self-employed women were less likely to be overweight and obese, in addition to government employees in case of obesity. Poor women were more likely to be overweight and obese compared with the poorest.

In the adjusted models, four variables remained significant; country, age, marital status and wealth quintile. Overall, the significance levels stayed similar throughout models for these variables except wealth quintile. Wealth quintile became highly significant after adjusting for other variables. Thus, the results of full model showed that only Georgian women were less likely to be overweight and obese compared with Russians. Women starting from age 30 had higher likelihoods of overweight and obesity, and these tended to increase considerably with age. Married or cohabiting and widowed women were more overweight and obese, in addition to divorced or separated women of being more overweight. Compared with the poorest, women from all other quintiles had higher likelihoods of overweight and obesity. The test for trend revealed that wealth had a linear association with the outcome ($p=0.051$). Then the results of interaction testing showed that wealth was interacting with age ($p=0.006$), therefore further analyses were stratified by age. For modelling purposes, age was regrouped creating a new variable with two categories: 18–44, and 45+ years.

The results of stratified analyses by age in women are presented in Table 16. Adjusted odds ratios in younger age group showed that only country and marital status were associated with the outcome. Hence for younger age group, Latvian women had a lower likelihood (54% lower) of overweight compared with Russian. Divorced or separated, widowed, and married or cohabiting women were 2.2–2.8 times as likely to be overweight as never married, while married or cohabiting and widowed women were 3–4.8 times as likely to be obese. On the contrary for older age group, all three variables (country, marital status and wealth) were significantly associated with the outcome. Kazakhstan and Georgian women had lower likelihoods (25% and 35% lower) of overweight. In regards to obesity, Georgian women had a lower likelihood (61% lower), while Latvian women had a higher likelihood (85% higher). Married or cohabiting and widowed women were 1.8 times as likely to be overweight, while same groups of women were about 2.3 times as likely to be obese. Wealth had a linear association with the outcome; odds ratios were increasing by 1.16 (for overweight) and 1.13 (for obesity) from one wealth quintile to the next.

Table 15. Odds ratios (99% CI) of the relation of overweight and obesity with demographic and socioeconomic determinants in females (N=8959)

	Model I – Crude		† Model II		‡Model III		Model IV – Full model	
	Overweight versus normal	Obese versus normal	Overweight versus normal	Obese versus normal	Overweight versus normal	Obese versus normal	Overweight versus normal	Obese versus normal
Country								
Russia	1	1	1	1	1	1	1	1
Estonia	0.87 (0.67; 1.14)	0.98 (0.72; 1.34)	0.86 (0.65; 1.14)	0.97 (0.69; 1.35)	0.90 (0.67; 1.19)	1.01 (0.72; 1.41)	0.91 (0.68; 1.22)	1.01 (0.71; 1.44)
Georgia	0.74 (0.61; 0.90)**	0.46 (0.35; 0.60)**	0.73 (0.59; 0.89)**	0.45 (0.34; 0.59)**	0.77 (0.62; 0.95)*	0.47 (0.35; 0.62)**	0.73 (0.58; 0.92)**	0.47 (0.34; 0.64)**
Kazakhstan	0.70 (0.59; 0.82)**	0.61 (0.50; 0.76)**	0.84 (0.70; 1.00)	0.82 (0.65; 1.03)	0.86 (0.72; 1.04)	0.83 (0.66; 1.05)	0.90 (0.73; 1.11)	0.89 (0.68; 1.16)
Latvia	0.89 (0.66; 1.21)	1.26 (0.91; 1.76)	0.89 (0.65; 1.23)	1.26 (0.88; 1.80)	0.94 (0.68; 1.30)	1.35 (0.94; 1.94)	0.97 (0.70; 1.35)	1.26 (0.87; 1.82)
Ukraine	0.93 (0.76; 1.14)	0.96 (0.76; 1.22)	0.98 (0.80; 1.22)	1.03 (0.80; 1.32)	0.99 (0.80; 1.23)	1.03 (0.80; 1.34)	0.97 (0.78; 1.21)	1.07 (0.82; 1.40)
Age								
18–29	1	1	1	1	1	1	1	1
30–44	2.87 (2.30; 3.57)**	4.60 (3.07; 6.89)**	2.88 (2.31; 3.60)**	4.61 (3.07; 6.92)**	2.41 (1.91; 3.03)**	3.82 (2.52; 5.79)**	2.41 (1.91; 3.05)**	3.95 (2.59; 6.02)**
45–59	6.94 (5.53; 8.72)**	18.80 (12.63; 27.95)**	6.94 (5.52; 8.71)**	18.69 (12.56; 27.83)**	5.80 (4.56; 7.39)**	15.62 (10.35; 23.57)**	5.84 (4.57; 7.46)**	16.12 (10.63; 24.43)**
60–69	7.35 (5.66; 9.55)**	22.99 (15.13; 34.95)**	7.32 (5.63; 9.52)**	23.19 (15.22; 35.33)**	6.06 (4.57; 8.05)**	18.66 (12.00; 29.02)**	6.36 (4.75; 8.52)**	18.85 (11.99; 29.65)**
70+	6.15 (4.77; 7.94)**	14.02 (9.18; 21.40)**	6.15 (4.75; 7.96)**	14.40 (9.39; 22.08)**	5.18 (3.86; 6.97)**	11.62 (7.32; 18.46)**	5.83 (4.24; 8.03)**	11.48 (7.05; 18.69)**
Settings								
Rural	1	1	1	1	1	1	1	1
Urban	1.18 (1.03; 1.35)*	1.30 (1.10; 1.54)**	1.09 (0.94; 1.27)	1.08 (0.89; 1.31)	1.12 (0.96; 1.30)	1.12 (0.92; 1.36)	1.08 (0.93; 1.27)	1.11 (0.91; 1.35)
Marital status								
Never married	1	1	1	1	1	1	1	1
Married/cohabiting	2.98 (2.42; 3.67)**	4.10 (3.02; 5.56)**	1.91 (1.52; 2.39)**	2.14 (1.54; 2.97)**	1.92 (1.53; 2.41)**	2.15 (1.55; 2.99)**	1.84 (1.46; 2.31)**	2.00 (1.43; 2.80)**
Divorced/separated	2.54 (1.97; 3.27)**	2.93 (2.03; 4.22)**	1.38 (1.04; 1.82)*	1.15 (0.78; 1.71)	1.38 (1.04; 1.82)*	1.16 (0.78; 1.71)	1.38 (1.04; 1.82)*	1.15 (0.78; 1.71)
Widowed	4.65 (3.68; 5.87)**	7.42 (5.35; 10.28)**	1.73 (1.32; 2.27)**	1.93 (1.34; 2.78)**	1.74 (1.32; 2.28)**	1.93 (1.34; 2.79)**	1.74 (1.33; 2.29)**	1.88 (1.30; 2.72)**
Education								
No/primary	1	1	1	1	1	1	1	1
Secondary	0.90 (0.66; 1.22)	0.82 (0.58; 1.14)	1.11 (0.79; 1.54)	0.96 (0.66; 1.38)	1.10 (0.79; 1.53)	0.95 (0.66; 1.37)	1.05 (0.76; 1.47)	0.90 (0.62; 1.30)
High school	0.73 (0.56; 0.95)*	0.47 (0.35; 0.63)**	1.29 (0.95; 1.76)	0.87 (0.62; 1.24)	1.27 (0.93; 1.73)	0.86 (0.60; 1.22)	1.20 (0.87; 1.64)	0.80 (0.56; 1.14)
College/University	0.72 (0.55; 0.94)*	0.44 (0.32; 0.59)**	1.30 (0.95; 1.78)	0.85 (0.59; 1.21)	1.28 (0.93; 1.76)	0.84 (0.58; 1.20)	1.18 (0.86; 1.63)	0.76 (0.52; 1.10)
Postgraduate	0.67 (0.44; 1.03)	0.45 (0.27; 0.75)**	1.15 (0.72; 1.84)	0.80 (0.45; 1.42)	1.17 (0.73; 1.88)	0.83 (0.46; 1.47)	1.08 (0.67; 1.75)	0.75 (0.42; 1.35)
Current job								
Not working	1	1	1	1	1	1	1	1
Govern. employee	0.92 (0.79; 1.08)	0.77 (0.63; 0.94)*	1.01 (0.83; 1.22)	0.86 (0.67; 1.09)	1.05 (0.87; 1.26)	0.91 (0.71; 1.16)	1.00 (0.82; 1.21)	0.89 (0.69; 1.14)
Non-govn. employee	0.66 (0.56; 0.77)**	0.59 (0.49; 0.73)**	0.84 (0.69; 1.03)	0.85 (0.65; 1.09)	0.88 (0.72; 1.08)	0.90 (0.69; 1.17)	0.86 (0.70; 1.05)	0.88 (0.68; 1.15)
Self-employed	0.77 (0.60; 0.99)*	0.61 (0.44; 0.85)**	0.99 (0.75; 1.30)	1.00 (0.69; 1.44)	1.02 (0.77; 1.34)	1.04 (0.72; 1.50)	1.00 (0.76; 1.32)	1.02 (0.70; 1.48)
Employer	0.89 (0.52; 1.53)	0.65 (0.31; 1.36)	1.12 (0.63; 1.98)	0.93 (0.43; 2.03)	1.20 (0.67; 2.13)	1.01 (0.46; 2.22)	1.12 (0.63; 2.01)	0.94 (0.43; 2.07)
Wealth quintile								
Quintile 1	1	1	1	1	1	1	1	1
Quintile 2	1.29 (1.06; 1.56)*	1.41 (1.12; 1.79)**	1.32 (1.07; 1.61)**	1.44 (1.12; 1.86)**	1.29 (1.05; 1.58)*	1.41 (1.09; 1.81)*	1.27 (1.04; 1.56)*	1.45 (1.12; 1.87)**
Quintile 3	1.13 (0.93; 1.37)	1.14 (0.90; 1.45)	1.36 (1.11; 1.68)**	1.46 (1.12; 1.90)**	1.31 (1.06; 1.62)*	1.39 (1.06; 1.82)*	1.30 (1.05; 1.61)*	1.46 (1.11; 1.91)**
Quintile 4	1.12 (0.92; 1.36)	1.02 (0.80; 1.31)	1.51 (1.22; 1.88)**	1.54 (1.17; 2.03)**	1.40 (1.13; 1.74)**	1.39 (1.05; 1.84)*	1.38 (1.11; 1.73)**	1.48 (1.11; 1.97)**
Quintile 5	1.00 (0.82; 1.22)	0.99 (0.77; 1.27)	1.48 (1.18; 1.84)**	1.71 (1.29; 2.27)**	1.34 (1.07; 1.68)*	1.50 (1.13; 2.01)**	1.32 (1.05; 1.67)*	1.61 (1.20; 2.17)**

*p<0.01; **p<0.001; † ORs adjusted for age and country; ‡ ORs adjusted for age, country, settings and marital status

Table 16. †Adjusted odds ratios (99% CI) of the relation of overweight and obesity with demographic and socioeconomic determinants in females, stratified by age

	Age in years			
	18–44 (N=4331)		45+ (N=4628)	
	Overweight versus normal	Obese versus normal	Overweight versus normal	Obese versus normal
Country				
Russia	1	1	1	1
Estonia	0.69 (0.43; 1.10)	0.80 (0.41; 1.54)	1.04 (0.72; 1.50)	1.14 (0.76; 1.71)
Georgia	0.88 (0.63; 1.21)	0.60 (0.36; 1.01)	0.65 (0.50; 0.84)**	0.39 (0.28; 0.54)**
Kazakhstan	0.95 (0.74; 1.23)	0.77 (0.52; 1.13)	0.75 (0.58; 0.97)*	0.84 (0.63; 1.11)
Latvia	0.46 (0.25; 0.84)*	0.81 (0.39; 1.68)	1.41 (0.92; 2.15)	1.85 (1.18; 2.91)**
Ukraine	0.90 (0.65; 1.24)	0.71 (0.43; 1.17)	1.08 (0.82; 1.43)	1.21 (0.89; 1.65)
Marital status				
Never married	1	1	1	1
Married/cohabiting	2.75 (2.10; 3.61)**	2.97 (1.91; 4.62)**	1.77 (1.22; 2.56)**	2.44 (1.52; 3.92)**
Divorced/separated	2.20 (1.54; 3.12)**	1.72 (0.94; 3.16)	1.34 (0.88; 2.04)	1.41 (0.83; 2.41)
Widowed	2.31 (1.28; 4.18)**	4.78 (2.24; 10.2)**	1.76 (1.22; 2.55)**	2.18 (1.36; 3.50)**
Wealth linear				
‡Common odds ratio	1.01 (0.94; 1.09)	1.08 (0.97; 1.21)	1.16 (1.08; 1.24)**	1.13 (1.05; 1.22)**

*p<0.01; **p<0.001
† Adjusted for all the variables in this table
‡ Odds ratio from one category to the next in 'wealth quintile' variable

Results of regression analyses for males

Table 17 presents odds ratios for the likelihood of overweight (versus normal) and of obesity (versus normal) in relation to demographic and socioeconomic determinants in men. In the model I, education was not associated with outcome. Compared with Russians, men from Kazakhstan had a lower likelihood of overweight, while Estonian men had a higher likelihood of obesity. All men except the youngest age group had higher likelihoods of overweight and obesity. While there was no difference between urban and rural settings for overweight, urban men were less likely to be obese than rural. By marital status, only never married men had lower likelihoods of overweight and obesity. Government employee and self-employed men were more likely to be overweight than those not working, whereas for obesity there was no difference observed. Wealthier men were more overweight and obese compared to the poorest.

The results of adjusted models showed that all variables from crude model remained significant. Generally the significance and magnitude of demographic factors stayed similar or decreased, while the opposite was observed for socioeconomic factors. As a result, in the full model, Kazakhstan men were 25% less likely to be overweight and Estonian men 90% more likely to be obese than Russians. In general, odds ratios for overweight and obesity were high in men starting from age of 30 years. Urban men were 30% less likely to be obese. All men except never married were about 1.6 times as likely to be overweight, whereas only married or cohabiting men were 1.8 times as likely obese compared with never married.

Table 17. Odds ratios (99% CI) of the relation of overweight and obesity with demographic and socioeconomic determinants in males (N=5185)

	Model I – Crude		† Model II		‡ Model III		Model IV – Full model	
	Overweight versus normal	Obese versus normal	Overweight versus normal	Obese versus normal	Overweight versus normal	Obese versus normal	Overweight versus normal	Obese versus normal
Country								
Russia	1	1	1	1	1	1	1	1
Estonia	0.73 (0.52; 1.03)	1.88 (1.15; 3.08)*	0.72 (0.51; 1.01)	1.77 (1.07; 2.91)*	0.73 (0.51; 1.04)	1.62 (0.97; 2.70)	0.74 (0.51; 1.08)	1.90 (1.09; 3.31)*
Georgia	0.99 (0.79; 1.24)	1.25 (0.84; 1.86)	1.03 (0.82; 1.30)	1.32 (0.88; 1.97)	1.10 (0.86; 1.41)	1.15 (0.74; 1.78)	1.07 (0.81; 1.41)	1.03 (0.64; 1.65)
Kazakhstan	0.76 (0.61; 0.94)*	0.86 (0.58; 1.26)	0.78 (0.63; 0.97)*	0.92 (0.62; 1.37)	0.76 (0.61; 0.96)*	0.77 (0.51; 1.16)	0.75 (0.58; 0.97)*	0.80 (0.50; 1.27)
Latvia	0.90 (0.62; 1.33)	1.72 (0.96; 3.07)	0.96 (0.65; 1.43)	1.81 (1.00; 3.28)	1.01 (0.68; 1.50)	1.77 (0.97; 3.23)	0.99 (0.65; 1.49)	1.85 (0.98; 3.48)
Ukraine	0.99 (0.77; 1.27)	1.23 (0.79; 1.90)	1.04 (0.80; 1.34)	1.29 (0.82; 2.01)	1.03 (0.79; 1.33)	1.18 (0.75; 1.85)	1.05 (0.80; 1.38)	1.30 (0.81; 2.08)
Age								
18–29	1	1	1	1	1	1	1	1
30–44	2.38 (1.89; 2.99)**	4.61 (2.61; 8.13)**	2.45 (1.94; 3.08)**	4.85 (2.74; 8.57)**	1.90 (1.47; 2.46)**	3.54 (1.91; 6.53)**	1.92 (1.48; 2.49)**	3.74 (2.00; 7.02)**
45–59	3.20 (2.52; 4.07)**	8.66 (4.93; 15.21)**	3.24 (2.54; 4.12)**	8.78 (4.99; 15.43)**	2.41 (1.83; 3.19)**	6.12 (3.29; 11.39)**	2.52 (1.90; 3.34)**	6.67 (3.52; 12.64)**
60–69	2.95 (2.22; 3.92)**	10.28 (5.67; 18.63)**	2.93 (2.20; 3.89)**	9.81 (5.41; 17.81)**	2.15 (1.55; 2.98)**	6.68 (3.45; 12.94)**	2.49 (1.77; 3.51)**	8.21 (4.09; 16.46)**
70+	2.50 (1.85; 3.38)**	5.75 (3.01; 10.99)**	2.41 (1.78; 3.27)**	5.39 (2.81; 10.33)**	1.79 (1.25; 2.56)**	3.75 (1.81; 7.76)**	2.21 (1.49; 3.28)**	5.12 (2.32; 11.27)**
Settings								
Rural	1	1	1	1	1	1	1	1
Urban	1.07 (0.91; 1.25)	0.75 (0.58; 0.97)*	1.09 (0.91; 1.30)	0.79 (0.59; 1.06)	1.09 (0.91; 1.30)	0.79 (0.59; 1.06)	1.01 (0.84; 1.22)	0.70 (0.52; 0.95)*
Marital status								
Never married	1	1	1	1	1	1	1	1
Married/cohabiting	2.62 (2.12; 3.25)**	4.64 (2.86; 7.51)**	1.79 (1.38; 2.32)**	2.07 (1.20; 3.57)*	1.78 (1.38; 2.31)**	2.09 (1.21; 3.61)*	1.69 (1.30; 2.20)**	1.83 (1.04; 3.22)*
Divorced/separated	2.39 (1.71; 3.35)**	3.34 (1.71; 6.55)**	1.48 (1.02; 2.15)*	1.27 (0.61; 2.65)	1.47 (1.01; 2.14)*	1.30 (0.63; 2.70)	1.56 (1.07; 2.28)*	1.46 (0.69; 3.09)
Widowed	2.46 (1.70; 3.56)**	4.07 (2.03; 8.17)**	1.55 (1.00; 2.40)*	1.53 (0.69; 3.37)	1.55 (1.00; 2.40)*	1.53 (0.69; 3.37)	1.59 (1.03; 2.47)*	1.58 (0.71; 3.54)
Education								
No/primary	1	1	1	1	1	1	1	1
Secondary	0.93 (0.64; 1.34)	0.74 (0.41; 1.34)	0.90 (0.60; 1.35)	1.10 (0.57; 2.11)	0.89 (0.60; 1.34)	1.11 (0.58; 2.14)	0.85 (0.57; 1.28)	1.01 (0.52; 1.95)
High school	0.87 (0.63; 1.20)	0.68 (0.41; 1.13)	0.95 (0.66; 1.38)	1.10 (0.61; 1.96)	0.91 (0.63; 1.32)	1.09 (0.60; 1.96)	0.82 (0.56; 1.20)	0.90 (0.49; 1.64)
College/University	1.10 (0.79; 1.52)	0.91 (0.55; 1.52)	1.19 (0.82; 1.73)	1.61 (0.89; 2.92)	1.13 (0.77; 1.66)	1.67 (0.91; 3.04)	0.98 (0.66; 1.44)	1.25 (0.67; 2.34)
Postgraduate	1.00 (0.58; 1.74)	1.09 (0.47; 2.51)	1.05 (0.58; 1.90)	2.01 (0.81; 4.99)	1.02 (0.56; 1.84)	2.12 (0.85; 5.31)	0.86 (0.47; 1.57)	1.58 (0.62; 4.05)
Current job								
Not working	1	1	1	1	1	1	1	1
Govern. employee	1.25 (1.01; 1.54)*	1.09 (0.77; 1.54)	1.28 (1.00; 1.63)	1.31 (0.87; 1.97)	1.17 (0.91; 1.50)	1.21 (0.80; 1.84)	1.06 (0.82; 1.37)	0.92 (0.60; 1.41)
Non-govn. employee	1.07 (0.88; 1.30)	0.71 (0.49; 1.01)	1.35 (1.07; 1.71)*	0.99 (0.65; 1.51)	1.26 (0.99; 1.60)	0.95 (0.62; 1.46)	1.17 (0.91; 1.49)	0.76 (0.49; 1.17)
Self-employed	1.28 (1.01; 1.62)*	1.43 (0.99; 2.08)	1.43 (1.09; 1.87)*	1.84 (1.20; 2.82)**	1.35 (1.03; 1.77)*	1.72 (1.12; 2.65)*	1.33 (1.01; 1.74)*	1.56 (1.01; 2.42)*
Employer	1.29 (0.80; 2.07)	1.00 (0.43; 2.30)	1.38 (0.84; 2.26)	1.21 (0.51; 2.87)	1.30 (0.79; 2.14)	1.12 (0.47; 2.66)	1.18 (0.71; 1.95)	0.79 (0.32; 1.91)
Wealth quintile								
Quintile 1	1	1	1	1	1	1	1	1
Quintile 2	1.07 (0.82; 1.38)	1.54 (0.94; 2.51)	1.07 (0.82; 1.39)	1.56 (0.95; 2.57)	1.05 (0.80; 1.36)	1.50 (0.91; 2.48)	1.03 (0.79; 1.35)	1.48 (0.89; 2.45)
Quintile 3	1.25 (0.97; 1.60)	1.74 (1.07; 2.80)*	1.33 (1.02; 1.72)*	2.01 (1.23; 3.27)**	1.29 (0.99; 1.68)	1.97 (1.20; 3.23)**	1.26 (0.97; 1.64)	1.90 (1.15; 3.15)*
Quintile 4	1.47 (1.15; 1.88)**	1.94 (1.21; 3.11)**	1.67 (1.29; 2.15)**	2.55 (1.57; 4.14)**	1.61 (1.24; 2.09)**	2.46 (1.50; 4.04)**	1.57 (1.20; 2.05)**	2.43 (1.46; 4.04)**
Quintile 5	1.38 (1.08; 1.77)*	2.46 (1.56; 3.86)**	1.58 (1.22; 2.05)**	3.37 (2.10; 5.40)**	1.51 (1.15; 1.96)**	3.37 (2.07; 5.49)**	1.43 (1.09; 1.89)*	3.22 (1.94; 5.35)**

*p<0.01; **p<0.001; † ORs adjusted for age and country; ‡ ORs adjusted for age, country, settings and marital status

Self-employed men were 1.3–1.6 times as likely overweight and obese compared with those not working. Wealthier men were more likely to be overweight and obese, and there was a clear increasing trend for the obesity. The results of the trend test showed that wealth quintile had a linear effect on the outcome (p=0.281). The tests of interaction revealed that wealth was interacting with settings at the borderline significance (p=0.015) which led to stratified analysis by rural and urban settings.

The results of stratified analyses by settings in men are displayed in Table 18. Adjusted odds ratios in rural settings showed that country, age and wealth were significantly associated with the outcome. Georgian and Kazakhstan men were 60–65% less likely to be obese, while there were no differences between countries for overweight. Men of age 30–69 years were about twice as likely to be overweight and 5-8 times as likely to be obese compared to the youngest. However for the obesity, 99% confidence intervals for odds ratios were considerably large. Wealth had a linear association with the outcome; odds ratios were increasing by 1.18 (for overweight) and 1.49 (for obesity) from one wealth quintile to the next. For those residing in urban areas, all 5 factors were significantly associated with the outcome. Only Estonian men were 2 times as likely to be obese, while others had no difference. Odds ratios for overweight were high starting from age of 30 and had a clear increasing trend with age (OR=1.74 to OR=3.04). While similar results were observed in terms of obesity, odds ratios were even higher but with large confidence intervals. By marital status, all men except never married were twice as likely to be overweight. Self-employed men had higher likelihoods of overweight and obesity, 54% and 96% higher likelihoods respectively. Odds ratios for linear wealth were increasing by 1.11 (for overweight) and 1.24 (for obesity) from one wealth quintile to the next.

Table 18. †Adjusted odds ratios (99% CI) of the relation of overweight and obesity with demographic and socioeconomic determinants in males, stratified by rural and urban settings

	Rural (N=1811)		Urban (N=3374)	
	Overweight versus normal	**Obese versus normal**	**Overweight versus normal**	**Obese versus normal**
Country				
Russia	1	1	1	1
Estonia	0.79 (0.36; 1.75)	0.81 (0.30; 2.19)	0.71 (0.46; 1.10)	1.97 (1.04; 3.74)*
Georgia	1.07 (0.56; 2.06)	0.40 (0.16; 0.96)*	1.09 (0.78; 1.53)	1.67 (0.96; 2.91)
Kazakhstan	0.63 (0.33; 1.24)	0.35 (0.14; 0.85)*	0.80 (0.60; 1.06)	0.92 (0.53; 1.58)
Latvia	1.19 (0.49; 2.90)	1.23 (0.40; 3.72)	0.89 (0.55; 1.43)	1.37 (0.61; 3.10)
Ukraine	1.21 (0.58; 2.52)	0.76 (0.29; 2.02)	1.00 (0.75; 1.34)	1.26 (0.74; 2.13)
Age				
18–29	1	1	1	1
30–44	2.06 (1.32; 3.20)**	5.13 (1.66; 15.88)**	1.74 (1.25; 2.41)**	3.15 (1.45; 6.83)**
45–59	2.37 (1.46; 3.84)**	8.24 (2.62; 25.94)**	2.49 (1.76; 3.52)**	6.15 (2.81; 13.47)**
60–69	2.07 (1.18; 3.62)*	8.00 (2.38; 26.88)**	2.80 (1.81; 4.31)**	9.66 (4.03; 23.13)**
70+	1.43 (0.76; 2.69)	3.60 (0.93; 13.85)	3.04 (1.85; 5.00)**	8.00 (3.00; 21.38)**
Marital status				
Never married	1	1	1	1
Married/cohabiting	1.08 (0.71; 1.66)	2.08 (0.81; 5.33)	2.22 (1.57; 3.13)**	1.58 (0.77; 3.23)
Divorced/separated	0.95 (0.45; 2.03)	2.14 (0.60; 7.69)	2.11 (1.34; 3.34)**	1.19 (0.47; 3.02)
Widowed	0.86 (0.41; 1.81)	1.73 (0.47; 6.35)	2.23 (1.27; 3.89)**	1.30 (0.46; 3.69)
Current job				
Not working	1	1	1	1
Govern. employee	1.04 (0.65; 1.66)	0.80 (0.39; 1.62)	1.20 (0.87; 1.64)	1.23 (0.71; 2.12)
Non-govn. employee	1.10 (0.72; 1.68)	0.53 (0.26; 1.10)	1.33 (0.98; 1.82)	1.11 (0.63; 1.94)
Self-employed	1.17 (0.80; 1.70)	1.34 (0.74; 2.44)	1.54 (1.04; 2.28)*	1.96 (1.03; 3.76)*
Employer	1.69 (0.80; 3.56)	0.81 (0.22; 2.93)	0.95 (0.47; 1.90)	1.04 (0.30; 3.55)
Wealth linear				
‡Common odds ratio	1.18 (1.06; 1.31)**	1.49 (1.25; 1.77)**	1.11 (1.03; 1.20)*	1.24 (1.08; 1.43)**

*p<0.01; **p<0.001
† Adjusted for all the variables in this table
‡ Odds ratio from one category to the next in 'wealth quintile' variable

5.5 Heavy alcohol use

A total number of 15 452 individuals were included in the analyses of heavy alcohol use, of which 9 833 (63.6%) were females and 5 619 (36.4%) were males. Due to objectives of this study, focus of writing was on heavy drinkers. For information on life-time abstainers, please refer directly to tables.

5.5.1 Results of country-specific analyses

The results of country-specific analyses for females and males are presented in the Appendix 1 (Tables 9, 10). The corresponding figures including all 5 risk factors are displayed in Figures 6 and 7.

Prevalence of heavy alcohol use in females by countries

The prevalence of heavy alcohol use in women was considerably low (2–6%) in all countries except in Ukraine (15.6%). There were more heavy drinkers among young and middle aged women. The prevalence by settings varied greatly across countries. Married or cohabiting and divorced or separated women had a higher prevalence of heavy alcohol use. Heavy drinking was more common among women with secondary or high school levels of education. There were too few observations in some categories of education. In general, not working women had a lower prevalence in all countries except Georgia. The prevalence of heavy alcohol use by wealth quintile varied greatly across countries.

Prevalence of heavy alcohol use in males by countries

The prevalence of heavy alcohol use among men ranged from 9.8% in Kazakhstan to 29.6% in Ukraine. Heavy drinking was more observed among young and middle aged men, as well as in men from rural areas. Generally never married men had a higher prevalence of heavy alcohol use. There were no or too few observations in some categories of education and current job. The prevalence by education and current job varied much and did not give any clear picture. According to wealth quintile, the most common feature was that men from the poorest quintile had a high prevalence of heavy alcohol use.

5.5.2 Results of combined analyses

5.5.2.1 Results of descriptive analyses

Characteristics of study participants

Table 19 gives distribution of characteristics and prevalence of life-time abstainers and heavy drinkers by sex. In total, there were 9 833 females and 5 619 males and only 0.3% of the general study population lacked data on heavy alcohol use (Figure 5). Hence, characteristics of this study population were similar to that of smoking data (Table 4).

Prevalence of heavy alcohol use in females and males

The overall prevalence of heavy alcohol use was 5% in females and 17.3% in males (Table 19). Figure 8 shows prevalence of heavy alcohol use by sex together with prevalence of other risk factors. In women, the prevalence was low and it was around 2–6% in all countries except Ukraine (15.4%). The prevalence in men varied from 9.4% in Kazakhstan to 28.5% in Ukraine. For both sexes, the prevalence tended to peak in 45–59 age group and then decrease with age. There was no difference between rural and urban women, while rural men were more heavy drinkers. Divorced or separated women and men had a higher prevalence in addition to never married men. People with the lowest and highest levels of education were less heavy drinkers. Government employees had a high prevalence of

heavy alcohol use, as well as self-employed men. According to wealth quintile, there was no difference in women but men from the lowest and middle quintiles were more heavy drinkers.

Table 19. Distribution of characteristics and prevalence of life-time abstainers and heavy drinkers in females and males

	Females				Males			
	Characteristics		Prevalence		Characteristics		Prevalence	
			Abstainers	Heavy drinkers			Abstainers	Heavy drinkers
	N	%	%	%	N	%	%	%
Country								
Russia	2757	28.0	31.7	3.0	1543	27.5	11.9	15.7
Estonia	628	6.4	13.4	2.4	357	6.4	8.1	14.0
Georgia	1533	15.6	50.2	5.8	1121	20.0	11.4	24.0
Kazakhstan	2911	29.6	41.2	2.4	1530	27.2	24.0	9.4
Latvia	558	5.7	15.8	2.3	283	5.0	6.4	15.9
Ukraine	1446	14.7	28.6	15.4	785	14.0	14.5	28.5
Age								
18–29	1608	16.4	36.0	5.1	1102	19.6	18.1	16.7
30–44	2945	30.0	30.1	5.3	1723	30.7	12.9	18.6
45–59	2450	24.9	29.3	5.6	1414	25.2	13.3	20.1
60–69	1331	13.5	40.8	4.6	724	12.9	13.7	15.6
70+	1499	15.2	46.9	3.7	656	11.7	20.0	11.0
Settings								
Rural	2851	29.0	47.2	4.6	1858	33.1	18.6	19.2
Urban	6982	71.0	29.8	5.2	3761	66.9	13.1	16.4
Marital status								
Never married	1390	14.1	39.1	4.1	1012	18.0	19.1	18.7
Married/cohabiting	4981	50.7	31.3	5.5	3793	67.5	14.3	16.8
Divorced/separated	1281	13.0	28.0	6.2	453	8.1	11.5	21.9
Widowed	2181	22.2	44.4	3.9	361	6.4	14.4	13.6
Education								
No/primary	754	7.7	42.0	3.1	391	7.0	16.9	15.1
Secondary	1348	13.7	35.0	4.9	774	13.8	10.6	19.0
High school	3913	39.8	37.0	5.3	2250	40.0	16.4	16.8
College/University	3522	35.8	30.8	5.4	2052	36.5	14.6	18.2
Postgraduate	296	3.0	35.5	1.7	152	2.7	15.8	11.2
Current job								
Not working	4732	48.1	42.4	4.6	2120	37.7	17.9	16.2
Govern. employee	2220	22.6	22.6	7.3	1172	20.9	9.8	19.5
Non-govn. employee	2132	21.7	29.0	3.6	1431	25.5	14.5	15.7
Self-employed	626	6.4	40.3	4.8	751	13.4	16.5	20.6
Employer	123	1.3	40.7	4.9	145	2.6	9.7	15.2
Wealth quintile								
Quintile 1	2128	21.6	47.7	4.9	986	17.6	18.0	18.5
Quintile 2	2068	21.0	38.8	5.4	1049	18.7	17.7	15.3
Quintile 3	1959	19.9	31.9	4.4	1105	19.7	14.0	18.9
Quintile 4	1879	19.1	28.5	5.0	1207	21.5	12.3	19.1
Quintile 5	1799	18.3	25.0	5.4	1272	22.6	13.6	15.1
Total	9833	100	34.9	5.0	5619	100	15.0	17.3

5.5.2.2 Results of regression analyses

Results of regression analyses for females

Table 20 shows odds ratios (OR) for the likelihood of life-time abstainers (versus non-heavy drinkers) and of heavy drinkers (versus non-heavy drinkers) in relation to demographic and socioeconomic determinants in women. In the crude model, only three variables were associated with heavy drinking. Georgian women were 2.9 times and Ukraine women were 6 times as likely to be heavy drinkers as Russians. Non-government employees had a 39% lower likelihood of heavy alcohol use compared with not working. By wealth, women from middle quintile had a 33% lower likelihood of heavy drinking than women from the poorest quintile.

In the adjusted models, country and wealth quintile remained significantly associated with heavy drinking. Therefore in the full model, Georgian women were 3.2 times and Ukraine women were 6.5 times as likely to be heavy drinkers. Women from mid quintiles had 36-39% lower likelihoods of heavy alcohol use. The tests for linear trend and interactions were not significant for heavy drinking among women.

Results of regression analyses for males

Table 21 presents odds ratios of the relation of life-time abstainers (versus non-heavy drinkers) and of heavy drinkers (versus non-heavy drinkers) with demographic and socioeconomic determinants in men. In the model I, all variables except education were associated with heavy drinking. Georgian and Ukraine men were almost twice as likely to be heavy drinkers compared to Russians, while Kazakhstan men were 35% less likely to be heavy drinkers. Being older, urban, widowed and wealthier were negatively associated with heavy drinking, while being self-employed was positively associated.

The results of adjusted models showed that only some demographic factors remained significantly associated with heavy drinking. Thus in the full model, Georgian men were 1.6 times and Ukraine men were 2.4 times as likely to be heavy drinkers, while Kazakhstan men were 43% less likely to be heavy drinkers than Russians. Men from urban settings and from the oldest age group had 23–44% lower likelihoods of heavy drinking. The tests for trend and interactions did not change the above-mentioned results for heavy drinking in men.

5.6 Multiple noncommunicable disease risk factors

Outcome 'multiple risk factors' (MRF) is the combination of all five noncommunicable disease risk factors: smoking, low fruit and vegetable intake, physical inactivity, overweight and obesity, and heavy alcohol use. As physical inactivity did not include respondents from Latvia and individuals aged 70 and above, analyses of multiple risk factors were performed by using combined data of five countries and adults up to 69 years old. Final

Table 20. Odds ratios (99% CI) of the relation of life-time abstainers and heavy drinkers with demographic and socioeconomic determinants in females (N=9833)

	Model I – Crude		† Model II		‡Model III		Model IV – Full model	
	Abstainers versus non-heavy drinkers	Heavy versus non-heavy drinkers	Abstainers versus non-heavy drinkers	Heavy versus non-heavy drinkers	Abstainers versus non-heavy drinkers	Heavy versus non-heavy drinkers	Abstainers versus non-heavy drinkers	Heavy versus non-heavy drinkers
Country								
Russia	1	1	1	1	1	1	1	1
Estonia	0.33 (0.24; 0.45)**	0.62 (0.30; 1.30)	0.35 (0.25; 0.48)**	0.62 (0.30; 1.29)	0.29 (0.21; 0.40)**	0.59 (0.28; 1.23)	0.28 (0.20; 0.40)**	0.70 (0.33; 1.49)
Georgia	2.35 (1.98; 2.80)**	2.90 (1.92; 4.37)**	2.50 (2.10; 2.99)**	2.88 (1.91; 4.35)**	1.85 (1.54; 2.24)**	2.73 (1.77; 4.20)**	1.72 (1.40; 2.11)**	3.22 (2.01; 5.14)**
Kazakhstan	1.51 (1.30; 1.74)**	0.95 (0.62; 1.46)	2.01 (1.72; 2.35)**	0.92 (0.59; 1.42)	1.66 (1.41; 1.95)**	0.87 (0.56; 1.35)	1.60 (1.33; 1.93)**	1.07 (0.65; 1.74)
Latvia	0.40 (0.29; 0.55)**	0.62 (0.29; 1.36)	0.39 (0.28; 0.53)**	0.63 (0.29; 1.37)	0.32 (0.23; 0.45)**	0.59 (0.27; 1.30)	0.31 (0.23; 0.44)**	0.58 (0.26; 1.28)
Ukraine	1.05 (0.87; 1.27)	6.05 (4.26; 8.58)**	1.14 (0.94; 1.38)	6.00 (4.22; 8.52)**	1.03 (0.85; 1.26)	5.86 (4.12; 8.34)**	0.99 (0.81; 1.22)	6.51 (4.47; 9.49)**
Age								
18–29	1	1	1	1	1	1	1	1
30–44	0.77 (0.64; 0.91)**	0.95 (0.66; 1.38)	0.73 (0.61; 0.87)**	1.07 (0.74; 1.56)	0.79 (0.65; 0.95)*	0.97 (0.65; 1.45)	0.86 (0.71; 1.05)	0.96 (0.64; 1.45)
45–59	0.74 (0.62; 0.88)**	0.99 (0.68; 1.44)	0.78 (0.65; 0.93)**	1.05 (0.72; 1.55)	0.82 (0.67; 1.01)	0.97 (0.64; 1.48)	0.87 (0.71; 1.07)	0.94 (0.61; 1.43)
60–69	1.23 (1.00; 1.50)*	0.97 (0.62; 1.53)	1.47 (1.19; 1.81)**	0.94 (0.59; 1.49)	1.43 (1.13; 1.81)**	0.92 (0.55; 1.53)	1.11 (0.87; 1.41)	0.82 (0.48; 1.39)
70+	1.56 (1.29; 1.89)**	0.87 (0.55; 1.39)	2.00 (1.63; 2.46)**	0.93 (0.58; 1.50)	1.76 (1.38; 2.25)**	0.97 (0.55; 1.68)	1.22 (0.93; 1.59)	0.79 (0.43; 1.46)
Settings								
Rural	1	1	1	1	1	1	1	1
Urban	0.47 (0.42; 0.53)**	0.84 (0.64; 1.10)	0.51 (0.45; 0.59)**	0.82 (0.61; 1.10)	0.51 (0.45; 0.58)**	0.82 (0.61; 1.10)	0.56 (0.49; 0.65)**	0.87 (0.64; 1.18)
Marital status								
Never married	1	1	1	1	1	1	1	1
Married/cohabiting	0.72 (0.61; 0.84)**	1.20 (0.81; 1.77)	0.75 (0.63; 0.91)**	1.26 (0.82; 1.93)	0.73 (0.60; 0.88)**	1.25 (0.81; 1.92)	0.75 (0.62; 0.90)**	1.30 (0.84; 2.01)
Divorced/separated	0.62 (0.50; 0.76)**	1.30 (0.81; 2.06)	0.75 (0.59; 0.96)*	1.45 (0.86; 2.43)	0.76 (0.59; 0.96)*	1.45 (0.86; 2.43)	0.73 (0.57; 0.93)*	1.41 (0.84; 2.37)
Widowed	1.25 (1.04; 1.50)*	1.03 (0.65; 1.63)	1.04 (0.83; 1.31)	1.03 (0.60; 1.79)	1.02 (0.81; 1.29)	1.03 (0.59; 1.78)	0.95 (0.75; 1.20)	0.99 (0.57; 1.72)
Education								
No/primary	1	1	1	1	1	1	1	1
Secondary	0.76 (0.60; 0.97)*	1.47 (0.77; 2.79)	0.89 (0.68; 1.17)	1.58 (0.80; 3.13)	0.93 (0.71; 1.22)	1.59 (0.81; 3.15)	0.97 (0.74; 1.28)	1.68 (0.85; 3.32)
High school	0.84 (0.68; 1.04)	1.67 (0.93; 2.99)	0.83 (0.63; 1.08)	0.97 (0.50; 1.88)	0.93 (0.71; 1.22)	0.97 (0.50; 1.89)	1.05 (0.80; 1.38)	1.05 (0.54; 2.06)
College/University	0.63 (0.51; 0.78)**	1.52 (0.85; 2.73)	0.62 (0.47; 0.81)**	0.92 (0.47; 1.80)	0.74 (0.56; 0.97)*	0.94 (0.48; 1.84)	0.94 (0.72; 1.24)	1.03 (0.52; 2.04)
Postgraduate	0.74 (0.51; 1.07)	0.48 (0.13; 1.76)	0.72 (0.48; 1.08)	0.52 (0.14; 1.99)	0.80 (0.53; 1.21)	0.52 (0.14; 2.02)	1.11 (0.73; 1.69)	0.60 (0.15; 2.32)
Current job								
Not working	1	1	1	1	1	1	1	1
Govern. employee	0.40 (0.35; 0.47)**	1.19 (0.90; 1.58)	0.56 (0.47; 0.67)**	1.10 (0.79; 1.54)	0.57 (0.48; 0.68)**	1.10 (0.79; 1.53)	0.62 (0.52; 0.75)**	1.21 (0.86; 1.71)
Non-govn. employee	0.54 (0.46; 0.62)**	0.61 (0.42; 0.86)**	0.58 (0.48; 0.69)**	0.82 (0.54; 1.24)	0.59 (0.49; 0.70)**	0.83 (0.55; 1.26)	0.62 (0.51; 0.75)**	0.90 (0.59; 1.36)
Self-employed	0.92 (0.73; 1.15)	1.00 (0.59; 1.68)	0.79 (0.62; 1.01)	1.08 (0.62; 1.87)	0.76 (0.59; 0.97)*	1.06 (0.61; 1.85)	0.77 (0.60; 1.00)*	1.09 (0.63; 1.91)
Employer	0.93 (0.57; 1.52)	1.03 (0.34; 3.12)	1.10 (0.66; 1.83)	1.14 (0.36; 3.59)	0.93 (0.56; 1.56)	1.09 (0.34; 3.43)	1.07 (0.63; 1.80)	1.21 (0.38: 3.84)
Wealth quintile								
Quintile 1	1	1	1	1	1	1	1	1
Quintile 2	0.69 (0.58; 0.81)**	0.92 (0.64; 1.33)	0.73 (0.61; 0.86)**	0.87 (0.60; 1.27)	0.76 (0.64; 0.90)**	0.87 (0.59; 1.27)	0.78 (0.65; 0.93)**	0.87 (0.59; 1.28)
Quintile 3	0.50 (0.42; 0.59)**	0.67 (0.45; 0.99)*	0.56 (0.47; 0.67)**	0.61 (0.40; 0.91)*	0.59 (0.49; 0.71)**	0.60 (0.40; 0.90)*	0.62 (0.52; 0.75)**	0.61 (0.40; 0.92)*
Quintile 4	0.43 (0.36; 0.51)**	0.71 (0.49; 1.05)	0.49 (0.41; 0.60)**	0.64 (0.43; 0.96)*	0.55 (0.45; 0.66)**	0.63 (0.42; 0.95)*	0.58 (0.48; 0.71)**	0.64 (0.42; 0.98)*
Quintile 5	0.36 (0.30; 0.43)**	0.74 (0.51; 1.08)	0.42 (0.35; 0.51)**	0.66 (0.44; 0.99)*	0.49 (0.40; 0.60)**	0.66 (0.43; 0.99)*	0.52 (0.43; 0.64)**	0.67 (0.43; 1.03)

*p<0.01; **p<0.001; † ORs adjusted for age and country; ‡ ORs adjusted for age, country, settings and marital status

Table 21. Odds ratios (99% CI) of the relation of life-time abstainers and heavy drinkers with demographic and socioeconomic determinants in males (N=5619)

	Model I – Crude		† Model II		‡ Model III		Model IV – Full model	
	Abstainers versus non-heavy drinkers	Heavy versus non-heavy drinkers	Abstainers versus non-heavy drinkers	Heavy versus non-heavy drinkers	Abstainers versus non-heavy drinkers	Heavy versus non-heavy drinkers	Abstainers versus non-heavy drinkers	Heavy versus non-heavy drinkers
Country								
Russia	1	1	1	1	1	1	1	1
Estonia	0.63 (0.37; 1.09)	0.83 (0.54; 1.28)	0.64 (0.37; 1.10)	0.84 (0.54; 1.29)	0.54 (0.31; 0.93)*	0.77 (0.49; 1.20)	0.44 (0.25; 0.79)**	0.78 (0.49; 1.25)
Georgia	1.07 (0.78; 1.48)	1.71 (1.32; 2.22)**	1.07 (0.77; 1.47)	1.74 (1.34; 2.25)**	0.80 (0.56; 1.14)	1.52 (1.14; 2.03)**	0.64 (0.44; 0.94)*	1.59 (1.15; 2.19)**
Kazakhstan	2.19 (1.69; 2.83)**	0.65 (0.49; 0.87)**	2.46 (1.89; 3.22)**	0.60 (0.45; 0.81)**	2.18 (1.64; 2.90)**	0.56 (0.41; 0.77)**	1.91 (1.38; 2.63)**	0.57 (0.40; 0.80)**
Latvia	0.50 (0.26; 0.96)*	0.94 (0.60; 1.49)	0.49 (0.25; 0.95)*	0.97 (0.61; 1.54)	0.41 (0.21; 0.80)*	0.88 (0.55; 1.40)	0.37 (0.18; 0.74)**	0.81 (0.50; 1.32)
Ukraine	1.55 (1.10; 2.17)*	2.31 (1.75; 3.06)**	1.56 (1.11; 2.20)*	2.30 (1.74; 3.04)**	1.47 (1.04; 2.08)*	2.25 (1.69; 3.00)**	1.31 (0.91; 1.88)	2.43 (1.80; 3.29)**
Age								
18–29	1	1	1	1	1	1	1	1
30–44	0.68 (0.52; 0.90)**	1.06 (0.81; 1.39)	0.62 (0.47; 0.83)**	1.18 (0.90; 1.56)	0.81 (0.58; 1.12)	1.24 (0.90; 1.69)	0.83 (0.59; 1.16)	1.23 (0.90; 1.68)
45–59	0.72 (0.54; 0.97)*	1.18 (0.89; 1.55)	0.73 (0.55; 0.99)*	1.23 (0.93; 1.63)	1.01 (0.71; 1.45)	1.30 (0.93; 1.81)	1.01 (0.70; 1.45)	1.28 (0.92; 1.79)
60–69	0.70 (0.49; 0.99)*	0.86 (0.61; 1.21)	0.80 (0.56; 1.14)	0.83 (0.59; 1.18)	1.15 (0.75; 1.74)	0.89 (0.59; 1.32)	0.94 (0.60; 1.46)	0.83 (0.55; 1.26)
70+	1.04 (0.75; 1.45)	0.62 (0.42; 0.92)*	1.35 (0.96; 1.90)	0.58 (0.39; 0.86)**	2.09 (1.37; 3.21)**	0.63 (0.40; 1.01)	1.50 (0.93; 2.42)	0.56 (0.33; 0.92)*
Settings								
Rural	1	1	1	1	1	1	1	1
Urban	0.62 (0.51; 0.76)**	0.75 (0.62; 0.91)**	0.63 (0.50; 0.78)**	0.74 (0.59; 0.92)**	0.62 (0.49; 0.78)**	0.74 (0.59; 0.92)**	0.65 (0.51; 0.82)**	0.77 (0.61; 0.96)*
Marital status								
Never married	1	1	1	1	1	1	1	1
Married/cohabiting	0.68 (0.53; 0.87)**	0.81 (0.64; 1.04)	0.55 (0.40; 0.76)**	0.83 (0.61; 1.12)	0.54 (0.39; 0.75)**	0.83 (0.62; 1.13)	0.59 (0.43; 0.82)**	0.87 (0.64; 1.18)
Divorced/separated	0.56 (0.36; 0.87)*	1.09 (0.76; 1.58)	0.63 (0.38; 1.03)	1.10 (0.72; 1.68)	0.64 (0.39; 1.06)	1.12 (0.73; 1.71)	0.64 (0.38; 1.05)	1.11 (0.72; 1.70)
Widowed	0.65 (0.42; 1.02)	0.63 (0.40; 0.99)*	0.44 (0.25; 0.75)**	0.83 (0.48; 1.43)	0.43 (0.25; 0.74)**	0.83 (0.48; 1.43)	0.44 (0.26; 0.77)**	0.83 (0.48; 1.43)
Education								
No/primary	1	1	1	1	1	1	1	1
Secondary	0.61 (0.38; 0.97)*	1.22 (0.78; 1.89)	0.57 (0.35; 0.95)*	0.98 (0.60; 1.58)	0.59 (0.35; 0.98)*	1.00 (0.62; 1.62)	0.60 (0.36; 1.00)	1.01 (0.62; 1.63)
High school	0.99 (0.67; 1.45)	1.13 (0.76; 1.68)	0.77 (0.49; 1.21)	0.67 (0.42; 1.05)	0.83 (0.52; 1.31)	0.71 (0.44; 1.12)	0.90 (0.57; 1.43)	0.72 (0.45; 1.15)
College/University	0.87 (0.59; 1.29)	1.22 (0.82; 1.82)	0.67 (0.42; 1.07)	0.74 (0.46; 1.18)	0.76 (0.48; 1.21)	0.80 (0.50; 1.29)	0.91 (0.56; 1.46)	0.85 (0.53; 1.38)
Postgraduate	0.87 (0.44; 1.72)	0.69 (0.32; 1.49)	0.63 (0.30; 1.30)	0.57 (0.25; 1.29)	0.70 (0.33; 1.45)	0.60 (0.27; 1.36)	0.91 (0.43; 1.92)	0.67 (0.30; 1.54)
Current job								
Not working	1	1	1	1	1	1	1	1
Govern. employee	0.51 (0.38; 0.69)**	1.12 (0.88; 1.44)	0.54 (0.39; 0.76)**	0.84 (0.63; 1.11)	0.60 (0.43; 0.85)**	0.90 (0.67; 1.20)	0.61 (0.43; 0.86)**	0.93 (0.69; 1.25)
Non-govn. employee	0.76 (0.59; 0.97)*	0.91 (0.71; 1.16)	0.56 (0.41; 0.75)**	0.97 (0.73; 1.30)	0.62 (0.46; 0.84)**	1.04 (0.78; 1.40)	0.63 (0.46; 0.86)**	1.10 (0.82; 1.48)
Self-employed	0.97 (0.72; 1.30)	1.33 (1.00; 1.77)*	0.82 (0.59; 1.15)	1.16 (0.85; 1.59)	0.87 (0.62; 1.22)	1.19 (0.87; 1.63)	0.86 (0.61; 1.22)	1.23 (0.89; 1.69)
Employer	0.47 (0.22; 1.00)	0.82 (0.44; 1.53)	0.42 (0.19; 0.90)*	0.74 (0.39; 1.41)	0.42 (0.19; 0.92)*	0.75 (0.40; 1.44)	0.43 (0.19; 0.93)*	0.80 (0.42; 1.54)
Wealth quintile								
Quintile 1	1	1	1	1	1	1	1	1
Quintile 2	0.94 (0.69; 1.27)	0.78 (0.57; 1.07)	0.96 (0.70; 1.31)	0.78 (0.57; 1.08)	0.96 (0.70; 1.31)	0.79 (0.57; 1.09)	0.97 (0.71; 1.34)	0.80 (0.58; 1.11)
Quintile 3	0.74 (0.54; 1.02)	0.97 (0.72; 1.31)	0.77 (0.56; 1.07)	0.93 (0.68; 1.26)	0.80 (0.57; 1.11)	0.97 (0.71; 1.31)	0.83 (0.59; 1.15)	0.99 (0.72; 1.35)
Quintile 4	0.64 (0.46; 0.88)**	0.96 (0.72; 1.29)	0.68 (0.49; 0.95)*	0.86 (0.63; 1.16)	0.71 (0.51; 1.00)*	0.91 (0.67; 1.23)	0.76 (0.54; 1.06)	0.94 (0.68; 1.29)
Quintile 5	0.68 (0.50; 0.92)*	0.73 (0.54; 0.98)*	0.71 (0.52; 0.98)*	0.64 (0.47; 0.87)**	0.79 (0.57; 1.10)	0.70 (0.51; 0.97)*	0.85 (0.60; 1.19)	0.72 (0.52; 1.01)

*p<0.01; **p<0.001; † ORs adjusted for age and country; ‡ ORs adjusted for age, country, settings and marital status

study population for the multiple risk factors comprised of 11 666 individuals, of which 7 303 (62.6%) were females and 4 363 (37.4%) were males.

5.6.1 Representativeness of the final study population

Baseline characteristics of the final study population in comparison with general study population and population with missing in MRF are presented in the Appendix 2, Table 12. There were 12 666 individuals in the general study population, and 1 000 observations with missing data on MRF (Figure 5). For comparison purposes, these data were not stratified by sex. Baseline characteristics of the final and general study populations were similar. However, there were some differences in the characteristics of the population missing in MRF compared with that of the final study population. More Russian respondents, older, urban, lower educated and not working people were in the missing data.

5.6.2 Results of combined analyses

5.6.2.1 Co-occurring patterns of noncommunicable disease risk factors

Prevalence of having 0 to 5 risk factors in females and males

Table 22 gives prevalence of having 0 to 5 noncommunicable disease risk factors for both females and males. Only 8% of females and 3% of males had none of the five risk factors. Forty three percent of females and 21% of males had one risk factor, 40% of females and 42% of males had two risk factors, and about 9% of females and 34% of males had three or more risk factors.

Prevalence of co-occurring patterns of NCD risk factors in females and males

The co-occurring patterns of the five risk factors and their corresponding prevalence for women and men are displayed in Table 23. Among individuals with one risk factor, low fruit and vegetable intake was the most common. For those with two risk factors; the most common combinations were 'low fruit and vegetable intake and overweight and obesity' in women (29%) and 'low fruit and vegetable intake and smoking' in men (19%). For those with three risk factors, the most common groupings were 'low fruit and vegetable intake, overweight and obesity, and physical inactivity' in women (3%) and 'low fruit and vegetable intake, overweight and obesity, and smoking' in men (14%). The prevalence of each co-occurring patterns was very low for women with four risk factors. For men with four factors, the most prevalent combination was 'low fruit and vegetable intake, overweight and obesity, smoking and heavy use of alcohol' (5%). There were no women with five risk factors, while only 15 (0.3%) men had all five risk factors.

Table 22. Prevalence of having 0 to 5 noncommunicable disease risk factors in females and males

Number of risk factors*	Females		Males	
	N	%	N	%
0	593	8.1	143	3.3
1	3113	42.6	924	21.2
2	2910	39.9	1828	41.9
3	637	8.7	1147	26.3
4	50	0.7	306	7.0
5	0	0	15	0.3
Total	7303	100	4363	100

* Risk factors include: 1) current smoking; 2) low fruit and vegetable intake; 3) physical inactivity; 4) overweight and obesity; and 5) heavy alcohol use

5.6.2.2 Results of descriptive analyses

Further to assess socioeconomic determinants of multiple noncommunicable disease risk factors, outcome 'multiple risk factors' was categorized into three levels: 0 to 1, 2, and 3 to 5 risk factors.

Characteristics of study participants

Table 24 shows distribution of characteristics and prevalence of multiple risk factors for females and males. A total of 7 303 females and 4 363 males were included in these data. Although 7.9% of the study population had missing values on MRF, characteristics of this population were almost similar to that of 'physical inactivity' data (Table 10).

Table 23. Prevalence of co-occuring patterns of noncommunicable disease risk factors in females and males

Number of risk factors	Smoking	Heavy alcohol use	Low fruit and vegetable intake	Physical inactivity	Overweight and obesity	Females		Males	
						N	%	N	%
0	.	.	.	.	.	593	8.1	143	3.3
1	Y	.	.	.	.	102	1.4	163	3.7
1	.	Y	.	.	.	47	0.6	15	0.3
1	.	.	Y	.	.	2388	32.7	595	13.6
1	.	.	.	Y	.	43	0.6	10	0.2
1	.	.	.	.	Y	533	7.3	141	3.2
2	Y	Y	.	.	.	16	0.2	49	1.1
2	Y	.	Y	.	.	299	4.1	821	18.8
2	Y	.	.	Y	.	8	0.1	9	0.2
2	Y	.	.	.	Y	69	0.9	155	3.6
2	.	Y	Y	.	.	80	1.1	64	1.5
2	.	Y	.	Y	.	2	0	1	0
2	.	Y	.	.	Y	51	0.7	38	0.9
2	.	.	Y	Y	.	226	3.1	62	1.4
2	.	.	Y	.	Y	2119	29.0	618	14.2
2	.	.	.	Y	Y	40	0.5	11	0.3
3	Y	Y	Y	.	.	36	0.5	221	5.1
3	Y	Y	.	Y	.	0	0	3	0.1
3	Y	Y	.	.	Y	11	0.2	43	1.0
3	.	Y	Y	Y	.	8	0.1	2	0
3	.	Y	Y	.	Y	109	1.5	99	2.3
3	.	.	Y	Y	Y	227	3.1	60	1.4
3	Y	.	Y	.	Y	211	2.9	618	14.2
3	Y	.	.	Y	Y	1	0	12	0.3
3	Y	.	Y	Y	.	34	0.5	87	2.0
3	.	Y	.	Y	Y	0	0	2	0
4	Y	Y	Y	Y	.	0	0	14	0.3
4	Y	Y	Y	.	Y	30	0.4	219	5.0
4	Y	Y	.	Y	Y	0	0	3	0.1
4	Y	.	Y	Y	Y	15	0.2	66	1.5
4	.	Y	Y	Y	Y	5	0.1	4	0.1
5	Y	Y	Y	Y	Y	0	0	15	0.3

Y – presence of the risk factor

Prevalence of multiple risk factors in females and males

The overall prevalence of women and men with 2 noncommunicable disease risk factors was about 40–42%, whereas, the overall prevalence of women and men with 3 to 5 risk factors were 9% and 34% respectively (Table 24). Figure 8 displays prevalence of noncommunicable disease risk factors and multiple risk factors by sex. In all relevant figures; multiple risk

factors are shown as a stacked bar, where darker colour stands for 2 risk factors and lighter colour stands for 3 to 5 risk factors.

Table 24. Distribution of characteristics and prevalence of multiple risk factors in females and males

	Females				Males			
	Characteristics		Prevalence		Characteristics		Prevalence	
			2 risk factors	3–5 risk factors			2 risk factors	3–5 risk factors
	N	%	%	%	N	%	%	%
Country								
Russia	1779	24.4	46.9	9.8	1059	24.3	39.7	36.1
Estonia	526	7.2	41.8	12.0	302	6.9	40.4	33.4
Georgia	1208	16.5	32.9	8.6	944	21.6	40.5	38.8
Kazakhstan	2667	36.5	40.8	9.0	1434	32.9	45.0	30.4
Ukraine	1123	15.4	33.1	9.5	624	14.3	41.5	29.3
Age								
18-29	1462	20.0	24.4	6.2	966	22.1	39.7	25.0
30-44	2634	36.1	35.4	9.2	1561	35.8	40.6	37.3
45-59	2142	29.3	50.2	11.5	1230	28.2	42.7	37.1
60-69	1065	14.6	51.2	10.3	606	13.9	47.4	31.2
Settings								
Rural	2209	30.3	36.2	6.9	1517	34.8	42.8	32.7
Urban	5094	69.8	41.4	10.5	2846	65.2	41.4	34.2
Marital status								
Never married	1149	15.7	25.9	7.8	868	19.9	39.3	26.0
Married/cohabiting	4178	57.2	41.1	9.2	3048	69.9	43.0	34.8
Divorced/separated	1022	14.0	41.6	11.2	328	7.5	39.3	40.2
Widowed	954	13.1	49.4	10.4	119	2.7	38.7	40.3
Education								
No/primary	163	2.2	52.8	10.4	122	2.8	44.3	37.7
Secondary	604	8.3	48.0	10.3	440	10.1	42.1	37.1
High school	3307	45.3	38.7	9.2	1940	44.5	42.1	32.6
College/University	2960	40.5	38.8	9.6	1728	39.6	41.4	34.3
Postgraduate	269	3.7	38.7	7.8	133	3.1	43.6	25.6
Current job								
Not working	2798	38.3	39.6	9.6	1263	29.0	44.7	32.0
Govern. employee	1926	26.4	41.4	8.5	1009	23.1	40.2	32.7
Non-govn. employee	1920	26.3	40.0	9.4	1267	29.0	39.9	35.0
Self-employed	560	7.7	37.1	11.8	696	16.0	42.2	36.1
Employer	99	1.4	29.3	10.1	128	2.9	44.5	31.3
Wealth quintile								
Quintile 1	1251	17.1	38.2	9.0	652	14.9	46.3	35.3
Quintile 2	1426	19.5	41.4	10.7	744	17.1	42.6	31.7
Quintile 3	1543	21.1	39.7	9.1	865	19.8	42.7	35.3
Quintile 4	1559	21.4	41.8	7.8	1020	23.4	41.1	34.6
Quintile 5	1524	20.9	37.8	10.5	1082	24.8	38.9	31.8
Total	7303	100	39.9	9.4	4363	100	41.9	33.7

The prevalence of multiple risk factors by sex varied across the countries. Respondents aged 45 to 69 years had higher prevalence of multiple risk factors, except middle aged men

of having high prevalence for 3 or more risk factors. Generally, residents from rural areas had lower prevalence of multiple risk factors. The highest prevalence was observed among widowed women for 2 risk factors and among divorced or separated women for 3 or more risk factors. Married or cohabiting men had the highest prevalence for 2 risk factors, while divorced or separated and widowed men for 3 or more risk factors. Lower educated people had more multiple risk factors, in addition to higher educated men with 2 risk factors. Government employees with 2 risk factors and self-employed women with 3 or more risk factors had higher prevalence. In men with two risk factors, the highest prevalence was observed among not working and employers, while, opposite was observed in men with 3 or more risk factors. The poorest men had the highest prevalence for 2 risk factors and it tended to decrease with increase of wealth. For others, prevalence of multiple risk factors varied greatly across the wealth quintiles.

5.6.2.3 Results of regression analyses

Results of regression analyses for females

Table 25 presents odds ratios for the likelihood of 2 risk factors (versus 0 to 1 risk factors) and of 3 to 5 risk factors (versus 0 to 1 risk factors) in relation to demographic and socioeconomic determinants in women. In the crude model, current job and wealth quintile were not associated with multiple risk factors. Compared to Russians, women from all countries except Estonia had lower likelihoods of 2 risk factors. In regards to 3 or more risk factors, only Georgian women had a lower likelihood. Women aged 30 to 69 years were more likely to have multiple risk factors than the youngest age group. Urban women had higher likelihoods of multiple risk factors. By marital status, all women except never married were more likely to have multiple risk factors. Women with high school and above levels of education were less likely to have 2 risk factors, while education was not significant for women with 3 or more risk factors.

In the adjusted models, only demographic factors remained significantly associated with multiple risk factors. Thus, the results of full model showed that Georgian and Ukraine women were 38–44% less likely to have 2 risk factors and there was no difference between countries for 3 or more risk factors. Women aged 30 to 69 years were 1.6–3.4 times as likely to have multiple risk factors compared to the youngest. Urban women had 27–80% higher likelihoods of multiple risk factors. By marital status, all women except never married were about 1.5 times as likely to have 2 risk factors, while no difference was observed for 3 or more risk factors. The tests for trend and interactions were not significant.

Results of regression analyses for males

Table 26 gives odds ratios for the likelihood of 2 risk factors (versus 0 to 1 risk factors) and of 3 to 5 risk factors (versus 0 to 1 risk factors) in relation to demographic and socioeconomic determinants in men. In the model I, settings and current job were not associated with

Table 25. Odds ratios (99% CI) of the relation of multiple risk factors with demographic and socioeconomic determinants in females (N=7303)

	Model I – Crude		† Model II		‡ Model III		Model IV – Full model	
	2 risk factors versus 0–1 risk factors	3–5 risk factors versus 0–1 risk factors	2 risk factors versus 0–1 risk factors	3–5 risk factors versus 0–1 risk factors	2 risk factors versus 0–1 risk factors	3–5 risk factors versus 0–1 risk factors	2 risk factors versus 0–1 risk factors	3–5 risk factors versus 0–1 risk factors
Country								
Russia	1	1	1	1	1	1	1	1
Estonia	0.84 (0.64; 1.10)	1.15 (0.75; 1.75)	0.82 (0.62; 1.08)	1.12 (0.73; 1.72)	0.87 (0.66; 1.16)	1.29 (0.83; 1.98)	0.86 (0.64; 1.16)	1.25 (0.79; 1.98)
Georgia	0.52 (0.42; 0.64)**	0.65 (0.46; 0.92)*	0.52 (0.42; 0.65)**	0.66 (0.46; 0.93)*	0.59 (0.47; 0.74)**	0.85 (0.59; 1.22)	0.62 (0.48; 0.79)**	0.77 (0.52; 1.15)
Kazakhstan	0.75 (0.63; 0.88)**	0.79 (0.60; 1.05)	0.83 (0.70; 0.99)*	0.84 (0.63; 1.12)	0.90 (0.75; 1.08)	1.00 (0.75; 1.35)	0.94 (0.76; 1.16)	0.94 (0.67; 1.33)
Ukraine	0.53 (0.43; 0.66)**	0.74 (0.52; 1.04)	0.53 (0.42; 0.65)**	0.73 (0.51; 1.03)	0.54 (0.43; 0.67)**	0.77 (0.54; 1.10)	0.56 (0.44; 0.70)**	0.78 (0.54; 1.13)
Age								
18–29	1	1	1	1	1	1	1	1
30–44	1.81 (1.50; 2.20)**	1.86 (1.33; 2.60)**	1.77 (1.46; 2.15)**	1.85 (1.32; 2.59)**	1.56 (1.27; 1.92)**	1.79 (1.25; 2.57)**	1.57 (1.27; 1.94)**	1.87 (1.29; 2.70)**
45–59	3.73 (3.06; 4.55)**	3.38 (2.41; 4.75)**	3.71 (3.04; 4.54)**	3.36 (2.39; 4.71)**	3.22 (2.59; 4.00)**	3.19 (2.20; 4.63)**	3.22 (2.58; 4.02)**	3.35 (2.29; 4.89)**
60–69	3.78 (3.00; 4.76)**	3.03 (2.04; 4.50)**	3.91 (3.09; 4.95)**	3.04 (2.04; 4.52)**	3.38 (2.60; 4.40)**	2.95 (1.89; 4.59)**	3.39 (2.58; 4.45)**	2.80 (1.77; 4.44)**
Settings								
Rural	1	1	1	1	1	1	1	1
Urban	1.35 (1.18; 1.56)**	1.81 (1.40; 2.33)**	1.27 (1.09; 1.48)**	1.80 (1.37; 2.35)**	1.28 (1.10; 1.49)**	1.79 (1.37; 2.34)**	1.27 (1.09; 1.49)**	1.80 (1.37; 2.37)**
Marital status								
Never married	1	1	1	1	1	1	1	1
Married/cohabiting	2.11 (1.74; 2.56)**	1.56 (1.13; 2.15)**	1.46 (1.18; 1.81)**	1.08 (0.76; 1.53)	1.47 (1.19; 1.83)**	1.11 (0.78; 1.57)	1.46 (1.17; 1.81)**	1.09 (0.76; 1.55)
Divorced/separated	2.25 (1.76; 2.87)**	2.00 (1.35; 2.96)**	1.38 (1.06; 1.81)*	1.23 (0.81; 1.89)	1.37 (1.05; 1.80)*	1.22 (0.80; 1.87)	1.38 (1.06; 1.81)*	1.22 (0.80; 1.87)
Widowed	3.13 (2.44; 4.02)**	2.18 (1.45; 3.28)**	1.47 (1.10; 1.96)*	1.10 (0.69; 1.75)	1.49 (1.11; 1.98)**	1.13 (0.71; 1.79)	1.48 (1.10; 1.97)*	1.08 (0.68; 1.72)
Education								
No/primary	1	1	1	1	1	1	1	1
Secondary	0.80 (0.49; 1.31)	0.87 (0.39; 1.93)	0.85 (0.51; 1.43)	1.04 (0.45; 2.38)	0.83 (0.49; 1.39)	0.98 (0.43; 2.27)	0.82 (0.49; 1.38)	0.97 (0.42; 2.23)
High school	0.52 (0.33; 0.81)**	0.62 (0.30; 1.28)	0.75 (0.47; 1.20)	0.87 (0.41; 1.86)	0.72 (0.45; 1.15)	0.80 (0.37; 1.71)	0.70 (0.43; 1.12)	0.80 (0.37; 1.71)
College/University	0.52 (0.34; 0.82)**	0.66 (0.32; 1.36)	0.76 (0.47; 1.22)	0.95 (0.44; 2.04)	0.71 (0.44; 1.15)	0.81 (0.38; 1.76)	0.68 (0.42; 1.10)	0.84 (0.39; 1.84)
Postgraduate	0.50 (0.29; 0.87)*	0.51 (0.20; 1.30)	0.60 (0.34; 1.08)	0.66 (0.25; 1.74)	0.59 (0.33; 1.06)	0.59 (0.22; 1.58)	0.55 (0.31; 1.00)	0.63 (0.23; 1.68)
Current job								
Not working	1	1	1	1	1	1	1	1
Govern. employee	1.06 (0.90; 1.24)	0.89 (0.68; 1.18)	1.02 (0.85; 1.23)	0.78 (0.58; 1.07)	1.03 (0.86; 1.25)	0.76 (0.55; 1.03)	1.05 (0.87; 1.27)	0.77 (0.56; 1.05)
Non-govn. employee	1.01 (0.86; 1.19)	0.98 (0.75; 1.29)	1.06 (0.87; 1.28)	1.00 (0.73; 1.36)	1.06 (0.88; 1.29)	0.95 (0.69; 1.29)	1.08 (0.89; 1.31)	0.96 (0.70; 1.32)
Self-employed	0.93 (0.72; 1.20)	1.22 (0.83; 1.81)	1.06 (0.81; 1.39)	1.35 (0.90; 2.04)	1.07 (0.81; 1.41)	1.35 (0.89; 2.05)	1.08 (0.82; 1.42)	1.35 (0.89; 2.04)
Employer	0.62 (0.34; 1.12)	0.88 (0.36; 2.17)	0.66 (0.36; 1.22)	0.88 (0.35; 2.19)	0.70 (0.38; 1.28)	0.96 (0.38; 2.40)	0.69 (0.37; 1.28)	0.94 (0.37; 2.35)
Wealth quintile								
Quintile 1	1	1	1	1	1	1	1	1
Quintile 2	1.19 (0.97; 1.48)	1.30 (0.92; 1.84)	1.13 (0.90; 1.40)	1.23 (0.86; 1.75)	1.11 (0.89; 1.39)	1.19 (0.83; 1.70)	1.13 (0.90; 1.41)	1.22 (0.85; 1.75)
Quintile 3	1.07 (0.87; 1.32)	1.04 (0.73; 1.47)	1.10 (0.88; 1.36)	1.03 (0.72; 1.47)	1.07 (0.86; 1..33)	0.99 (0.69; 1.42)	1.10 (0.88; 1.37)	1.03 (0.71; 1.48)
Quintile 4	1.15 (0.93; 1.41)	0.91 (0.63; 1.30)	1.25 (1.01; 1.55)*	0.95 (0.65; 1.37)	1.19 (0.95; 1.49)	0.89 (0.61; 1.30)	1.23 (0.98; 1.54)	0.94 (0.64; 1.38)
Quintile 5	1.01 (0.82; 1.24)	1.19 (0.84; 1.67)	1.16 (0.93; 1.44)	1.28 (0.89; 1.82)	1.08 (0.86; 1.36)	1.16 (0.80; 1.68)	1.12 (0.89; 1.42)	1.22 (0.83; 1.78)

*p<0.01; **p<0.001; † ORs adjusted for age and country; ‡ ORs adjusted for age, country, settings and marital status

Table 26. Odds ratios (99% CI) of the relation of multiple risk factors with demographic and socioeconomic determinants in males (N=4363)

	Model I – Crude		† Model II		‡ Model III		Model IV – Full model	
	2 risk factors versus 0–1 risk factors	3–5 risk factors versus 0–1 risk factors	2 risk factors versus 0–1 risk factors	3–5 risk factors versus 0–1 risk factors	2 risk factors versus 0–1 risk factors	3–5 risk factors versus 0–1 risk factors	2 risk factors versus 0–1 risk factors	3–5 risk factors versus 0–1 risk factors
Country								
Russia	1	1	1	1	1	1	1	1
Estonia	0.94 (0.62; 1.44)	0.86 (0.55; 1.33)	0.92 (0.60; 1.41)	0.86 (0.55; 1.34)	0.94 (0.61; 1.45)	0.92 (0.58; 1.44)	0.87 (0.54; 1.40)	0.78 (0.48; 1.29)
Georgia	1.19 (0.88; 1.62)	1.26 (0.92; 1.71)	1.23 (0.90; 1.67)	1.34 (0.98; 1.83)	1.31 (0.94; 1.82)	1.54 (1.10; 2.17)*	1.26 (0.87; 1.81)	1.53 (1.05; 2.24)*
Kazakhstan	1.12 (0.86; 1.46)	0.83 (0.63; 1.10)	1.15 (0.88; 1.50)	0.84 (0.63; 1.11)	1.16 (0.87; 1.54)	0.89 (0.66; 1.20)	1.13 (0.81; 1.56)	0.82 (0.58; 1.15)
Ukraine	0.87 (0.63; 1.20)	0.68 (0.48; 0.95)*	0.89 (0.64; 1.23)	0.71 (0.50; 1.00)	0.89 (0.64; 1.24)	0.73 (0.52; 1.04)	0.90 (0.63; 1.27)	0.75 (0.52; 1.08)
Age								
18–29	1	1	1	1	1	1	1	1
30–44	1.63 (1.26; 2.11)**	2.39 (1.81; 3.15)**	1.62 (1.25; 2.10)**	2.43 (1.84; 3.22)**	1.42 (1.05; 1.91)*	1.94 (1.40; 2.67)**	1.43 (1.06; 1.94)*	1.96 (1.42; 2.71)**
45–59	1.88 (1.43; 2.48)**	2.60 (1.93; 3.50)**	1.91 (1.45; 2.51)**	2.63 (1.95; 3.55)**	1.63 (1.17; 2.26)**	2.01 (1.41; 2.85)**	1.62 (1.16; 2.26)**	2.03 (1.43; 2.90)**
60–69	1.97 (1.41; 2.75)**	2.06 (1.43; 2.97)**	2.00 (1.43; 2.79)**	2.03 (1.41; 2.94)**	1.71 (1.16; 2.53)**	1.51 (0.99; 2.31)	1.47 (0.97; 2.21)	1.35 (0.86; 2.10)
Settings								
Rural	1	1	1	1	1	1	1	1
Urban	0.97 (0.79; 1.20)	1.05 (0.84; 1.30)	1.08 (0.86; 1.36)	1.18 (0.93; 1.50)	1.08 (0.86; 1.36)	1.17 (0.92; 1.50)	1.18 (0.93; 1.49)	1.25 (0.97; 1.61)
Marital status								
Never married	1	1	1	1	1	1	1	1
Married/cohabiting	1.72 (1.36; 2.18)**	2.10 (1.62; 2.72)**	1.33 (0.99; 1.78)	1.57 (1.14; 2.17)**	1.33 (0.99; 1.78)	1.57 (1.14; 2.17)**	1.45 (1.07; 1.96)*	1.71 (1.23; 2.37)**
Divorced/separated	1.70 (1.10; 2.63)*	2.62 (1.68; 4.11)**	1.34 (0.83; 2.18)	1.89 (1.15; 3.11)*	1.34 (0.82; 2.17)	1.87 (1.13; 3.07)*	1.27 (0.78; 2.07)	1.82 (1.10; 3.02)*
Widowed	1.62 (0.83; 3.18)	2.56 (1.30; 5.02)**	1.12 (0.54; 2.32)	1.89 (0.91; 3.93)	1.13 (0.55; 2.33)	1.90 (0.91; 3.96)	1.09 (0.52; 2.26)	1.84 (0.88; 3.87)
Education								
No/primary	1	1	1	1	1	1	1	1
Secondary	0.82 (0.39; 1.70)	0.85 (0.40; 1.79)	0.79 (0.36; 1.75)	0.72 (0.32; 1.62)	0.78 (0.35; 1.71)	0.70 (0.31; 1.58)	0.81 (0.37; 1.79)	0.71 (0.31; 1.61)
High school	0.68 (0.35; 1.32)	0.61 (0.31; 1.22)	0.63 (0.31; 1.29)	0.52 (0.25; 1.09)	0.60 (0.29; 1.23)	0.49 (0.23; 1.03)	0.67 (0.32; 1.38)	0.52 (0.25; 1.10)
College/University	0.69 (0.35; 1.36)	0.68 (0.34; 1.34)	0.65 (0.31; 1.34)	0.56 (0.26; 1.19)	0.61 (0.29; 1.27)	0.51 (0.24; 1.10)	0.73 (0.35; 1.54)	0.58 (0.27; 1.26)
Postgraduate	0.58 (0.25; 1.33)	0.40 (0.16; 0.97)*	0.52 (0.21; 1.26)	0.32 (0.12; 0.83)*	0.49 (0.20; 1.20)	0.29 (0.11; 0.76)*	0.64 (0.26; 1.59)	0.35 (0.13; 0.94)*
Current job								
Not working	1	1	1	1	1	1	1	1
Govern. employee	0.77 (0.59; 1.02)	0.88 (0.66; 1.17)	0.78 (0.58; 1.05)	0.79 (0.57; 1.09)	0.73 (0.54; 0.99)*	0.73 (0.53; 1.01)	0.78 (0.57; 1.07)	0.79 (0.57; 1.11)
Non-govn. employee	0.83 (0.64; 1.08)	1.01 (0.77; 1.33)	0.83 (0.62; 1.11)	1.09 (0.80; 1.48)	0.79 (0.58; 1.06)	1.01 (0.74; 1.39)	0.85 (0.63; 1.15)	1.11 (0.81; 1.54)
Self-employed	1.01 (0.74; 1.39)	1.21 (0.87; 1.68)	0.94 (0.67; 1.31)	1.04 (0.73; 1.48)	0.90 (0.64; 1.26)	0.99 (0.69; 1.41)	0.94 (0.67; 1.33)	1.05 (0.73; 1.50)
Employer	0.96 (0.52; 1.75)	0.94 (0.49; 1.79)	0.88 (0.48; 1.64)	0.81 (0.42; 1.58)	0.85 (0.46; 1.57)	0.77 (0.40; 1.51)	0.94 (0.50; 1.75)	0.87 (0.44; 1.71)
Wealth quintile								
Quintile 1	1	1	1	1	1	1	1	1
Quintile 2	0.66 (0.46; 0.95)*	0.64 (0.44; 0.95)*	0.64 (0.44; 0.92)*	0.62 (0.42; 0.91)*	0.63 (0.44; 0.91)*	0.62 (0.42; 0.91)*	0.65 (0.45; 0.93)*	0.63 (0.42; 0.93)*
Quintile 3	0.77 (0.54; 1.10)	0.83 (0.57; 1.21)	0.78 (0.54; 1.12)	0.82 (0.56; 1.20)	0.75 (0.52; 1.09)	0.81 (0.55; 1.18)	0.78 (0.54; 1.14)	0.85 (0.57; 1.25)
Quintile 4	0.67 (0.47; 0.95)*	0.74 (0.52; 1.06)	0.70 (0.50; 1.00)	0.75 (0.52; 1.09)	0.67 (0.47; 0.96)*	0.73 (0.51; 1.07)	0.71 (0.49; 1.02)	0.78 (0.53; 1.14)
Quintile 5	0.53 (0.38; 0.74)**	0.57 (0.40; 0.81)**	0.55 (0.39; 0.77)**	0.56 (0.39; 0.80)**	0.51 (0.36; 0.72)**	0.52 (0.36; 0.76)**	0.54 (0.37; 0.77)**	0.56 (0.38; 0.82)**

*p<0.01; **p<0.001; † ORs adjusted for age and country; ‡ ORs adjusted for age, country, settings and marital status

outcome. Only Ukraine men were less likely to have 3 or more risk factors compared to Russians. Men aged 30 to 69 years were more likely to have multiple risk factors compared to the youngest. Excluding widowed men with 2 risk factors, all men had higher likelihoods of multiple risk factors compared to never married. Men who completed postgraduate level of education were less likely to have 3 or more risk factors. Poor and wealthier men had lower likelihoods of multiple risk factors.

The results of adjusted models showed that all variables from crude model remained significant. Overall, the significance and magnitude of variables stayed similar or decreased except Georgian men with 3 to 5 risk factors. Consequently, the full model revealed that only Georgian men were 1.5 times as likely to have 3 or more risk factors as those from Russia. Compared to the youngest, middle aged men were 1.5–2 times as likely to have multiple risk factors. Married or cohabiting men had 45–71% higher likelihoods of multiple risk factors than never married, while divorced or separated men were 82% more likely to have 3 or more risk factors. Men with postgraduate level of education were 65% less likely to have 3 or more risk factors compared with the least educated ones. Poor men had about 35% lower and the wealthiest men had about 46% lower likelihoods of multiple risk factors. Tests for trend and interactions did not produce any significant results.

6 DISCUSSION

The main findings of this study confirm that socioeconomic determinants not only play an important role in the distribution of noncommunicable disease risk factors, but also have own specific dynamics of associations in the former Soviet countries. Summary results of regression analyses comprising all five NCD risk factors and multiple risk factors are integrated in Tables 27–28, separately for females and males.

From studied SES variables, wealth quintile and current job were the most significant determinants of NCD risk factors rather than education. Education was not at all associated with all five NCD risk factors and multiple risk factors for women; but for men, it was associated with only smoking and multiple risk factors. Men with higher education smoked less and were less likely to have three or more risk factors compared with the least educated ones.

On the other hand, wealth quintile was related with the majority of risk factors for both sexes. Males with better material possessions were less likely to be smokers, had higher intake of fruit and vegetables, and yet were more overweight and obese. Those from poor and the richest quintiles were less likely to have multiple risk factors. The wealth quintile was not associated with physical inactivity and heavy alcohol use in men; whereas in women, it was not associated with smoking and multiple risk factors. Analogous to men, wealthier women were more likely to have sufficient amount of fruits and vegetables. Rural women from the richest quintile had sedentary lifestyle, while wealth was not significant for urban women. Likewise in men, wealthier women had more excess weight but it was only relevant for those women aged 45 and plus. Wealth had some protective effect for heavy alcohol use among females.

Females working for pay, except those working for government, were more likely to smoke than those not working. Employers from both sexes had higher fruit and vegetable intake, in addition to government employee and self-employed males. All government employees and as well those males who were non-government employees or self-employed were more likely to be physically active. Self-employed males residing in urban settings were more likely to be overweight and obese.

Table 27. Summary of regression analyses for noncommunicable disease risk factors and multiple risk factors in females

Noncommunicable Disease Risk Factors			Demographic and Socioeconomic determinants						
			Country ‡	Age	Settings	Marital status	Education	Current job	Wealth quintile
Smoking			Estonia, Latvia: (+) Georgia, Kazakhstan: (-)	Increase by age: (-)	Urban: (+)	Divorced/separated: (+)	X	Non-govn. employee, self-employed, employer: (+)	X
Low fruit and vegetable intake			Estonia, Georgia, Ukraine: (-) Kazakhstan: (+)	Increase by age: (+)	Urban: (+)	X	X	Employer: (-)	Increase by wealth: (-)
Physical inactivity*		Rural	X	X		X	X	Govern. employee: (-)	Richest: (+)
		Urban	Georgia, Kazakhstan: (+) Ukraine: (-)	X		X	X	Govern. employee: (-)	X
Overweight and obesity*	18–44 years	Overweight	Latvia: (-)		X	Married/cohabiting, divorced/separated, widowed: (+)	X	X	X
		Obese	X		X	Married/cohabiting, widowed: (+)	X	X	X
	45+ years	Overweight	Georgia, Kazakhstan: (-)		X	Married/cohabiting, widowed: (+)	X	X	Common OR†: (+)
		Obese	Georgia: (-) Latvia: (+)		X	Married/cohabiting, widowed: (+)	X	X	Common OR†: (+)
Heavy alcohol use			Georgia, Ukraine: (+)	X	X	X	X	X	Middle, richer (-)
Multiple risk factors		2 RFs	Georgia, Ukraine: (-)	Increase by age: (+)	Urban: (+)	Married/cohabiting, divorced/separated, widowed: (+)	X	X	X
		3–5 RFs	X	Increase by age: (+)	Urban: (+)	X	X	X	X

*stratified results; (+) positive association; (-) negative association; X – no association; † odds ratio from one category to the next in 'wealth quintile' variable; ‡ Russia is the reference group for 'country' variable

Table 28. Summary of regression analyses for noncommunicable disease risk factors and multiple risk factors in males

Noncommunicable Disease Risk Factors			Demographic and Socioeconomic determinants						
			Country ‡	Age	Settings	Marital status	Education	Current job	Wealth quintile
Smoking			Kazakhstan: (-)	45+ years (-)	Urban: (+)	Married/cohabiting, divorced/separated, widowed: (+)	College/ University, Postgraduate: (-)	X	Middle, richer, richest: (-)
Low fruit and vegetable intake			Georgia, Latvia, Ukraine: (-) Kazakhstan: (+)	X	X	X	X	Govern. employee, self-employed, employer: (-)	Being richer: (-)
Physical inactivity			Kazakhstan: (+)	X	Urban: (+)	X	X	Govern. employee, non-govn. employee, self-employed: (-)	X
Overweight and obesity*	**Rural**	**Overweight**	X	30–69 years old (+)		X	X	X	Common OR†: (+)
		Obese	Georgia, Kazakhstan: (-)	30–69 years old (+)		X	X	X	Common OR†: (+)
	Urban	**Overweight**	X	Increase by age: (+)		Married/cohabiting, divorced/separated, widowed: (+)	X	Self-employed: (+)	Common OR†: (+)
		Obese	Estonia: (+)	Increase by age: (+)		X	X	Self-employed: (+)	Common OR†: (+)
Heavy alcohol use			Georgia, Ukraine: (+) Kazakhstan: (-)	Oldest: (-)	Urban: (-)	X	X	X	X
Multiple risk factors		**2 RFs**	X	30–59 years old (+)	X	Married/cohabiting: (+)	X	X	Poor, richest: (-)
		3–5 RFs	Georgia: (+)	30–59 years old (+)	X	Married/cohabiting, divorced/separated: (+)	Postgraduate: (-)	X	Poor, richest: (-)

*stratified results; (+) positive association; (-) negative association; X – no association; † odds ratio from one category to the next in 'wealth quintile' variable; ‡ Russia is the reference group for 'country' variable

6.1 Study strengths and limitations

6.1.1 Study strengths

The World Health Survey (WHS) data used in this study is valid, reliable and cross-nationally comparable data produced by careful implementation of the quality assurance procedures in each step of the survey. The current study covered total of 15 501 study participants from six countries of the former Soviet Union including two Baltic States, which have a different trajectory of development connected to their EU membership. This enables to capture an overall picture of these FSU countries including those with better off and worse levels of development, in regards to NCD and their risk factors. Study samples were broadly representative of general adult population of each participating countries, thus the study findings are generalizable.

Particularly for these countries, this is the first study to compile the most common NCD risk factors and their socioeconomic determinants, by using reliable cross-country comparable data and a common modelling approach of statistical analyses. In addition, this study gives a valuable contribution to the existing research of health inequalities in the FSU countries, which often face great challenges due to lack of information on socioeconomic status in routinely collected data and limited amount of national health surveys (Bobak 2009). Before 1989, there were no explicit intentions to study social distributions of health-related events in these countries due to their official positions of non-existence of social differences. After 1989, information on occupation and income are still rarely used in health researches based on routinely collected data and it seems there are no systematic efforts in the FSU to conceptualise different dimensions of socioeconomic status.

6.1.2 Study limitations

Despite the above mentioned strengths, the current study has several limitations. To begin with, using secondary data is complicated as in any other studies. Extensive materials and sources were available for the survey conducting stage but not many after the survey, or precisely how it was conducted in each country. More detailed information could have helped to better write the relevant parts of this thesis. Nevertheless, it was tackled in satisfactory level to give better understanding of the survey based on few available materials, information gathered during actual data management and published articles of researchers involved in data collection.

The study design was cross-sectional, which naturally does not allow for making any causal inference. However, for preventive and planning purposes, this study provides enough information about distribution of NCD risk factors by different socioeconomic groups. Moreover, Schaap and Kunst (2009) revealed that there are no differences between the cross-sectional and longitudinal studies in terms of their ability to demonstrate associations

between SES and smoking. Additionally, cross-sectional surveys are the preferred data source for monitoring smoking inequalities as they cover large and representative samples of national populations.

Although response rates were high and the study samples largely representative of the target population, the Russian sample was subnational and this could potentially affect prevalence of NCD risk factors. Nevertheless, it was corrected by weighting in country-specific analyses which will provide the actual estimate of prevalence by individual countries. Rates of missing data were reasonably low in this large dataset, yet about 8.8% had missing data for creating 'overweight and obesity' and 7.9% had missing for 'multiple risk factors'. As with most surveys, there were more respondents from lower socioeconomic groups among those with missing data compared with the final study population. This may underestimate prevalence of relevant risk factors; however, it should not cause much problem considering the rates of missing data being still comparatively low.

Another important limitation is that all the results were based on self-reported information, which is prone to reporting bias. Respondents tend to underreport socially undesirable behaviours while overreporting desirable ones. For instance, women from Russian Karelia greatly underreported their smoking status compared with the assessment by the serum cotinine measurements (Laatikainen, Vartiainen & Puska 1999). However, a review of the validity of self-reported smoking suggested that it is a sensitive, specific measure and provide accurate data, especially when collected by interviewers (Patrick et al. 1994). Similarly to smoking, alcohol consumption is underreported in transition countries, which is particularly more pronounced for women (Laatikainen et al. 2002b; Stillman 2006). Regarding overweight and obesity, there is a tendency of overreporting of height and underreporting of weight which will lead to the underestimation of the BMI, although the degree of this trend varies by sex and characteristics of the population (Gorber et al. 2007). A comparison of self-reported information and objective measures of overweight and obesity in 12 European nations, including eastern countries, produced clear underestimation of the prevalence of these conditions for both males and females (Tolonen et al. 2014).

Accordingly, there is a potential source of bias to underestimate prevalence of all NCD risk factors and this should be accounted for during the interpretation of the study results. Yet, the self-reported method could be the only feasible way of obtaining data from a large number of participants covering various topics on health as in the case of the WHS survey. In addition, the survey was administered by trained interviewers using standardized questionnaires allowing all respondents to be treated the same way which could potentially minimize the bias. Nonetheless, cautions must be taken in regards to cultural differences between countries, even though this was carefully considered in the design of the survey.

The use of the International Physical Activity Questionnaire (IPAQ) for the assessment of physical inactivity could underestimate the actual prevalence of this risk factor as the IPAQ is known to overestimate the physical activity of populations (Ainsworth et al.

2006; Ekelund et al. 2006), and there is a lot of criticism about this method. However, this questionnaire is explicitly designed for the international comparison and still produces consistent results (Warren et al. 2010; Guthold et al. 2008). Its reliability and validity were rigorously tested and this has been replicated in many developed and developing countries. Moreover, the IPAQ gives total physical activity level which is important in maintaining energy expenditure and preventing obesity, particularly in developing economies, where non-leisure domains of physical activity are predominant (Bauman et al. 2011).

As multiple risk factors were derived from above mentioned risk factors, similar problems could potentially underestimate its prevalence. Furthermore, co-occurrence analyses are focused on concurrent but independent risk factors and do not provide any indication of underlying associations between them (McAloney et al. 2013). On the other hand while being the first study conducted on this topic for the FSU countries, the co-occurrence approach is the best choice for exploring and comparing with other results as it is more frequently used in earlier literature. In addition, the policy message is much simpler than that of the advanced methods which scrutinize the underlying associations.

6.2 Discussion of the key findings

6.2.1 Prevalence of NCD risk factors

Among NCD risk factors, low fruit and vegetable intake had the highest prevalence for both sexes in all studied countries. The overall prevalence of low intake was much higher than global and European average (WHO 2009a). Country-specific prevalence varied from 52.9% to 89.3% for women and from 56.3% to 91.3% for men, being the lowest in Ukraine and the highest in Kazakhstan. These results were similar to the finding of Hall et al. (2009) which also used WHS data; and in case of Russia, the prevalence was higher than other reported results (Zabina et al. 2001; Petrukhin & Lunina 2012). The poor situation or inadequate amount of fruit and vegetable consumption in countries of the FSU is likewise evident throughout other studies, although direct comparisons of current results would not be possible due to different definitions of outcome (Laatikainen et al. 2002a; Cockerham et al. 2004; Boniol & Autier 2010; Paalanen et al. 2011; Abe et al. 2013).

The present findings are giving alarmingly high prevalence of low fruit and vegetable intake; however, these are not surprising results for former Soviet countries. The possible reasons could be linked to availability and affordability of fruits and vegetables in this part of the world. The FSU countries have a long tradition of seasonal availability of fresh fruits and vegetables; although it is becoming better with a free-market development, the access is still uneven (Figueras et al. 2004; Paalanen et al. 2013). Many households reduced their budget for foodstuffs and shifted towards cheaper food products to cope economic hardship (Walters & Suhrcke 2005; Huffman & Rizov 2007). Consequently, it could lead to the low consumption of fruits and vegetables as it is connected to poverty and food

insecurity (Drewnowski & Specter 2004). Also in the current study, use of berries was not included in the consumption of fruits and vegetables. This could potentially affect the actual prevalence of this outcome in Baltic nations and in any other countries, where berries are important part of their diet.

Next NCD risk factor by its high prevalence was smoking in all six countries, but only for men. The overall prevalence of smoking was considerably high among males (54.8%) in these countries, which is far exceeding the European average (WHO 2011a). On the other hand, smoking in females (10.6%) was lower than in the Europe. Country-specific results for women ranged from 6.3% in Georgia to 25% in Estonia; whereas for men, it was around 52% in Kazakhstan and 64.5% in Latvia. These results were consistent with other studies confirming high smoking level in men and relatively lower rates in women in the majority of the FSU countries (Gilmore et al. 2001; Gilmore et al. 2004; Bobak et al. 2006; Andreeva & Krasovsky 2007; Perlman et al. 2007; Storr et al. 2010; Boniol & Autier 2010; Zatonski et al. 2012).

According to Perlman et al. (2007) and Gilmore et al. (2004), tobacco epidemic model in Russia and other FSU countries seems directly connected and dictated by the entry of transnational tobacco companies (TTCs). High smoking rates in men for over many decades has failed to decline as expected by model, while in women, it started later than predicted but coincided with industry's marketing strategies. Although smoking is still less common in women, it is highly likely to increase as TTCs target specifically women and young people. Furthermore, women started to smoke more to express their independence and freedom after collapse of the communism, while smoking among men is situational norm and culturally accepted behaviour in the FSU countries (Stickley & Carlson 2009). Recent studies have found that smoking prevalence seems to have stabilized and may have some decline in younger groups, yet remains still very high among men (Roberts et al. 2012; Giovino et al. 2012). This is possibly related to ratification or accession of these nations to the WHO Framework Convention on Tobacco Control (FCTC) and implementation of it at varying degrees (Roberts et al. 2012). As all six study countries became a Party to the WHO FCTC during 2005–2008, there could be some positive signs of smoking decrease in these countries in the nearest future.

Overweight and obesity were the next most important risk factor by its prevalence, and they were ranked at the second place for women and the third for men amongst studied NCD risk factors. The combined prevalence of overweight and obesity was about 48% for both sexes, which was a bit lower than European average of 55% (WHO 2011a). This was in line with other studies conducted in Russia and other FSU countries (Zabina et al. 2001; Petrukhin & Lunina 2012; Watson et al. 2013). Moreover; the current results reflect increased weight status of populations, which could be explained by further worsening of the existing unhealthy dietary practices, increased use of goods contributing to physical inactivity and other negative health lifestyles aggravated after the economic transition (Ulijaszek & Koziel 2007; Huffman & Rizov 2007).

Generally, females were less likely to be overweight but more likely to be classified as obese compared with males. Country-specific results for overweight women were within the range of 28.1–33.4%, whereas the prevalence of obese was between 12.1% and 21.9%. In these countries, Russian women were the most overweight and Latvian women were the most obese. The country-specific prevalence of overweight men fluctuated from 30.3% to 41.4%, while that of obese men was around 7.3–14.7%. The most overweight men were from Georgia and the most obese were from Estonia. These results were supported by other studies (Klumbiene et al. 2004; Tekkel, Veideman & Rahu 2010; Boniol & Autier 2010; Moore et al. 2010; Watson et al. 2013); although there were some differences observed in regards to prevalence of obesity being reported higher than this study, especially among women (Huffman & Rizov 2007; Vlasoff et al. 2008).

The subsequent NCD risk factor was heavy alcohol use based on the overall prevalence for men, which was around 17.3%. However, that of women was comparably lower, only about 5%. Regardless of slightly different measures used, heavy drinking in men was near to the average in the European Region, which has the highest alcohol-related mortality and morbidity in the world (WHO 2010). The country-specific prevalence of heavy alcohol use in females was considerably low (2–6%) in the studied countries with the exception in Ukraine (15.6%). In males, it ranged from 15.3% in Estonia to 29.6% in Ukraine, excluding Kazakhstan (9.8%). These findings confirm general knowledge about the high level of alcohol consumption among males in the FSU countries, while it is relatively uncommon among females (Pomerleau et al. 2008; McKee et al. 2000; Zabina et al. 2001; Jukkala et al. 2008; Klumbiene et al. 2012). Webb et al. (2005) found similarly high percentage of female heavy drinkers in Ukraine, especially among younger age group.

It has been reported that hazardous alcohol consumption is a major cause of death among working age males in Russia (Leon et al. 2007; Zaridze et al. 2009; Tomkins et al. 2012) and alcohol is a continuing crisis in Russian mortality (Leon, Shkolnikov & McKee 2009). Cockerham, Hinote & Abbott (2006) noted that high alcohol consumption is a normative behaviour for men in these countries. Thus in fact, the actual prevalence could be even higher for men and women as well. It has been found that alcohol intake among women increased during the transition period (Rahu et al. 2009; Klumbiene et al. 2012), most notably they started to drink more alcohol after the communism to reject traditional Soviet norms and values (Hinote, Cockerham & Abbott 2009a). However, female participants may still underreport as it is socially undesirable behaviour. Moreover, home distilled spirits or surrogate alcohols were not specifically asked in the current study, which seem like a serious issue in the former Soviet countries and this might underestimate the actual burden of alcohol use for the studied population (Pomerleau et al. 2008; Perlman 2010; Tomkins et al. 2007; Pärna & Leon 2011).

Of all NCD risk factors, physical inactivity had the lowest prevalence in men and the second lowest in women, followed by heavy alcohol use. Nonetheless, the overall prevalence of physical inactivity was similar for both sexes and it was around 8%. This was much lower

than the European average at about 36% (WHO 2011a). However, a direct comparison should be done cautiously as the current study excluded older individuals, who are more physically inactive and inclusion of them can increase the prevalence (Guthold et al. 2008). A study on worldwide variability of physical inactivity, which used the same data source, showed that only about 17.7% of participants from 51 mainly low and middle income countries were physically inactive, considerably less than in wealthier nations (Guthold et al. 2008). The authors came to similar results as this study, in which country-specific prevalence ranged from 4.2% to 13.5% for both men and women.

Although the prevalence of total physical inactivity was low as mentioned above, hardly one third of the population exercise during their leisure-time in the former Soviet countries (Puska et al. 2003; Laatikainen et al. 2002a; Vlasoff et al. 2008; Petrukhin & Lunina 2012), indicating the importance of other domains of physical activity for this region. Dearth-Wesley and colleagues (2014) reported that occupational physical activity followed by travel physical activity was the largest contributor to total physical activity for Russian men; while for women, it was domestic physical activity followed by occupational physical activity. Thus, the majority of physical activity in these countries is linked to non-recreational activities undertaken at work, at home and in garden, and during travel. Indeed, Bauman et al. (2011) noted that all domains of physical activity must be included in international surveillance studies, particularly for economically developing countries, as economic development can affect the level of physical activity.

6.2.2 Prevalence of multiple NCD risk factors

Almost half of women and three fourths of men had multiple risk factors consisting of any two or more of the five NCD risk factors: smoking, low fruit and vegetable intake, physical inactivity, overweight and obesity, and heavy alcohol use. The proportion of those with two risk factors was similar for both women and men, about 40–42%. However, only about 9% of women had three or more risk factors compared to 34% of men. Generally there were big sex differences observed for multiple risk factors, specifically, women of being healthier and having lower number of co-occurring NCD risk factors than men. This overall picture is in line with earlier reports, although the magnitude of the multiple risk factors was different between studies (Schuit et al. 2002; Berrigan et al. 2003; Poortinga 2007). The differing results in prevalence could be explained by different choices of and numbers of risk factors, and related definitions employed by various researchers.

The five NCD risk factors seemed to co-occur in certain multiple combinations in studied population. There were a total of 32 co-occurring patterns of these risk factors. The most common combinations of multiple risk factors were 'low fruit and vegetable intake' with 'overweight and obesity' for women (29%) and men (14%); with 'smoking' for men only (19%) followed by 'low fruit and vegetable intake, smoking, and overweight and obesity' for men (14%). Thus for this population, preventive measures for MRF must

be directed towards the co-occurrence of low fruit and vegetable intake, overweight and obesity, and also smoking for men. Other studies found similar patterns, although physical inactivity was equally important as well (Schuit et al. 2002; Fine et al. 2004; Poortinga 2007; Lawder et al. 2010).

6.2.3 Socioeconomic determinants of NCD risk factors and multiple risk factors

6.2.3.1 Socioeconomic determinants of smoking

The current results highlighted big sex differences in correlates of all studied NCD risk factors; there was less socioeconomic patterning among women compared to men. The levels of NCD risk factors varied throughout the six countries, and the between-country differences were also observed in other studies of the FSU (Pomerleau et al. 2004; Pomerleau et al. 2008; Abe et al. 2013; Watson et al. 2013).

Age was a strong predictor of smoking for both sexes, and the lower likelihood of smoking at older ages was consistent with other reports in the FSU countries (Pudule et al. 1999; Gilmore et al. 2001; Pomerleau et al. 2004; Cockerham, Hinote & Abbott 2006; Stickley & Carlson 2009). This could be explained by greater smoking initiation in younger generation due to promotional activities of tobacco companies, and as well, by high mortality among smokers in the older age group.

Respondents residing in urban areas had a higher likelihood of smoking. In the middle income countries, residence in urbanized settings was also associated with increased smoking level (Hosseinpoor et al. 2011). In the FSU countries, a similar tendency was observed mainly for women (McKee et al. 1998; Pudule et al. 1999; Gilmore et al. 2001; Gilmore, McKee & Rose 2001; Pomerleau et al. 2004) and less for men (Usmanova et al. 2012). The present results reflect a general picture of greater smoking rates among urban (Palipudi et al. 2012) and consequences of the activities of the transnational tobacco companies which initially targeted bigger cities in the FSU region with intention to expand later to rural areas.

Divorced or separated women and all men, except never married, were more likely to smoke, and this was demonstrated as well in Belarus (Gilmore, McKee & Rose 2001). In other studies of the FSU, the observed strong association of marital status was more evident in females but not in males (Pomerleau et al. 2004; Gilmore et al. 2001). Although smoking seemed somewhat uniformly distributed among men, it is not clear why never married men smoke less than the rest. One suggestion is that it could be related to development level of countries as Hosseinpoor et al. (2011) found that never married males from low income countries were less likely to smoke, whereas divorced or separated or widowed males from middle income nations were more likely to smoke. In case of women, those who were divorced or separated are, perhaps, less disposed to follow traditional paths of non-smoking (Gilmore, McKee & Rose 2001).

From socioeconomic determinants, only current job was strongly associated with smoking in women. Non-government employees, self-employed and employers; in other words, those women who have some income at hand and or certain authority were at greater risk of smoking. It is in line with other findings that women with a high locus of control (Stickley & Carlson 2009), female skilled workers and top managers smoked more (Cockerham, Hinote & Abbott 2006). No associations of smoking with education and economic situation were also reported in many FSU countries (Stickley & Carlson 2009; Cockerham, Hinote & Abbott 2006; Gilmore et al. 2001; Gilmore, McKee & Rose 2001; Pärna, Rahu, K. & Rahu, M. 2002). Overall, the current findings confirm that in this particular region of the world, women smoke more to express their freedom and independence, regardless of their education or wealth status. Thus, the study results for women are contrasting with common knowledge of education being the most dominant or stable indicator of SES for smoking in affluent (Schaap & Kunst 2009), low or middle income nations (Hosseinpoor et al. 2011).

Quite the opposite of females, education and wealth quintile were the most important predictors of smoking among males. Men with college or higher degrees and those from middle to the richest wealth quintiles had a lower likelihood of smoking. This was in agreement with other studies in the FSU (Pomerleau et al. 2004; Pudule et al. 1999), nevertheless of some non-significant results as well (Gilmore, McKee & Rose 2001; Gilmore et al. 2001; Usmanova et al. 2012). Harper & McKinnon (2012) reported that in all regions of the world, richer males were generally less likely to be current smokers with few exceptions. Hence, male smoking in these countries appears to follow the general SES patterning of smoking (Schaap & Kunst 2009; Hosseinpoor et al. 2011; Harper & McKinnon 2012). Non-significance of current job with smoking was also demonstrated in Estonia (Pärna, Rahu, K. & Rahu, M. 2002), whereas some studies reported that unemployed and working class males smoked more (Cockerham, Hinote & Abbott 2006; Gilmore et al. 2001; Gilmore, McKee & Rose 2001). As Stickley and Carlson (2009) reported that high locus of control was not important factor of smoking for men, unlike for women, and this could be the explanation for non-significance of current job among males.

6.2.3.2 Socioeconomic determinants of low fruit and vegetable intake

Age and settings were strong predictors of low fruit and vegetable intake for women, but not for men. Older and urban females consumed less fruit and vegetables. Less consumption of fruit and vegetables with increasing age was also found in the study of global variability by Hall et al. (2009), and in Lithuania, where it was relevant for both sexes (Luksiene et al. 2011). However, urban residence was not associated with low fruit and vegetable intake (Hall et al. 2009). Although prevalence of low fruit and vegetable intake was equally high and its associations with other demographic and SES indicators were similar in both sexes, it is unclear why older and urban women have less consumption of this food group. Marital

status was not associated with low intake for both males and females, while in other studies, married persons were more likely to consume daily vegetables (Cockerham et al. 2004; Cockerham et al. 2005).

SES patterning of low fruit and vegetable intake was quite similar in both sexes. From SES variables, current job and wealth quintile were significantly associated with this outcome, while education was not related. Wealthier people and employers had more intakes of fruit and vegetables, in addition to government employee and self-employed men. Even though education was not significant, the current results are consistent with other studies describing less consumption of fruit and vegetables among lower socioeconomic groups in countries of the FSU (Cockerham et al. 2004; Kriaucioniene et al. 2012; Luksiene et al. 2011; Petrukhin & Lunina 2012; Paalanen et al. 2011; Abe et al. 2013) and worldwide (Irala-Estevez et al. 2000; Giskes et al. 2010; Boylan et al. 2011; Hosseinpoor et al. 2012). Boylan et al. (2011) noted that economic difficulties showed the most consistent relationships with food habits. Correspondingly, in these particular countries, having more income or economic capacity to buy fruit and vegetables was the most important predictors of this outcome. In other words, the fruit and vegetable consumption is closely linked to their availability and affordability in this region of the world.

6.2.3.3 Socioeconomic determinants of physical inactivity

Among demographic variables, only setting was associated with physical inactivity in both sexes. Respondents residing in urban settings were more likely to be physically inactive, but in fact, wealth was interacting with settings in women. The current study covered total physical activity which consists of different activities undertaken at home and in garden, at work, to get from place to place, and in spare time. These activities and overall lifestyle can be quite different for those living in rural or urban settings. Differing levels of physical inactivity by residence were also found in Russia, the Baltic nations and the USA, while it was also relevant for age and marital status (Cockerham 2000; Pomerleau et al. 2000a; Parks, Housemann & Brownson 2003).

Although the relationship between wealth quintile and physical inactivity in women varied by settings, general socioeconomic patterning of physical inactivity did not differ by sex. Education was not significant for both sexes likewise in many other NCD risk factors, which is certainly the common feature in the present study and quite well supported by other FSU studies whenever it is available or applicable. Wealth quintile was related with physical inactivity only in women; particularly, those from the richest quintile residing in rural areas had more sedentary lifestyle. These were inconsistent with the results of the systematic review of different domains of physical activity, which found that education rather than income was the most significant predictor of total physical activity among European adults (Beenackers et al. 2012). Moreover, decreasing levels of physical activity with increasing levels of SES was found in Southern Europe but it was opposite in the

Anglo-Saxon countries. This divergence in the SES patterning of the total physical activity within European countries could partially explain the current results in terms of wealth. Nevertheless; the observed high physical inactivity, among the wealthiest females from rural areas, seems more related to different lifestyles of urban or rural residents in these FSU countries, as mentioned above.

Current job was the most important SES indicator of physical inactivity for both sexes; government employees were less likely to be physically inactive including males who were non-government employee or self-employed. This could be due to availability of more disposable incomes to pay for gym facilities and different sport clubs (McNeill, Kreuter & Subramanian 2006) or engagement in more active type of jobs. Beenackers and colleagues (2012) reported in their review that occupational class is the most sensitive indicator for studying SES differences in occupational physical activity. Accordingly, it is possible that the majority of physical activities in these FSU countries happen during the work as occupation related SES indicator was the most significant in predicting physical inactivity and its considerably lower prevalence in the current population. This is supported by other studies where physical activity in Russia was linked more to non-recreational activities taken at work, at home and during travel (Dearth-Wesley, Popkin & Ng 2014); and as well in low income countries, people from lower socioeconomic groups were less inactive by total physical inactivity (Hosseinpoor et al. 2012) as they more likely to engage in job-related activities and walking (Ford et al. 1991).

6.2.3.4 Socioeconomic determinants of overweight and obesity

Age was a strong determinant of overweight and obesity in both sexes, and the observed higher likelihood of excess weight at older ages was in agreement with studies conducted in the Baltics, Finland and other FSU countries (Pomerleau et al. 2000b; Klumbiene et al. 2004; Watson et al. 2013). Furthermore, wealth quintile was interacting with age among women, and this was in line with the suggestion of age being an effect modifier in the relationship between SES and obesity (McLaren 2007).

There was no difference between overweight and obese people in regards to their demographic and socioeconomic determinants with the exception of marital status. Marital status was a strong determinant of excess weight for both sexes. Married or cohabiting and widowed females were more likely to be overweight and obese, while younger females who were divorced or separated had a higher likelihood of overweight. All urban males, except never married, were more likely be overweight. In overall, the observed positive relationship of the excess weight with marital status was consistent with other reports (Stillman 2006; Selassie & Sinha 2011; Watson et al. 2013).

Setting was not associated with overweight and obesity in women. In men, wealth quintile was interacting with settings. Notably, males from urban settings were more physically inactive; and due to close connections of these NCD risk factors, it suggests

that urban should be more overweight and obese in this population. In fact, the difference between urban and rural settings was in the associations of excess weight with marital status and current job. Indeed self-employed males in urban settings were more overweight and obese, yet they were more physically active as well. However, based on the results of low fruit and vegetable intake, the self-employed men had a higher intake of this food groups. Hence, having excess weight appears to be more linked with fruit and vegetable intake rather than with physical inactivity in this population, which is also supported by their higher co-occurrence. Therefore, it is possible that overweight and obesity are more likely connected to the availability of income and resources to buy certain foodstuffs in these FSU countries. This was reinforced by very strong positive association of wealth quintile with excess weight in males. Similarly in women, wealthier were fatter but it was relevant for those aged 45 and plus.

This conclusion was consistent with findings of the further worsening of traditionally unhealthy diet accompanied by the introduction of Western high-fat and high-sugar foods due to the impact of liberalisation after the collapse of the Soviet Union (Huffman & Rizov 2007; Webber et al. 2012). Moreover, many households shifted to cheaper food items (Jahns, Baturin & Popkin 2003; Hinote, Cockerham & Abbott 2009b), which often can be high in energy density comprised of refined grains, added sugars and fats (Drewnowski & Specter 2004). It appears that in the current study, people consume more fattening foodstuffs and or more amounts of them according to their purchasing power. Consequently, the SES patterns of the excess weight in these FSU countries are similar to that of low and middle income nations, where obesity risk is higher among advantaged individuals (Law et al. 2007; McLaren 2007; Moore et al. 2010).

6.2.3.5 Socioeconomic determinants of heavy alcohol use

The majority of demographic and socioeconomic determinants were not associated with heavy alcohol use in both sexes. Men from the oldest age group and residing in urban settings were less likely to be heavy drinkers; while in women, only those from middle and richer quintiles had a lower likelihood of heavy drinking. Generally younger people more likely to be heavy or binge drinkers were also observed in other studies of the FSU, but residence was mainly not significant (McKee et al. 2000; Cockerham et al. 2004; Webb et al. 2005; Jukkala et al. 2008).

As social inequalities in alcohol use vary greatly across gender and groups of countries, depending on alcohol measure used (Bloomfield et al. 2006); the direct comparison of study findings should be done cautiously. Nevertheless, the observed low SES patterning in heavy alcohol use was consistent with the study in Russia (Bobak et al. 1999), in which the absence of substantial socioeconomic differences could be due to widespread use of alcohol in this country, especially among males. In eight countries of the FSU, episodic heavy drinking was not related with education and economic situation, but with employment

(Pomerleau et al. 2008). Furthermore, socioeconomic patterning of heavy drinking was more evident in females than in males was in agreement with the findings from the Baltic States and Finland (Helasoja et al. 2007; Klumbiene et al. 2012).

Although heavy alcohol use is widely spread in Russia and other FSU countries, the present study found considerably lower prevalence of heavy alcohol use than one would expect. First of all, it could be the reflection of heavy drinkers relatively more underestimating their alcohol consumption compared with light drinkers (Poikolainen 1985). Moreover, the observed low levels of prevalence and of SES patterning might be linked to the measurement of alcohol use for this particular group of countries. Tomkins and colleagues (2007) concluded that at least in Russia, traditional methods of examining hazardous drinking should go beyond the collection of information on the frequency and amount of consumption of beer, wine and spirits as they are less prevalent and express much weaker associations with socioeconomic status. However, countries of the FSU are very diverse in regards to drinking patterns and preferred beverages (Pomerleau et al. 2005). Thus, conventional methods of alcohol use are still required in order to have comparable results within these countries until, perhaps, suitable methods will be developed. As the result, it seems that alcohol measurement should be further developed to adjust or capture drinking style of countries of the FSU or any other nations with similar history and habits of high alcohol consumption.

6.2.3.6 Socioeconomic determinants of multiple risk factors

Age was a strong indicator of multiple risk factors in both sexes; older females and middle aged males were more likely to have 2 or more risk factors. Increasing number of risk factors with advancing age is quite understandable due to cumulative effects of behavioural risk factors over the life span of individuals, and it was also found in Asian countries, Canada, and Holland (Ahmed et al. 2009; Li et al. 2009; Schuit et al. 2002). Yet, studies conducted in the USA reported that young adults were more likely to engage in multiple risk factors (Berrigan et al. 2003; Pronk et al. 2004; Fine et al. 2004).

Setting was not significant in males, but it was strongly associated in females. Urban females were more likely to have multiple risk factors, and this could be explained by the fact that those in bigger cities probably more exposed to various risky behaviours. Unfortunately, not many studies on this topic covered differences by urban and rural settings. Marital status was an important predictor of having multiple risk factors for both sexes. All females, except never married, had higher likelihoods of 2 risk factors; and this was consistent with the study of Li et al. (2009), while the opposite was reported by Poortinga (2007). Married or cohabiting males were more likely to have multiple risk factors, in addition to those who were divorced or separated had higher likelihoods of 3 or more risk factors. A higher number of risk factors among divorced, separated or widowed

people were reported as well by Lawder et al. (2010). However, it is not clear why married or cohabiting males have higher likelihoods of multiple risk factors.

Socioeconomic determinants were not associated with multiple risk factors for women; and this was consistent with the finding of Drieskens et al. (2010) where SES differences were less pronounced in women. This might be because in the present study, there was a lower number of co-occurring risk factors and of significant SES associations in individual NCD risk factors for women compared to men. Males with the highest level of education were less likely to have 3 or more risk factors. Poor and the wealthiest males had lower likelihoods of multiple risk factors; notably, being in the richest quintile had a stronger effect on the outcome. The current results in males were in agreement with other reports which concluded that lower socioeconomic groups are most vulnerable for having multiple numbers of risk factors (Schuit et al. 2002; Poortinga 2007; Li et al. 2009; Lawder et al. 2010). The observed lower likelihood of multiple risk factors among poor men could be due to many positive associations found between wealth quintile and excess weight in these FSU countries.

6.3 Implications for NCD prevention and control

This thesis highlights the importance of socioeconomic determinants of NCD risk factors in these transition or rapidly changing countries with still reforming and not well-established health systems. As discussed by Laatikainen et al. (2002a) and Vlasoff et al. (2008), there is indeed a huge challenge to change lifestyles or NCD risk factors which are deeply rooted in the tradition fuelled by the poor situation of preventive work and policies. The observed non-significance of education with the majority of studied risk factors in both sexes suggests that the education is not a good measure of SES for these countries; or health promotion activities were not implemented in satisfactory level to make any difference, thus this population is not knowledgeable about risky behaviours. Moreover, the current study confirms that many health behaviours are not only shaped by individual-level factors but also social environmental factors (Sorensen et al. 2003), which are clearly visible in these FSU countries due to their relatively recent history.

Based on the findings of this thesis, health policies should address high prevalence of NCD risk factors by providing population-wide and individual-based preventive measures, specifically targeting those who are most vulnerable and disadvantaged.

The current study has the following implications for future prevention and control activities:

- NCD prevention and control activities focusing on higher taxes on tobacco, alcohol, fatty and sugary foods; bans on advertisements of these products; education and promotion of healthy lifestyles; and other cost-effective policy interventions suitable for the situation of individual countries must be implemented.

- Effective implementation of the WHO Framework Convention on Tobacco Control is highly recommended.
- Effective anti-tobacco lobby must be implemented in order to combat the powerful influence of the transnational tobacco companies in the FSU region.
- Effective policies and interventions that reduce male smoking, specifically targeting lower socioeconomic groups, should be implemented.
- Preventive measures of smoking must be integrated and implemented in various occupational places with special attention on female smoking.
- Population-wide interventions to increase the consumption of fruit and vegetables, with equity-based approaches targeting as well vulnerable people, should be implemented.
- Comprehensive intervention programmes on improving population diet and leisure-time physical activities to combat and prevent the excess weight must be implemented.
- Effective preventive measures on heavy alcohol use must be implemented, in addition to further development of locally tailored alcohol measures is suggested for alcohol studies in the FSU or similar nations.
- Multiple-intervention strategy that will achieve greater health gains should be implemented, predominantly targeting lower socioeconomic groups and the most common co-occurring combinations such as low fruit and vegetable intake, overweight and obesity, and as well smoking in case of men.

6.4 Recommendations for future research

Although health situation of the FSU region is among the poorest in Europe, these countries were considerably less researched and existing data are getting old with time. There was lots of attention around the end of the first decade of transition, which is important time period in terms of studying the effect of transition on population health. As the second decade is well around, it is recommended to collect more recent data to update the situation and also to compare the results between different decades. For that matter, the second round of WHS is highly recommended or at least to repeat the survey using the same method for these or similar countries which need more attention. Due to limited data sources and national health surveys, there are clear needs in these countries for public health monitoring and surveillance of various NCD risk factors covering necessary SES indicators. Depending on availability of resources, health examination studies must be conducted to bring more detailed picture and analyses of highly prevalent NCD risk factors to prevent future burden of NCDs in this part of the world.

7 CONCLUSIONS

The overall aim of this dissertation was to examine the socioeconomic determinants of noncommunicable disease risk factors in rapidly changing societies and their implications for noncommunicable disease prevention and control programmes in the studied FSU countries. The following conclusions can be drawn:

1) To address effectively certain public health problems, it is important to consider and understand the history and background of the society in regards to their social, economic and political context including the culture and ideology of targeted population. Health problems do not exist in the vacuum; public health workers and researchers need to be aware of these issues, specifically those who are covering transition or rapidly changing countries which are numerous at the present political situation of the world. Moreover, what works in one country may not be applicable to other country unless it has similar conditions.
2) In the studies of health equity, it is crucial to employ all three dimensions of socioeconomic indicators involving education, occupation, and wealth or income. Otherwise, it will fail to detect important association or directions of it between socioeconomic determinants and health or health behaviours. As discovered by this study, education was not a significant predictor of the majority of the studied NCD risk factors in these FSU countries when all three indicators were taken together. Oftentimes researchers use existing or precollected data, and it is very encouraging in terms of resource saving and low burden to the study participants. The study results; nevertheless, can be limited due to availability of the suitable information for particular research question. However, it is also impossible to collect or anticipate every possible future application of gathered data. Yet at least, for demographic and socioeconomic indicators, all essential ones must be included. Especially today, when it is well known that the socioeconomic status is important in any health issues, the collection of adequate SES information must be the requirement for any data in health.
3) This thesis highlights the significance of socioeconomic correlates of NCD risk factors in these transition or rapidly changing countries. Particularly, there are clearly observed SES differences in the studied countries but not as constant as in many western nations. It seems that the SES differences are just developing in

these societies along their development and economic situations; however, it might become a major public health concern in the future.

4) In overall, countries of the former Soviet bloc face huge challenges to combat the burden of NCD and its risk factors added with health inequality. Based on the findings of this dissertation, health policies should address high levels of NCD risk factors by providing population-wide and individual-based preventive measures and policies, explicitly targeting those who are most vulnerable and poor. Furthermore, multiple-intervention strategies that will achieve greater health gains should be implemented, predominantly targeting lower socioeconomic groups and the most common co-occurring combinations of NCD risk factors.

8 ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to my both supervisors Dr Patrik Finne and Dr Cherian Varghese, for their invaluable guidance and encouragement. This dissertation would not have been completed without their understanding and support. During the whole time of my PhD process, I always knew they would be there for me. It was very important and reassuring feeling, which has given me a lot of strength to accomplish this work. I am impressed of their style of supervision, giving me a great deal of freedom and independence, and yet guiding me in a right scientific direction. This eventually helped me to explore my own abilities, develop further my research skills, and learn to make important decisions regarding my work.

My profound thanks go to the reviewers Prof Mika Gissler, Docent Ossi Rahkonen, and Prof Tiina Laatikainen, for their time and useful comments for the improvement of this dissertation. I am also very grateful to Docent Pekka Jousilahti for accepting to examine my work during public defence.

I am very thankful for the Doctoral Programme in Public Health (DPPH) grant, which enabled me to focus solely on my research work. I also like to acknowledge the World Health Organization, for providing the data for this study.

Many thanks go to all professors, lecturers and staff of the School of Health Sciences, University of Tampere, Finland. I am very grateful to Ms Heini Huhtala for helping me in data management and statistical analyses. I will deeply miss her smart questions on my many questions, which improved this work immensely. My heartfelt thanks go to Ms Catarina Ståhle-Nieminen, for all her assistance and support throughout the whole process of my studies, and always making me feel at ease and at home. I would like to express my gratitude to Ms Leena Nikkari, for her careful guidance in completing the procedures and formalities for this dissertation, which essentially made it possible to meet the deadlines of my future work. I am also very thankful to Ms Sirpa Randell for meticulously setting the layout of this thesis; and as well, for accommodating my busy schedule.

I thank all my classmates, colleagues, and friends from the school. It has been a great time and journey to experience with all of you. I would like to express my profound gratitude to my father, mother, sisters, and brother, for their love and unwavering belief in me. To my extended family in Finland, thank you for making me feel like a part of bigger

family. Finally, to my daughter and husband, thank you for all your patience, support, and love.

Thank you very much!

Tuvshinjargal Chimed

September 2014, Espoo, Finland

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Table 1. Distribution of characteristics and prevalence of smoking in females, by country

	Russia			Estonia			Georgia			Kazakhstan			Latvia			Ukraine		
	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*
Age																		
18–29	362	12.2	20.3	97	20.0	33.1	277	22.6	7.4	550	27.4	15.8	74	19.6	40.2	253	20.1	21.0
30–44	617	25.0	17.7	161	24.6	36.9	379	27.1	7.8	1288	32.9	8.6	128	24.5	35.4	376	26.0	15.7
45–59	652	23.4	13.5	179	23.7	30.8	323	22.7	8.8	793	21.7	8.7	133	23.5	18.9	373	23.1	8.1
60–69	467	16.2	4.1	96	14.6	8.9	244	13.2	2.6	187	10.2	4.6	96	15.1	14.8	242	15.2	0.7
70+	658	23.2	0.8	96	17.2	4.8	310	14.3	1.1	94	7.7	3.5	130	17.3	4.7	215	15.6	1.0
Settings																		
Rural	232	11.9	10.5	206	29.5	25.6	809	48.0	1.7	1125	41.1	3.9	172	31.8	17.2	309	31.8	4.3
Urban	2524	88.1	11.0	423	70.5	24.9	724	52.0	10.5	1787	58.9	13.9	389	68.2	27.2	1150	68.2	13.3
Marital status																		
Never married	329	12.2	16.3	98	18.3	27.8	312	21.0	8.7	399	15.4	13.3	75	17.3	30.3	182	13.2	21.3
Married/cohabiting	1217	44.2	11.7	328	50.2	27.1	764	57.7	5.3	1749	53.9	8.1	221	40.7	25.1	708	54.9	9.4
Divorced/separated	384	16.2	16.6	90	13.0	36.6	72	3.4	21.4	423	15.2	18.9	107	18.7	33.0	210	10.2	18.7
Widowed	826	27.4	3.9	113	18.5	9.0	385	17.9	3.9	341	15.5	3.2	158	23.2	10.3	359	21.7	2.4
Education																		
No/primary	275	10.0	1.2	119	19.2	16.9	110	5.7	1.8	32	1.5	0	131	21.4	22.2	90	6.5	1.4
Secondary	819	28.6	8.3	24	4.0	31.8	77	4.1	3.5	81	4.2	14.4	238	44.1	23.7	111	8.1	3.6
High school	534	18.6	15.7	357	56.4	29.4	700	44.1	3.5	1506	51.2	9.3	111	21.0	33.4	710	47.5	10.9
College/University	1044	40.3	12.8	127	20.1	19.9	638	45.4	9.8	1101	36.8	9.9	77	13.0	13.3	542	37.3	13.0
Postgraduate	84	2.5	12.9	2	0.3	0	8	0.8	9.5	192	6.2	12.4	4	0.5	15.1	6	0.5	0
Current job																		
Not working	1437	49.3	6.1	281	47.3	16.2	1044	66.2	5.5	877	37.6	6.4	349	60.0	24.7	754	52.4	6.8
Govern. employee	973	40.0	13.2	138	19.9	25.0	218	15.6	6.5	313	8.9	11.3	107	20.6	13.3	475	32.0	10.5
Non-govn. employee	268	7.9	27.6	185	28.8	39.2	38	3.2	22.2	1372	43.0	10.3	85	15.5	32.9	187	12.8	19.1
Self-employed	53	2.0	19.7	18	2.9	19.4	218	14.0	6.9	297	9.4	18.3	12	2.6	28.6	27	1.7	17.1
Employer	25	0.8	8.4	7	1.0	60.2	15	1.0	0	53	1.1	18.0	8	1.7	43.8	16	1.2	67.5
Wealth quintile																		
Quintile 1	618	22.2	7.4	132	22.1	22.3	336	15.8	2.1	624	20.8	4.9	113	18.6	29.5	310	18.3	7.0
Quintile 2	577	19.3	7.8	115	17.8	16.8	326	18.4	3.3	602	22.2	7.1	131	20.8	23.9	322	19.5	8.0
Quintile 3	552	20.1	13.3	129	21.1	32.5	297	20.7	3.6	584	18.6	10.7	107	18.7	25.6	292	19.9	8.6
Quintile 4	519	18.3	11.5	118	18.0	33.2	292	21.5	8.0	572	19.0	11.9	108	19.8	22.3	270	20.5	11.8
Quintile 5	490	20.2	14.9	135	20.9	20.9	282	23.6	12.3	530	19.4	15.0	102	22.1	19.7	265	21.9	16.0
Total	2756	100	10.9	629	100	25.1	1533	100	6.3	2912	100	9.8	561	100	24.0	1459	100	10.4

* N represents sample size, % represents weighted percentage

Table 2. Distribution of characteristics and prevalence of smoking in males, by country

	Russia			Estonia			Georgia			Kazakhstan			Latvia			Ukraine		
	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*
Age																		
18–29	254	13.5	60.5	57	25.4	60.4	237	26.2	65.7	319	30.7	51.9	64	24.5	59.9	177	24.7	61.6
30–44	423	28.9	69.0	86	28.4	62.4	303	30.6	72.6	650	36.3	57.2	60	29.8	77.6	202	29.9	66.9
45–59	418	25.3	61.4	99	24.9	63.0	250	21.8	59.8	379	20.5	49.2	64	24.4	70.5	207	24.4	57.6
60–69	193	13.8	51.1	63	12.2	48.4	170	11.9	45.5	132	7.8	54.2	55	12.4	64.9	114	13.0	33.6
70+	256	18.5	37.5	52	9.0	19.0	162	9.6	28.1	51	4.7	23.7	40	8.9	16.4	94	8.0	12.9
Settings																		
Rural	119	13.8	61.5	135	32.3	55.9	670	50.0	56.6	656	46.4	49.5	91	35.2	62.9	188	34.1	56.0
Urban	1425	86.2	57.0	222	67.7	56.6	452	50.0	64.4	875	53.6	54.4	192	64.8	65.3	606	65.9	53.9
Marital status																		
Never married	251	13.8	52.0	59	23.6	62.1	273	24.9	58.6	231	21.7	46.2	67	27.9	66.4	135	18.3	56.8
Married/cohabiting	915	61.9	59.3	236	61.3	53.5	736	69.3	61.7	1210	73.6	53.4	151	50.7	62.2	552	72.1	54.9
Divorced/separated	219	12.7	66.6	39	10.5	68.0	33	1.8	77.7	56	3.0	58.1	46	14.7	65.6	61	5.8	65.2
Widowed	159	11.5	45.4	23	4.6	38.7	80	4.0	45.1	34	1.7	62.2	19	6.7	71.7	46	3.7	23.8
Education																		
No/primary	89	6.4	37.1	103	24.1	60.4	57	3.5	39.2	20	1.3	26.3	85	28.0	73.2	39	3.3	18.6
Secondary	480	30.6	63.9	14	4.5	81.3	66	3.2	48.8	59	4.7	68.7	102	41.0	62.4	55	6.8	45.5
High school	318	22.7	47.8	191	57.7	58.3	527	46.9	62.2	761	46.2	55.0	60	20.1	66.9	397	53.0	61.9
College/University	584	36.8	64.6	48	13.6	33.8	464	45.7	62.1	624	42.6	48.9	36	10.8	45.2	300	36.5	49.8
Postgraduate	73	3.5	30.8	1	0.2	0	8	0.7	4.6	67	5.2	44.6	0	0	0	3	0.4	0
Current job																		
Not working	574	39.2	48.6	167	39.0	54.3	572	47.4	57.0	343	25.4	43.0	153	48.0	59.4	313	36.8	42.7
Govern. employee	562	37.6	61.9	45	14.6	55.5	160	17.5	63.1	107	8.2	50.6	36	13.3	67.0	266	34.9	59.0
Non-govn. employee	303	17.6	65.8	115	36.6	61.2	47	4.8	69.0	741	47.2	54.3	64	24.0	63.5	166	21.7	65.0
Self-employed	65	3.6	60.9	26	8.7	41.7	318	28.0	63.8	289	16.7	60.3	20	10.7	87.4	34	4.6	60.5
Employer	40	2.1	75.4	4	1.1	100.0	25	2.4	56.5	51	2.5	53.9	10	4.0	61.1	15	2.0	74.2
Wealth quintile																		
Quintile 1	248	18.5	53.0	66	17.4	61.9	205	14.2	49.9	267	16.2	63.3	57	20.0	80.1	144	14.8	54.1
Quintile 2	285	18.2	48.1	83	20.0	53.3	228	15.9	56.7	283	17.3	53.7	43	14.2	72.6	129	15.8	50.9
Quintile 3	307	21.0	64.2	68	19.7	61.4	215	21.1	61.1	307	19.3	53.7	59	18.2	42.1	153	18.1	53.1
Quintile 4	337	20.9	64.5	78	24.7	61.3	231	21.6	65.1	316	19.9	48.4	60	23.7	75.0	185	25.7	59.7
Quintile 5	367	21.4	56.6	62	18.1	42.4	243	27.1	64.2	358	27.3	46.1	64	23.9	53.1	183	25.6	53.3
Total	1544	100	57.6	357	100	56.4	1122	100	60.5	1531	100	52.1	283	100	64.5	794	100	54.7

* N represents sample size, % represents weighted percentage

Table 3. Distribution of characteristics and prevalence of low fruit and vegetable intake in females, by country

	Russia			Estonia			Georgia			Kazakhstan			Latvia			Ukraine		
	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*
Age																		
18–29	362	12.2	77.7	97	20.0	73.4	277	22.6	72.1	549	27.4	88.3	74	19.6	63.6	253	20.4	46.2
30–44	618	25.0	82.0	161	24.6	76.7	379	27.1	78.0	1289	33.0	89.2	128	24.5	72.3	370	26.1	48.3
45–59	652	23.4	78.8	179	23.7	78.4	323	22.7	74.0	793	21.7	88.2	133	23.5	84.1	359	22.9	55.2
60–69	467	16.2	86.1	95	14.5	76.2	244	13.3	78.2	187	10.2	92.4	96	15.1	76.0	234	15.0	58.1
70+	657	23.1	92.7	96	17.2	86.4	308	14.2	79.0	94	7.7	92.3	130	17.3	90.7	209	15.6	61.1
Settings																		
Rural	232	11.9	91.1	206	29.6	73.0	809	48.0	75.0	1125	41.1	89.3	172	31.8	72.5	306	32.1	47.5
Urban	2524	88.1	82.9	422	70.4	80.2	722	52.0	76.7	1787	58.9	89.3	389	68.2	79.3	1119	67.9	55.4
Marital status																		
Never married	329	12.2	84.1	98	18.3	73.8	311	20.9	74.1	399	15.4	90.5	75	17.3	66.4	176	13.2	56.1
Married/cohabiting	1217	44.2	82.4	327	50.1	76.2	766	57.9	76.2	1749	53.9	89.5	221	40.7	74.5	696	55.1	49.3
Divorced/separated	384	16.2	79.2	90	13.0	82.6	72	3.4	77.9	423	15.2	87.1	107	18.7	82.8	202	10.0	57.5
Widowed	826	27.4	88.9	113	18.5	84.0	382	17.8	76.5	341	15.5	89.4	158	23.2	85.2	351	21.7	58.1
Education																		
No/primary	275	10.0	91.1	118	19.1	84.0	109	5.6	77.3	32	1.5	98.2	131	21.4	84.9	88	6.4	66.7
Secondary	818	28.5	86.1	24	4.0	82.2	77	4.1	78.3	81	4.2	90.0	238	44.1	71.4	107	8.1	52.9
High school	534	18.6	76.9	357	56.5	78.6	701	44.2	78.8	1507	51.3	90.6	111	21.0	81.2	694	47.5	52.5
College/University	1045	40.4	83.5	127	20.2	69.8	636	45.3	73.1	1100	36.7	86.9	77	13.0	76.4	530	37.4	51.1
Postgraduate	84	2.5	88.0	2	0.3	100.0	8	0.8	51.6	192	6.2	89.5	4	0.5	100.0	6	0.6	47.4
Current job																		
Not working	1436	49.3	88.4	280	47.2	80.5	1043	66.2	76.0	878	37.7	88.0	349	59.7	78.1	735	52.2	55.1
Govern. employee	974	40.0	78.3	138	20.0	78.2	217	15.6	77.7	312	8.8	87.4	107	20.6	81.0	467	32.4	49.8
Non-govn. employee	268	7.9	83.1	185	28.9	74.2	38	3.2	53.2	1372	43.1	92.1	85	15.5	69.6	182	12.7	52.7
Self-employed	53	2.0	84.7	18	2.9	79.2	218	14.1	79.6	297	9.4	86.7	12	2.6	57.6	26	1.6	32.7
Employer	25	0.8	85.4	7	1.0	66.9	15	1.0	63.1	53	1.1	59.8	8	1.7	93.2	15	1.1	71.3
Wealth quintile																		
Quintile 1	617	22.1	92.7	131	22.0	86.5	336	15.8	79.4	624	20.8	95.0	113	18.6	89.6	302	18.2	62.7
Quintile 2	578	19.3	80.9	115	17.9	82.4	326	18.4	75.2	603	22.2	91.7	131	20.8	79.3	315	19.6	57.3
Quintile 3	552	20.1	83.6	129	21.1	72.8	296	20.7	79.0	584	18.6	90.5	107	18.7	77.4	285	19.7	56.7
Quintile 4	519	18.3	85.7	118	18.0	76.3	292	21.6	76.3	571	18.9	85.4	108	19.8	83.2	264	20.7	48.6
Quintile 5	490	20.2	72.5	135	21.0	72.3	281	23.5	71.1	530	19.4	83.0	102	22.1	58.9	259	21.8	41.4
Total	2756	100	83.9	628	100	78.0	1531	100	75.9	2912	100	89.3	561	100	77.1	1425	100	52.9

* N represents sample size, % represents weighted percentage

Table 4. Distribution of characteristics and prevalence of low fruit and vegetable intake in males, by country

	Russia			Estonia			Georgia			Kazakhstan			Latvia			Ukraine		
	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*
Age																		
18–29	254	13.5	80.0	57	25.4	80.7	238	26.3	73.7	319	30.7	87.5	64	24.5	71.6	175	24.8	56.5
30–44	423	28.9	74.9	86	28.5	88.1	303	30.5	78.7	650	36.3	93.1	60	29.8	78.2	197	29.8	51.7
45–59	418	25.3	81.3	99	25.0	81.1	250	21.7	84.3	379	20.5	92.6	64	24.4	77.0	204	24.5	53.4
60–69	194	13.8	89.5	63	12.2	86.3	170	11.8	80.9	132	7.8	88.8	55	12.4	68.5	111	12.9	69.0
70+	256	18.5	89.1	51	8.9	85.0	163	9.7	79.2	51	4.7	100.0	40	8.9	64.1	92	8.0	61.6
Settings																		
Rural	120	13.8	87.3	134	32.2	76.8	671	50.0	84.2	656	46.4	92.3	91	35.2	73.1	185	34.3	53.7
Urban	1425	86.2	81.0	222	67.8	87.3	453	50.0	73.6	875	53.6	90.3	192	64.8	74.2	594	65.7	57.7
Marital status																		
Never married	251	13.8	76.2	59	23.6	86.1	274	25.0	73.0	231	21.7	91.8	67	27.9	74.5	133	18.3	50.9
Married/cohabiting	916	61.9	79.9	236	61.4	83.2	737	69.2	81.4	1210	73.6	91.0	151	50.7	73.3	543	72.3	58.5
Divorced/separated	219	12.7	87.2	39	10.5	81.2	33	1.7	75.8	56	3.0	88.3	46	14.7	73.1	58	5.6	47.6
Widowed	159	11.5	93.5	22	4.5	89.2	80	4.0	74.8	34	1.7	100.0	19	6.7	76.5	45	3.8	53.9
Education																		
No/primary	89	6.4	81.6	102	24.0	87.7	57	3.5	89.1	20	1.3	100.0	85	28.0	81.4	37	3.3	57.6
Secondary	480	30.6	85.3	14	4.5	82.0	66	3.2	80.8	59	4.7	95.3	102	41.0	71.0	53	6.6	74.6
High school	318	22.7	81.9	191	57.7	81.3	528	46.9	82.1	761	46.2	92.6	60	20.1	70.3	393	53.3	48.9
College/University	585	36.8	78.4	48	13.7	88.8	465	45.7	75.0	624	42.6	89.7	36	10.8	71.6	293	36.4	63.3
Postgraduate	73	3.5	87.5	1	0.2	100.0	8	0.7	62.4	67	5.2	85.5	0	0	0	3	0.4	100.0
Current job																		
Not working	574	39.2	89.3	166	38.9	84.5	574	47.5	80.9	343	25.4	93.6	153	48.0	74.5	305	36.7	59.3
Govern. employee	563	37.6	75.1	45	14.6	81.8	160	17.4	77.1	107	8.2	87.2	36	13.3	79.8	263	35.1	56.0
Non-govn. employee	303	17.6	81.8	115	36.6	84.4	47	4.8	50.6	741	47.2	92.0	64	24.0	72.7	164	21.8	53.3
Self-employed	65	3.6	81.4	26	8.7	81.5	318	27.9	81.7	289	16.7	89.6	20	10.7	69.4	32	4.3	54.5
Employer	40	2.1	65.2	4	1.1	100.0	25	2.4	77.1	51	2.5	78.5	10	4.0	64.3	15	2.0	46.6
Wealth quintile																		
Quintile 1	248	18.4	93.7	65	17.3	93.1	205	14.1	89.4	267	16.2	96.9	57	20.0	74.0	141	14.8	66.7
Quintile 2	286	18.3	82.4	83	20.0	86.2	228	15.9	79.6	283	17.3	93.1	43	14.2	79.2	127	15.9	59.8
Quintile 3	307	21.0	81.9	68	19.8	85.7	215	21.0	85.0	307	19.3	93.3	59	18.2	74.5	149	18.0	54.9
Quintile 4	337	20.9	75.8	78	24.8	77.5	233	21.9	78.9	316	19.9	91.3	60	23.7	84.7	181	25.6	53.4
Quintile 5	367	21.4	77.1	62	18.1	79.7	243	27.0	68.3	358	27.3	85.3	64	23.9	59.1	181	25.7	52.2
Total	1545	100	81.8	356	100	84.0	1124	100	78.9	1531	100	91.3	283	100	73.8	779	100	56.3

* N represents sample size, % represents weighted percentage

Table 5. Distribution of characteristics and prevalence of physical inactivity in females, by country

	Russia			Estonia			Georgia			Kazakhstan			Ukraine		
	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*
Age															
18–29	362	16.0	3.8	97	24.1	3.3	276	26.3	7.7	550	29.7	13.9	250	24.3	3.1
30–44	615	32.5	2.9	161	29.7	5.2	378	31.6	8.9	1289	35.7	9.9	358	30.3	3.5
45–59	648	30.4	4.9	179	28.6	5.1	323	26.5	7.8	792	23.5	10.8	368	28.0	4.4
60–69	467	21.1	10.9	96	17.6	7.8	244	15.5	14.8	187	11.1	16.8	232	17.5	6.7
Settings															
Rural	163	11.1	4.7	173	29.0	3.7	621	46.2	4.6	1097	42.0	9.6	240	30.2	6.5
Urban	1929	88.9	5.4	360	71.0	5.8	600	53.8	13.2	1721	58.0	13.9	968	69.8	3.2
Marital status															
Never married	299	14.2	5.5	87	19.7	3.3	267	23.2	7.7	393	16.1	12.1	170	15.5	3.0
Married/cohabiting	1087	50.8	5.2	304	55.9	4.2	707	63.1	8.7	1738	57.8	12.0	650	60.6	3.6
Divorced/separated	358	19.3	3.7	86	14.7	7.6	66	3.7	14.0	415	15.8	10.6	191	11.1	8.1
Widowed	348	15.6	7.7	56	9.8	10.9	181	10.0	14.3	272	10.3	14.9	197	12.8	5.2
Education															
No/primary	53	2.1	17.6	70	12.7	5.9	21	1.4	17.1	12	0.4	15.5	29	2.6	9.9
Secondary	528	24.6	6.7	19	3.7	0	45	3.5	8.1	59	2.4	8.5	51	3.4	5.7
High school	501	22.0	4.8	323	60.8	5.4	590	45.5	8.0	1473	52.9	11.4	625	51.3	4.0
College/University	935	48.3	4.5	119	22.5	5.0	559	48.8	10.2	1083	37.7	13.1	498	42.1	4.0
Postgraduate	75	2.9	2.5	2	0.3	0	6	0.8	8.7	191	6.5	12.9	5	0.5	0
Current job															
Not working	781	34.1	8.8	191	37.6	5.7	773	62.8	9.4	785	32.5	14.6	533	44.2	6.2
Govern. employee	970	52.1	3.3	136	23.6	3.7	204	17.5	10.2	313	9.6	4.7	456	37.7	1.8
Non-govn. employee	267	10.2	3.3	183	34.4	6.2	38	3.7	4.7	1371	46.6	11.3	177	14.7	5.4
Self-employed	52	2.6	10.3	16	3.1	0	192	15.0	8.3	296	10.1	14.9	27	2.0	0
Employer	22	0.9	0	7	1.2	0	14	1.0	7.1	53	1.2	7.1	15	1.3	0
Wealth quintile															
Quintile 1	286	13.4	9.6	83	15.9	3.6	226	13.9	4.7	580	19.2	9.4	208	14.3	5.6
Quintile 2	398	17.2	7.3	80	14.1	3.6	241	17.6	6.5	569	20.3	14.1	246	18.1	3.2
Quintile 3	461	21.3	6.0	123	24.3	3.2	237	19.7	7.9	571	19.1	8.7	259	21.5	4.5
Quintile 4	485	22.8	2.7	114	20.9	10.7	256	23.1	8.7	570	20.5	9.6	249	22.4	3.5
Quintile 5	462	25.3	3.5	133	24.9	4.3	261	25.7	15.0	528	20.9	18.1	246	23.7	4.5
Total	2092	100	5.3	533	100	5.2	1221	100	9.2	2818	100	12.1	1208	100	4.2

* N represents sample size, % represents weighted percentage

Table 6. Distribution of characteristics and prevalence of physical inactivity in males, by country

	Russia			Estonia			Georgia			Kazakhstan			Ukraine		
	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*	N*	%*	Prevalence %*
Age															
18–29	253	16.6	4.8	57	27.9	2.1	237	29.3	7.2	319	32.2	9.2	172	27.8	7.5
30–44	423	35.5	8.2	86	31.2	4.5	298	33.6	6.7	650	38.1	15.1	194	32.2	5.7
45–59	417	31.0	6.3	99	27.4	1.9	248	24.2	7.3	379	21.5	14.6	198	26.4	3.4
60–69	194	17.0	7.0	63	13.4	14.4	167	12.9	9.1	132	8.2	19.8	108	13.6	6.1
Settings															
Rural	101	13.9	3.9	115	31.8	3.7	548	48.5	2.1	635	46.3	12.9	157	34.0	6.7
Urban	1186	86.1	7.3	190	68.2	4.7	402	51.5	12.2	845	53.7	14.0	515	66.0	5.1
Marital status															
Never married	245	16.5	4.7	59	25.9	1.4	270	27.9	6.2	231	22.8	7.9	133	20.9	6.7
Married/cohabiting	768	63.8	6.7	204	61.6	4.6	620	68.4	7.7	1175	73.2	15.2	469	71.3	5.3
Divorced/separated	212	15.1	10.7	35	10.5	10.0	30	1.9	8.0	55	3.1	11.5	55	6.1	7.0
Widowed	62	4.5	3.8	7	2.0	10.3	30	1.9	7.0	19	0.9	19.9	15	1.8	0
Education															
No/primary	21	2.7	6.0	71	20.7	7.5	20	1.6	9.8	13	1.2	43.5	9	1.0	0
Secondary	368	29.4	3.7	13	4.7	7.6	39	2.4	3.4	54	4.7	17.8	34	4.9	0
High school	290	21.5	8.7	182	61.6	2.8	460	47.9	3.4	739	46.0	11.8	362	55.3	4.9
College/University	541	42.5	8.7	39	13.0	6.1	427	47.9	11.1	608	42.9	15.2	264	38.4	7.6
Postgraduate	67	4.0	1.5	0	0	0	4	0.3	41.4	66	5.2	3.9	3.0	0.5	0
Current job															
Not working	324	25.8	8.8	117	33.4	7.1	432	43.7	8.7	295	22.0	16.7	217	32.4	6.6
Govern. employee	557	45.8	7.3	44	15.8	0	150	18.6	9.3	107	8.6	14.9	255	37.6	3.6
Non-govn. employee	302	21.5	3.1	114	40.0	4.5	43	5.0	10.9	739	49.3	11.2	153	22.9	6.7
Self-employed	64	4.4	8.2	26	9.5	0	301	30.2	4.1	288	17.5	15.2	33	5.2	12.0
Employer	40	2.6	8.0	4	1.2	22.2	24	2.6	0	51	2.6	14.0	14	1.9	0
Wealth quintile															
Quintile 1	157	13.0	7.3	53	16.8	14.6	153	13.3	2.7	254	16.4	10.9	108	13.3	3.6
Quintile 2	200	15.6	7.9	60	17.9	0.8	180	14.9	3.9	263	16.3	13.7	103	15.3	5.0
Quintile 3	261	22.3	6.4	59	19.8	1.6	188	21.4	3.1	295	18.1	13.7	119	16.5	4.2
Quintile 4	320	24.2	9.1	75	26.5	3.1	205	21.9	5.4	311	20.7	14.4	171	27.5	4.5
Quintile 5	349	25.0	4.2	58	19.1	3.6	224	28.5	15.9	357	28.5	14.0	171	27.3	9.0
Total	1287	100	6.9	305	100	4.4	950	100	7.3	1480	100	13.5	672	100	5.6

* N represents sample size, % represents weighted percentage

Table 7. Distribution of characteristics and prevalence of overweight and obesity in females, by country

	Russia				Estonia				Georgia				Kazakhstan				Latvia				Ukraine			
			Prevalence				Prevalence				Prevalence				Prevalence				Prevalence				Prevalence	
	Characteristics		Overweight	Obesity	Characteristics		Overweight	Obesity	Characteristics		Overweight	Obesity	Characteristics		Overweight	Obesity	Characteristics		Overweight	Obesity	Characteristics		Overweight	Obesity
	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*
Age																								
18–29	338	14.1	14.2	4.7	95	19.7	14.8	3.4	275	22.5	13.3	0.3	517	27.5	14.0	4.5	73	22.2	8.0	0	249	20.9	13.4	3.2
30–44	553	28.1	31.0	10.4	159	24.8	21.6	12.1	375	27.0	29.5	10.5	1219	32.7	28.7	8.9	112	24.7	16.6	15.6	366	26.7	30.7	12.3
45–59	547	24.3	38.5	28.8	177	23.9	42.3	29.4	322	22.8	48.0	18.4	760	21.9	37.7	22.4	119	25.2	43.8	25.7	364	23.5	41.2	30.3
60–69	350	15.7	45.4	26.7	95	14.7	35.4	29.2	245	13.4	32.5	23.7	176	10.1	46.7	20.1	79	14.1	31.7	49.1	226	14.8	36.1	29.6
70+	410	17.7	35.0	33.9	93	16.8	45.1	26.7	310	14.4	33.1	12.7	89	7.8	24.2	21.3	89	13.7	50.0	33.4	177	14.1	33.8	22.7
Settings																								
Rural	167	10.9	34.4	28.5	200	28.8	25.1	23.2	805	47.9	28.0	9.1	1099	41.3	26.3	13.3	130	29.0	29.6	20.7	284	31.0	30.2	20.8
Urban	2031	89.1	33.3	19.9	419	71.2	33.6	18.0	722	52.1	33.7	14.8	1662	58.7	29.4	12.4	342	71.0	27.7	22.4	1098	69.0	31.1	17.7
Marital status																								
Never married	282	13.1	16.2	8.7	96	18.3	16.9	6.3	310	20.9	14.7	2.3	381	15.5	18.9	5.1	70	19.2	10.3	8.6	176	13.5	9.0	4.1
Married/cohabiting	1030	46.8	35.0	19.4	324	50.5	34.3	21.0	760	57.7	36.4	13.3	1641	53.6	29.6	13.8	193	41.1	29.6	23.0	688	56.0	31.9	20.6
Divorced/separated	309	17.3	33.5	27.0	87	12.5	27.3	15.1	72	3.4	40.1	7.1	410	15.4	24.2	10.0	92	19.5	28.8	18.3	198	10.0	37.0	20.3
Widowed	577	22.8	40.0	25.7	112	18.7	39.2	31.3	385	18.0	30.8	20.5	329	15.6	35.8	19.6	117	20.2	42.2	35.7	320	20.5	39.2	22.3
Education																								
No/primary	169	7.4	34.2	36.5	116	18.8	34.7	25.8	110	5.7	17.3	15.8	30	1.4	14.2	32.2	91	18.1	34.4	25.8	65	5.0	27.3	31.0
Secondary	614	26.5	33.2	23.0	24	4.1	22.1	13.1	77	4.1	20.1	18.2	79	4.3	19.3	30.6	204	44.5	25.2	25.0	96	7.6	35.0	14.1
High school	456	19.7	32.7	17.7	354	56.8	31.9	19.5	695	43.9	32.1	9.8	1429	51.5	27.8	12.6	101	22.7	30.0	21.0	686	48.1	32.8	21.7
College/University	881	43.7	33.6	18.9	123	20.0	27.4	15.2	637	45.5	32.5	13.2	1036	36.8	30.4	10.2	72	14.1	27.8	9.2	529	38.7	27.6	14.3
Postgraduate	78	2.8	35.3	8.7	2	0.3	53.6	0	8	0.8	39.9	18.9	187	6.1	25.5	12.5	4	0.6	21.3	0	6	0.6	59.5	8.9
Current job																								
Not working	1030	44.0	36.1	25.7	276	47.0	35.1	21.6	1039	66.2	28.5	11.0	823	37.8	30.7	14.2	278	56.4	30.0	26.7	694	51.1	32.6	20.6
Govern. employee	874	45.1	32.3	16.7	134	19.8	30.7	18.9	217	15.6	38.0	16.4	291	8.6	29.8	14.3	96	21.5	29.8	19.6	466	33.2	32.8	14.9
Non-govn. employee	231	8.3	25.8	13.2	184	29.2	23.7	16.2	38	3.2	39.7	16.2	1308	43.0	24.7	11.1	80	17.3	20.5	13.9	182	13.0	20.4	18.8
Self-employed	46	2.1	30.9	35.4	18	3.0	41.1	20.3	218	14.1	33.4	12.4	288	9.5	30.2	13.5	10	2.8	29.8	0	24	1.5	18.7	19.7
Employer	17	0.5	35.1	23.8	7	1.0	44.2	25.2	15	1.0	27.0	0	51	1.2	38.9	7.8	8	2.0	29.7	8.4	16	1.2	29.4	37.2
Wealth quintile																								
Quintile 1	393	16.5	34.1	19.6	129	21.9	35.3	20.7	335	15.7	19.4	10.3	591	20.5	23.3	13.2	84	16.9	37.0	30.0	276	17.3	36.5	17.6
Quintile 2	464	19.9	31.2	30.0	113	17.9	32.5	26.0	324	18.4	29.4	10.5	576	22.3	32.8	13.4	104	19.3	40.6	22.5	303	19.3	33.7	20.5
Quintile 3	467	21.4	36.1	21.8	126	20.9	24.1	20.9	295	20.7	33.6	11.9	555	18.8	27.6	12.0	97	19.8	29.0	26.0	277	19.5	29.0	20.8
Quintile 4	452	20.1	31.4	13.2	118	18.3	34.8	17.2	293	21.7	34.5	9.4	535	19.0	29.1	9.3	96	20.5	21.4	17.5	266	21.4	28.3	21.3
Quintile 5	422	22.1	34.1	19.3	133	21.0	29.7	13.4	280	23.6	34.4	17.2	504	19.4	27.1	15.7	91	23.5	17.3	15.8	260	22.5	27.9	13.5
Total	2198	100	33.4	20.8	619	100	31.2	19.5	1527	100	31.0	12.1	2761	100	28.1	12.8	472	100	28.3	21.9	1382	100	30.8	18.7

* N represents sample size, % represents weighted percentage

Table 8. Distribution of characteristics and prevalence of overweight and obesity in males, by country

	Russia				Estonia				Georgia				Kazakhstan				Latvia				Ukraine			
			Prevalence				Prevalence				Prevalence				Prevalence				Prevalence				Prevalence	
	Characteristics		Overweight	Obesity	Characteristics		Overweight	Obesity	Characteristics		Overweight	Obesity	Characteristics		Overweight	Obesity	Characteristics		Overweight	Obesity	Characteristics		Overweight	Obesity
	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*
Age																								
18–29	214	15.4	26.1	0.5	56	25.2	23.9	5.3	238	26.3	30.4	2.9	307	30.2	19.2	4.8	59	25.6	23.0	3.2	170	24.8	26.1	1.8
30–44	370	31.8	38.1	10.4	85	28.4	27.9	21.5	301	30.4	43.9	12.9	627	36.4	35.9	5.9	55	30.9	33.0	10.1	197	30.5	39.6	4.4
45–59	335	24.8	48.5	9.1	98	24.9	31.5	14.5	250	21.8	48.5	13.1	370	20.8	38.9	11.8	55	23.2	41.9	14.8	197	24.3	51.7	14.2
60–69	144	12.5	33.7	22.2	63	12.3	45.3	19.0	170	11.8	46.4	14.6	131	8.0	32.6	10.9	50	12.3	42.0	21.1	112	13.1	45.8	15.3
70+	152	15.4	33.8	8.1	52	9.2	32.0	14.4	162	9.7	41.8	2.7	49	4.7	44.8	8.6	33	8.0	50.0	22.3	83	7.3	40.3	14.0
Settings																								
Rural	99	14.0	36.8	21.2	134	32.3	32.7	17.2	669	50.0	41.5	8.6	648	46.7	32.2	7.1	83	35.9	39.6	18.4	178	33.4	39.3	10.7
Urban	1116	86.0	37.8	7.8	220	67.7	29.1	13.5	452	50.0	41.4	10.5	836	53.3	31.1	7.5	169	64.1	32.4	8.0	581	66.6	40.4	7.0
Marital status																								
Never married	201	14.3	24.9	1.8	57	23.0	21.4	6.3	274	25.1	31.5	4.0	225	21.5	17.2	5.7	58	28.4	23.3	3.2	129	18.3	15.2	2.1
Married/cohabiting	743	63.1	40.4	11.5	235	61.7	33.2	18.5	734	69.2	45.7	11.6	1171	73.7	36.0	7.7	138	51.5	37.0	14.0	529	72.1	47.0	9.8
Divorced/separated	164	11.3	44.7	9.6	39	10.6	35.5	10.6	33	1.7	29.5	11.0	55	3.1	30.0	2.6	40	14.0	39.1	20.6	60	6.0	38.6	1.1
Widowed	107	11.3	31.5	9.8	23	4.6	24.0	15.8	80	4.0	35.6	8.3	33	1.7	29.1	21.0	16	6.1	62.7	12.0	41	3.6	29.7	19.6
Education																								
No/primary	54	5.4	44.3	18.8	103	24.4	31.9	7.6	56	3.5	37.3	6.7	19	1.4	17.0	26.9	71	25.7	37.4	11.2	34	2.9	49.1	14.1
Secondary	370	28.7	39.8	8.6	14	4.5	16.1	0	66	3.2	33.7	8.4	57	4.7	41.8	9.5	92	42.1	36.3	13.9	52	6.8	26.1	10.3
High school	260	23.8	30.4	7.0	189	57.5	29.2	17.9	527	46.9	40.8	7.3	741	46.7	30.6	4.7	54	20.5	18.7	10.5	382	53.8	37.8	8.0
College/University	464	38.1	39.1	10.4	47	13.5	37.1	18.8	464	45.7	42.8	12.2	602	42.6	32.6	8.8	35	11.7	53.5	7.5	288	36.1	45.4	7.9
Postgraduate	67	4.1	42.5	13.8	1	0.2	0	0	8	0.7	49.8	0	65	4.8	26.9	12.2	0	0	0	0	3	0.5	27.2	0
Current job																								
Not working	390	34.2	36.9	12.3	165	38.6	29.4	13.1	572	47.5	36.5	6.6	328	25.4	27.2	8.7	130	45.3	34.1	12.1	290	35.2	32.8	8.9
Govern. employee	481	42.3	37.1	10.0	45	14.8	30.0	28.7	159	17.4	45.5	15.1	99	7.9	27.4	2.9	33	13.5	34.1	11.0	259	35.5	44.0	7.2
Non-govn. employee	251	17.5	40.5	4.1	114	36.7	34.5	10.9	47	4.8	33.8	7.7	722	47.3	32.5	6.0	60	25.3	31.1	12.2	161	22.3	44.5	6.4
Self-employed	57	3.7	31.6	9.3	26	8.8	18.3	16.2	318	27.9	48.4	12.2	285	16.9	35.1	10.9	19	11.5	40.9	5.4	34	4.9	42.0	22.4
Employer	36	2.4	46.4	9.4	4	1.1	22.2	0	25	2.4	43.6	0	50	2.5	50.4	8.9	10	4.4	53.4	24.0	15	2.1	42.2	0
Wealth quintile																								
Quintile 1	153	14.6	30.2	9.5	65	17.1	30.8	14.6	205	14.2	38.6	6.3	253	16.0	22.4	2.6	47	18.8	36.3	2.5	134	14.4	40.2	4.4
Quintile 2	215	17.2	35.2	11.7	83	20.2	29.0	8.4	226	15.8	44.7	5.3	274	17.3	28.0	6.5	32	11.8	28.2	7.9	121	15.7	36.7	9.8
Quintile 3	247	21.7	36.9	9.1	68	20.0	24.5	17.5	215	21.1	36.1	9.1	302	19.5	38.3	5.6	56	19.2	45.3	22.4	151	18.8	36.9	11.8
Quintile 4	290	23.3	39.1	11.8	77	24.7	32.9	16.3	232	21.9	42.8	9.8	310	20.2	34.7	12.3	57	24.9	42.9	11.2	178	25.9	42.1	6.3
Quintile 5	310	23.2	43.2	6.8	61	18.0	34.2	16.7	243	27.1	44.1	13.8	345	27.1	32.3	8.2	60	25.3	21.6	12.9	175	25.1	42.3	8.7
Total	1215	100	37.6	9.7	354	100	30.3	14.7	1121	100	41.4	9.5	1484	100	31.6	7.3	252	100	35.0	11.7	759	100	40.0	8.2

* N represents sample size, % represents weighted percentage

Table 9. Distribution of characteristics and prevalence of life-time abstainers and heavy drinkers in females, by country

	Russia				Estonia				Georgia				Kazakhstan				Latvia				Ukraine			
			Prevalence				Prevalence				Prevalence				Prevalence				Prevalence				Prevalence	
	Characteristics		Abstainers	Heavy drinkers	Characteristics		Abstainers	Heavy drinkers	Characteristics		Abstainers	Heavy drinkers	Characteristics		Abstainers	Heavy drinkers	Characteristics		Abstainers	Heavy drinkers	Characteristics		Abstainers	Heavy drinkers
	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*
Age																								
18–29	362	12.2	22.2	4.2	97	20.0	7.3	3.8	277	22.6	56.6	6.8	549	27.3	44.1	2.6	73	19.5	3.7	4.3	250	20.0	31.5	10.3
30–44	618	25.0	21.7	4.6	161	24.6	7.2	2.5	379	27.1	45.6	5.6	1288	33.0	40.4	2.7	127	24.5	8.2	4.2	372	26.0	19.6	18.1
45–59	652	23.4	20.8	2.1	179	23.7	9.2	3.0	322	22.6	41.4	9.2	793	21.7	42.7	3.1	132	23.4	15.8	4.0	372	23.4	19.7	18.7
60–69	467	16.2	35.3	2.3	96	14.6	18.5	1.7	246	13.3	51.7	4.3	187	10.2	46.8	0.2	96	15.2	14.6	0	239	15.1	44.2	13.2
70+	658	23.2	45.0	1.8	95	17.1	32.1	0	309	14.3	57.5	3.9	94	7.8	63.7	0	130	17.4	29.1	0.5	213	15.6	43.5	15.7
Settings																								
Rural	232	11.9	44.1	2.7	206	29.6	10.9	2.8	809	47.9	65.3	3.9	1126	41.2	55.4	1.2	170	31.6	14.2	3.8	308	32.0	33.7	16.7
Urban	2525	88.1	27.1	3.0	422	70.4	14.7	2.1	724	52.1	35.2	8.4	1785	58.8	36.6	3.1	388	68.4	13.5	2.5	1138	68.0	27.4	15.0
Marital status																								
Never married	329	12.2	35.2	3.2	98	18.3	12.3	0	311	20.9	52.7	6.8	399	15.5	45.5	0.7	74	17.2	7.5	8.0	179	13.1	34.9	7.3
Married/cohabiting	1217	44.1	22.4	4.0	327	50.2	10.6	3.3	765	57.8	47.1	7.2	1750	54.0	41.3	2.7	221	40.9	11.5	1.8	701	55.0	24.6	17.3
Divorced/separated	384	16.2	20.0	1.8	90	13.0	12.5	3.8	72	3.4	38.5	10.7	421	15.1	42.4	4.9	105	18.5	10.5	4.3	209	10.2	22.3	18.2
Widowed	827	27.4	42.8	1.8	113	18.5	23.8	0.9	385	17.9	56.4	1.9	341	15.5	55.9	0.2	158	23.4	24.7	0	357	21.7	41.8	14.9
Education																								
No/primary	275	10.0	43.3	1.0	118	19.1	21.9	1.5	110	5.7	66.5	0.9	32	1.5	72.9	2.2	131	21.5	17.7	1.5	88	6.3	50.0	13.2
Secondary	819	28.6	36.5	4.4	24	4.0	15.4	3.4	77	4.1	58.6	0.8	81	4.2	51.3	0.4	237	44.1	13.0	4.4	110	8.1	33.3	17.4
High school	534	18.6	24.3	2.3	357	56.4	12.1	2.3	702	44.2	52.5	8.3	1505	51.2	47.6	2.3	110	21.0	11.0	2.6	705	47.6	27.7	17.3
College/University	1045	40.3	22.7	2.8	127	20.1	9.9	2.8	636	45.3	44.7	5.5	1101	36.8	38.0	2.6	76	12.9	15.0	0.9	537	37.4	27.1	13.6
Postgraduate	84	2.5	29.5	0.5	2	0.3	0	0	8	0.8	4.2	0	192	6.2	43.8	2.1	4	0.5	0	0	6	0.6	47.4	0
Current job																								
Not working	1437	49.3	38.9	2.3	280	47.2	20.2	1.1	1044	66.2	52.4	6.6	877	37.7	52.9	0.6	348	59.8	17.0	1.7	746	52.2	37.6	14.8
Govern. employee	974	40.0	18.0	3.4	138	20.0	7.5	3.5	217	15.6	42.8	5.0	313	8.9	34.5	4.5	105	20.3	9.7	3.8	473	32.3	22.0	18.5
Non-govn. employee	268	7.9	16.9	5.2	185	28.9	8.4	2.7	38	3.1	30.2	9.8	1371	43.0	41.0	2.8	85	15.6	9.2	4.1	185	12.7	19.0	9.4
Self-employed	53	2.0	43.7	3.1	18	2.9	0	4.9	219	14.1	47.9	5.9	297	9.4	35.4	4.1	12	2.6	0	6.0	27	1.7	9.5	30.4
Employer	25	0.8	69.4	0	7	1.0	13.5	14.8	15	1.0	59.6	0	53	1.1	41.6	7.8	8	1.7	11.2	18.5	15	1.1	11.5	16.5
Wealth quintile																								
Quintile 1	618	22.2	43.2	4.0	131	22.0	25.9	2.2	336	15.8	65.6	3.0	623	20.8	58.1	1.9	113	18.7	15.1	2.1	307	18.2	42.3	16.6
Quintile 2	578	19.3	38.9	2.6	115	17.9	18.9	1.0	326	18.4	54.8	3.3	603	22.2	47.9	1.5	130	20.8	21.9	6.0	316	19.2	31.0	18.6
Quintile 3	552	20.1	28.0	1.5	129	21.1	7.6	0	297	20.7	53.7	5.3	584	18.6	43.1	2.7	106	18.7	10.4	1.0	291	20.0	26.2	17.5
Quintile 4	519	18.3	19.5	3.5	118	18.0	6.1	3.9	293	21.6	40.2	10.2	572	19.0	40.0	3.3	108	19.9	11.7	3.3	269	20.7	24.4	11.5
Quintile 5	490	20.2	14.3	3.1	135	21.0	8.6	4.5	281	23.5	40.1	8.0	529	19.3	31.0	2.3	101	22.0	9.6	1.9	263	21.9	25.1	14.1
Total	2757	100	29.2	2.9	628	100	13.6	2.3	1533	100	49.7	6.3	2911	100	44.4	2.3	558	100	13.7	2.9	1446	100	29.4	15.6

* N represents sample size, % represents weighted percentage

Table 10. Distribution of characteristics and prevalence of life-time abstainers and heavy drinkers in males, by country

	Russia				Estonia				Georgia				Kazakhstan				Latvia				Ukraine			
			Prevalence				Prevalence				Prevalence				Prevalence				Prevalence				Prevalence	
	Characteristics		Abstai-ners	Heavy drinkers	Characteristics		Abstai-ners	Heavy drinkers	Characteristics		Abstai-ners	Heavy drinkers	Characteristics		Abstai-ners	Heavy drinkers	Characteristics		Abstai-ners	Heavy drinkers	Characteristics		Abstai-ners	Heavy drinkers
	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*	N*	%*	%*	%*
Age																								
18–29	253	13.5	11.6	16.2	57	25.4	10.6	16.4	236	26.1	14.3	20.6	319	30.8	33.4	10.7	64	24.5	9.2	27.4	173	24.4	15.5	31.2
30–44	423	28.9	7.8	20.0	86	28.4	3.9	16.9	303	30.6	6.2	29.0	650	36.4	23.4	11.3	60	29.8	3.4	20.5	201	30.1	8.6	27.4
45–59	418	25.3	7.6	16.5	99	24.9	6.5	21.0	249	21.7	8.2	26.5	378	20.3	26.3	8.6	64	24.4	3.1	23.1	206	24.5	11.1	35.0
60–69	193	13.8	12.3	17.0	63	12.2	6.3	4.3	170	11.9	12.2	23.1	132	7.8	26.0	4.8	55	12.4	3.8	11.9	111	12.9	14.3	28.7
70+	256	18.5	15.7	12.1	52	9.0	16.1	5.8	163	9.8	18.5	16.6	51	4.7	20.7	4.6	40	8.9	14.7	3.3	94	8.1	33.2	17.8
Settings																								
Rural	119	13.8	12.6	26.3	135	32.3	6.3	16.0	670	50.1	12.1	32.7	656	46.5	28.7	8.0	91	35.2	6.8	17.4	187	34.3	15.0	32.1
Urban	1424	86.2	10.0	15.2	222	67.7	8.3	14.9	451	49.9	9.2	15.9	874	53.5	25.8	11.3	192	64.8	5.2	21.8	598	65.7	12.9	28.3
Marital status																								
Never married	250	13.7	15.5	17.8	59	23.6	7.8	18.9	272	24.8	13.5	24.9	231	21.8	37.6	10.8	67	27.9	10.9	24.0	133	18.2	16.7	34.2
Married/cohabiting	915	62.0	8.3	15.3	236	61.3	8.7	14.2	736	69.4	9.5	25.3	1209	73.5	23.9	9.3	151	50.7	3.6	16.0	546	72.1	12.5	29.6
Divorced/separated	219	12.8	12.5	30.8	39	10.5	0	17.0	33	1.8	9.2	16.8	56	3.0	28.7	8.6	46	14.7	0	17.3	60	5.8	10.8	19.4
Widowed	159	11.5	12.7	7.8	23	4.6	10.2	7.2	80	4.0	12.5	7.2	34	1.7	31.4	18.1	19	6.7	14.3	43.3	46	3.8	24.3	24.3
Education																								
No/primary	89	6.4	23.6	17.1	103	24.1	8.5	21.8	57	3.5	22.3	17.3	20	1.4	62.8	2.8	85	28.0	7.1	22.5	37	3.2	32.1	23.3
Secondary	479	30.6	11.0	21.9	14	4.5	12.9	14.9	66	3.2	11.0	18.3	59	4.7	10.6	11.4	102	41.0	5.2	21.1	54	6.7	19.8	36.7
High school	318	22.7	8.5	12.1	191	57.7	5.8	13.3	528	47.0	10.4	25.1	760	46.1	29.1	8.8	60	20.1	5.7	19.2	393	53.1	11.3	28.0
College/University	584	36.8	7.7	16.0	48	13.6	11.1	12.2	462	45.6	10.1	24.9	624	42.7	26.0	9.9	36	10.8	4.9	13.0	298	36.6	14.4	30.8
Postgraduate	73	3.5	20.1	8.4	1	0.2	100.0	0	8	0.7	0	0	67	5.2	24.9	17.3	0	0	0	0	3	0.4	0	59.2
Current job																								
Not working	574	39.2	14.4	18.8	167	39.0	10.4	16.3	572	47.6	14.7	21.3	343	25.4	37.3	4.7	153	48.0	9.6	13.9	311	37.0	19.0	29.3
Govern. employee	562	37.6	7.1	14.2	45	14.6	0	14.0	160	17.5	6.5	22.3	107	8.2	23.3	13.2	36	13.3	2.4	33.8	262	34.8	11.5	27.8
Non-govn. employee	302	17.5	8.8	17.2	115	36.6	6.6	12.8	46	4.6	11.5	26.3	740	47.1	23.6	11.0	64	24.0	3.6	25.6	164	21.7	8.7	32.5
Self-employed	65	3.6	10.0	15.8	26	8.7	13.6	21.6	318	28.0	6.9	30.9	289	16.7	24.4	13.2	20	10.7	0	23.6	33	4.5	15.2	35.5
Employer	40	2.1	5.2	20.5	4	1.1	0	26.2	25	2.4	2.1	19.9	51	2.5	21.5	4.4	10	4.0	0	9.8	15	2.0	1.8	22.7
Wealth quintile																								
Quintile 1	248	18.5	10.7	24.3	66	17.4	13.0	17.2	204	14.2	14.5	27.2	267	16.3	31.6	12.1	57	20.0	2.0	35.8	144	15.0	18.4	35.6
Quintile 2	284	18.1	19.4	16.7	83	20.0	9.9	16.8	228	15.9	13.5	27.0	283	17.3	28.3	5.4	43	14.2	14.8	17.7	128	15.7	13.8	24.6
Quintile 3	307	21.0	9.6	12.5	68	19.7	4.2	10.3	215	21.1	7.5	24.1	306	19.1	23.3	10.6	59	18.2	3.2	17.3	150	18.0	22.2	37.2
Quintile 4	337	20.9	6.1	17.9	78	24.7	2.1	19.9	233	22.0	6.7	28.4	316	20.0	30.5	11.7	60	23.7	3.7	17.2	183	25.7	7.7	28.5
Quintile 5	367	21.4	7.2	13.2	62	18.1	11.4	10.8	241	26.9	12.5	18.1	358	27.4	24.0	9.1	64	23.9	7.7	13.9	180	25.6	10.5	25.0
Total	1543	100	10.3	16.7	357	100	7.7	15.3	1121	100	10.6	24.3	1530	100	27.2	9.8	283	100	5.8	20.2	785	100	13.6	29.6

* N represents sample size, % represents weighted percentage

11 APPENDIX 2

Table 11. Baseline characteristics of general and final study population, and observations with missing body mass index (BMI)

Characteristics	General study population		Final study population		BMI missing	
	N	%	N	%	N	%
Country						
Russia	4307	27.8	3413	24.1	894	65.9
Estonia	986	6.4	973	6.9	13	1.0
Georgia	2659	17.2	2648	18.7	11	0.8
Kazakhstan	4444	28.7	4245	30.0	199	14.7
Latvia	844	5.4	724	5.1	120	8.8
Ukraine	2261	14.6	2141	15.1	120	8.8
Sex						
Female	9864	63.6	8959	63.3	905	66.7
Male	5637	36.4	5185	36.7	452	33.3
Age						
18–29	2727	17.6	2591	18.3	136	10.0
30–44	4677	30.2	4419	31.2	258	19.0
45–59	3873	25.0	3594	25.4	279	20.6
60–69	2063	13.3	1841	13.0	222	16.4
70+	2161	13.9	1699	12.0	462	34.1
Settings						
Rural	4717	30.4	4496	31.8	221	16.3
Urban	10784	69.6	9648	68.2	1136	83.7
Marital status						
Never married	2413	15.6	2259	16.0	154	11.4
Married/cohabiting	8798	56.8	8186	57.9	612	45.1
Divorced/separated	1743	11.2	1559	11.0	184	13.6
Widowed	2547	16.4	2140	15.1	407	30.0
Education						
No/primary	1151	7.4	918	6.5	233	17.2
Secondary	2127	13.7	1745	12.3	382	28.2
High school	6180	39.9	5874	41.5	306	22.6
College/University	5595	36.1	5178	36.6	417	30.7
Postgraduate	448	2.9	429	3.0	19	1.4
Current job						
Not working	6874	44.4	6015	42.5	859	63.3
Govern. employee	3405	22.0	3154	22.3	251	18.5
Non-govn. employee	3574	23.1	3378	23.9	196	14.4
Self-employed	1379	8.9	1343	9.5	36	2.7
Employer	269	1.7	254	1.8	15	1.1
Wealth quintile						
Quintile 1	3123	20.2	2665	18.8	458	33.8
Quintile 2	3128	20.2	2835	20.0	293	21.6
Quintile 3	3072	19.8	2856	20.2	216	15.9
Quintile 4	3094	20.0	2904	20.5	190	14.0
Quintile 5	3084	19.9	2884	20.4	200	14.7
Total	15501	100	14144	100	1357	100

Table 12. Baseline characteristics of general and final study population, and observations with missing multiple risk factors (MRF)

Characteristics	General study population*		Final study population		MRF missing	
	N	%	N	%	N	%
Country						
Russia	3391	26.8	2838	24.3	553	55.3
Estonia	838	6.6	828	7.1	10	1.0
Georgia	2186	17.3	2152	18.5	34	3.4
Kazakhstan	4299	33.9	4101	35.2	198	19.8
Ukraine	1952	15.4	1747	15.0	205	20.5
Sex						
Female	7928	62.6	7303	62.6	625	62.5
Male	4738	37.4	4363	37.4	375	37.5
Age						
18–29	2589	20.4	2428	20.8	161	16.1
30–44	4489	35.4	4195	36.0	294	29.4
45–59	3676	29.0	3372	28.9	304	30.4
60–69	1912	15.1	1671	14.3	241	24.1
Settings						
Rural	3885	30.7	3726	31.9	159	15.9
Urban	8781	69.3	7940	68.1	841	84.1
Marital status						
Never married	2165	17.1	2017	17.3	148	14.8
Married/cohabiting	7791	61.5	7226	61.9	565	56.5
Divorced/separated	1512	11.9	1350	11.6	162	16.2
Widowed	1198	9.5	1073	9.2	125	12.5
Education						
No/primary	320	2.5	285	2.4	35	3.5
Secondary	1215	9.6	1044	9.0	171	17.1
High school	5596	44.2	5247	45.0	349	34.9
College/University	5116	40.4	4688	40.2	428	42.8
Postgraduate	419	3.3	402	3.5	17	1.7
Current job						
Not working	4480	35.4	4061	34.8	419	41.9
Govern. employee	3223	25.5	2935	25.2	288	28.8
Non-govn. employee	3414	27.0	3187	27.3	227	22.7
Self-employed	1300	10.3	1256	10.8	44	4.4
Employer	249	2.0	227	2.0	22	2.2
Wealth quintile						
Quintile 1	2121	16.8	1903	16.3	218	21.8
Quintile 2	2355	18.6	2170	18.6	185	18.5
Quintile 3	2602	20.5	2408	20.6	194	19.4
Quintile 4	2777	21.9	2579	22.1	198	19.8
Quintile 5	2811	22.2	2606	22.3	205	20.5
Total	12666	100	11666	100	1000	100

*General study population without Latvia and age group 70+