Life Course Socioeconomic Circumstances and Cardiovascular Disease Risk in Central and Eastern Europe

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Declaration

I, Elizabeth Alice Webb, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Abstract

This thesis investigated the influences of early life socioeconomic circumstances (SEC) on cardiovascular disease (CVD) risk in Russia, Poland and the Czech Republic. Early life SEC are inversely associated with CVD risk factors and outcomes in western countries, but the same relationships have not been evaluated in Central and Eastern Europe. CVD is a major cause of morbidity and mortality in this region.

I used data from the first round of the HAPIEE (Health, Alcohol and Psychosocial factors In Eastern Europe) study, which randomly selected men and women aged 45 to 69 years from population registers in Novosibirsk (Russia), Krakow (Poland) and six towns in the Czech Republic. Nearly 29,000 people were recruited, with an overall response rate of 61%.

Blood pressure (systolic and diastolic blood pressure, hypertension), lipids (total and HDL cholesterol), adiposity (BMI, waist circumference, waist to hip ratio), smoking habits (starting and quitting) and CVD risk, as measured by SCORE, were assessed in relation to retrospectively collected direct and proxy measures of early life SEC.

The reliability of adult anthropometric measures (height, leg length and trunk length) as proxy markers of early life SEC was confirmed by investigating the relationships with three direct measures of early life SEC (maternal and paternal education and household ownership of six assets at age ten years).

Higher childhood SEC were linked to an increased likelihood of women starting smoking, a decreased likelihood of men quitting smoking, and reduced adiposity in both genders. The remaining CVD risk factors and overall CVD risk did not appear to be consistently influenced by childhood SEC.

The results of the thesis suggest that early life socioeconomic influences on classical CVD risk may not be consistent across cultures, and that they may vary by the stage of the epidemiological transition and by local context.

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Table of contents

List of Tables

List of Figures

Chapter 1. Introduction

Central and Eastern Europe (CEE)[a] has high rates of morbidity and mortality and a substantial proportion of the burden of ill health, and of the excess mortality compared to Western Europe, is due to cardiovascular disease (CVD). Evidence from Western European populations shows a link between CVD and the established risk factors, smoking, obesity, blood pressure and cholesterol, on the one hand, and between these risk factors and socioeconomic circumstances (SEC), both in childhood and adulthood, on the other.

The impact of adult SEC upon CVD in CEE has been shown to be similar to that observed in Western Europe, but there has been virtually no research into the influence of early life SEC. Socio-political changes in CEE over the last half century have profoundly influenced both the social structure of societies in the region and the SEC trajectories of individuals. The relationship with SEC earlier in life is therefore of great interest. This thesis explores the socioeconomic predictors of CVD risk in middle and older age, with a particular focus on early life SEC, in three countries in CEE.

Data are drawn from the first round of the HAPIEE (Health, Alcohol and Psychosocial factors In Eastern Europe) study. The study was established to explore the drivers of the high rates of CVD in the region. Comprehensive data were collected on nearly 29000 men and women aged 45 to 69 in 2002-2005, living in Novosibirsk in Russia, Krakow in Poland and six towns in the Czech Republic.

The thesis investigates the relationships between different measures of childhood SEC and the association of childhood SEC with four classical CVD risk factors: smoking, obesity, blood pressure and cholesterol, and determines whether these effects of childhood SEC are independent of those of later life SEC. It also explores the relationship of early life SEC with an overall CVD risk score calculated from these risk factors.

The thesis is structured as follows. The second chapter provides a general literature review on the mortality gap between Eastern and Western Europe, with a focus on recent

[a] Central and Eastern Europe (CEE) has been defined as the 12 formerly planned economies in Europe which were not part of the USSR, and includes Poland and the Czech Republic. In this

trends in mortality in Russia, Poland and the Czech Republic. It summarises the life course approach to epidemiology, the trends and transitions which are central to this and the mechanisms through which early life SEC might impact upon CVD risk. This general literature review is by no means exhaustive, and the specific literature is reviewed in each chapter.

The third chapter outlines the aims and objectives of the thesis, and the conceptual framework within which the thesis is conceived.

Chapter four gives further details of the HAPIEE study and the data collection methods. It outlines the measurement, calculation and coding of the variables used in the analyses, and gives a general statistical analysis plan for the thesis. Specific details on the methods are given, when necessary, in the relevant chapters.

Chapters five to eleven are results chapters, which are ‘self-contained’, that is, each includes a review of the literature on the topic of the chapter, as well as specific objectives, methods, results and discussion sections.

The first results chapter, chapter five, discusses the concept of SEC, and explores the associations between the SEC measures used throughout the thesis. It investigates and discusses the association between maternal and paternal education in terms of partner choice and the association between parental education and childhood asset ownership in terms of the financial returns to education. The potential use of adult anthropometric measures as proxy measures for childhood SEC is investigated, as is intergenerational educational social mobility in these study populations.

Chapter six investigates the secular trends in SEC and height, by determining the associations of birth date with childhood assets and with adult height.

The seventh to eleventh chapters describe the distribution of CVD risk factors in the study populations, and investigate the life course socioeconomic predictors of these outcomes. The chapters focus, in order, on blood pressure, cholesterol, smoking, adiposity and a composite measure of CVD mortality risk, the European Society of Cardiology’s CVD risk

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thesis CEE is used to refer to all the European countries which had planned economies, including Russia.

score. This score calculates a ten year percentage risk of CVD mortality based on cholesterol, blood pressure and smoking, plus age and gender

The final chapter summarises the findings of the thesis and provides an overall discussion which explores the impact of the work, as well as its potential limitations, and outlines necessary further research.

Chapter 2. Background and concepts

This chapter provides a general background and literature review for the topics covered by the thesis. It discusses recent mortality trends in CEE, with a particular focus on the dramatic changes in Russia. It outlines the principles of life course epidemiology and discusses the particular interest of applying the methodology to a CEE setting. The chapter summarises the theory of the epidemiologic and nutritional transitions and the impact of these upon the relationship between life course SEC and health. Specific literature reviews with further detail on each of the main outcomes investigated in the thesis are provided in subsequent chapters.

2.1 Mortality in Central and Eastern Europe

A political and ideological divergence occurred after WWII when Europe divided into the ‘capitalist’ west and the ‘socialist’[b] east. In spite of the political differences, in the immediate post-war period the two regions initially showed similar mortality trends.[1] Infant mortality and mortality from infectious diseases fell, and there were gradual increases in life expectancy across Europe until the mid-1960s.[1] Since that time, however, mortality rates in three regions within Europe have followed deviating paths.

Mortality rates decreased steadily in Western Europe, and between 1970 and 1998 there was a mean gain in life expectancy at birth of 6.4 years in the EU member states (members prior to 2004).[2] Over the same period, a plateau in CEE (excluding Russia) resulted in mean life expectancy at birth in CEE being 5.9 years lower than in the EU in 1998.[2] In Russia, the same period witnessed large fluctuations in life expectancy.[1-3] The gap in life expectancy at birth between the Commonwealth of Independent States (CIS)[c] and the EU member states (prior to 2004) was 10.3 years in 1998 and has increased since to 12.7 years in 2005.[4]

A large proportion of the growing mortality gap between Eastern and Western Europe has been attributable to deaths from CVD. Figure 2.1 shows the cause components of the

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[b] The communist regimes of the USSR, Poland and Czechoslovakia in the twentieth century are referred to as ‘socialist’ throughout the thesis. This is not intended to imply success or otherwise of these regimes in achieving socialist goals.

mortality gap between Russia and England and Wales between 1970 and 1993, the magnitude of which has increased throughout this period, other than in 1987.[5] The largest relative contributor has consistently been CVD mortality, closely followed amongst males by violent deaths. Other data show that in 1992, 54% of the 6.1 year gap in life expectancy between CEE and the former Soviet Union (FSU) and the rest of Europe was due to CVD mortality.[6] In 2000 CEE countries had mean standardized mortality ratios (SMRs) for ischaemic heart disease and cerebrovascular disease of two and nearly four times as high as those of other European countries.[7] In 2005 the standardised death rate (SDR) for diseases of the circulatory system was 2.3 times higher in the CEE countries which acceded to the EU in 2004, and 3.7 times higher in the CIS countries, than the countries which were EU member states in 2004.[4]

Recent trends in mortality in the countries included in this thesis, Russia, Poland and the Czech Republic, are discussed in more detail below.

[c] The Commonwealth of Independent States comprises eleven former Soviet Republics, including Russia.

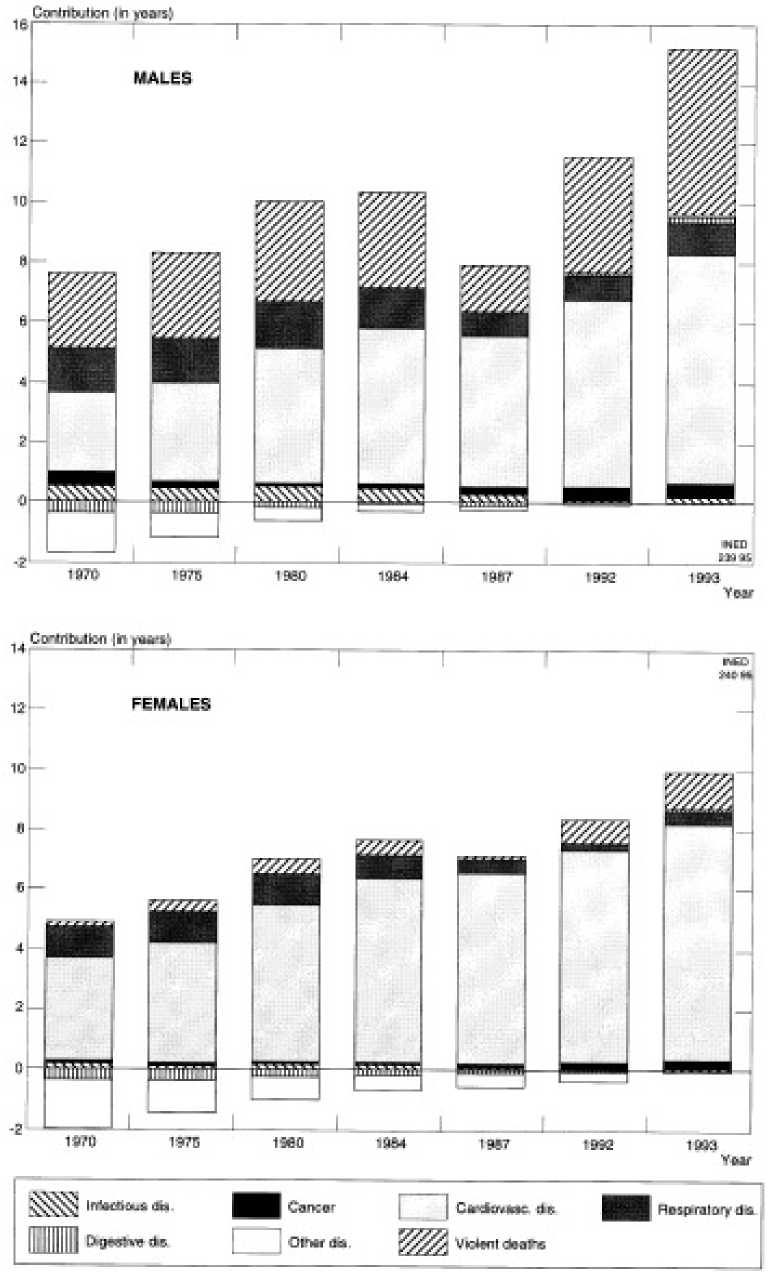

Figure 2.1. Cause components of the difference in life expectancy between Russia and England and Wales, 1970-1993, from Shkolnikov et al, 1996[5]

2.1.1 Russia

There have been unstable patterns in mortality in Russia and the other states of the FSU since the 1970s, and fluctuations have been particularly dramatic since the mid-1980s. Figures 2.2 and 2.3 show male and female life expectancy at 15 in Russia between 1980 and 2005, in comparison with Poland, the Czech Republic and the EU member states (prior to the accession of CEE countries on May 1st 2004). There were fluctuations throughout the period, with overall decreases in life expectancy.

Life expectancy for both men and women in Russia increased from 1984 to 1987. Some commentators have linked this improvement to Gorbachev's attempts to reform the Soviet Union, and particularly to reduce alcohol consumption during the period of *glasnost*, from 1985,[8-12] although the pre-eminence of alcohol's influence on mortality in Russia has been disputed.[13-16] From 1987 until 1995 life expectancy declined, initially gradually and then more rapidly, following the collapse of the Soviet Union in 1991. Between 1990 and 1994 men's and women's life expectancies decreased by 6.1 and 3.2 years and age-adjusted mortality rates rose by 36% and 23%, respectively.[17] In 1995 life expectancy at birth was at it's lowest in the period, at 57.6 years for men and 71.2 for women,[18] then it increased until the rouble reform in 1998, and fell again until 2003, when it was 58.7 and 71.9 years for men and women, respectively.[18]

A particularly unusual aspect of the recent trends in Russia has been the fact that the largest changes have been amongst young and middle-aged adults.[8;17] The mortality rate for men aged 35-44 years almost doubled between 1990 and 1994, and for women in the same age group it increased by more than 70%.[17] The increase in mortality amongst 25-54 year olds contributed 55% of the decrease in life expectancy between 1990 and 1994. In contrast, the changes amongst children (≤ 14 years) and the elderly (≥ 65 years) together contributed less than 20%.[17]

The gender gap in life expectancy in Russia is of a far greater magnitude than in other European countries. In the UK the gap in life expectancy at birth gradually decreased from 6.3 to 4.3 years between 1970 and 2005. At its smallest, in 1987, the gender gap in Russia was 9.5 years, it peaked at 13.5 years in 1994 (figure 2.4),[4;8;17] and since the millennium it has not fallen below 13 years.[4;18]

This large gender gap in life expectancy is largely a numerical artefact, however, since the differences in life expectancy reflect absolute differences in mortality rates, rather than relative differences.[19] Despite the large gender gap in life expectancy, the trends observed amongst men and women have followed similar patterns. While the absolute changes have been greater amongst men (figure 2.5), men's and women's mortality rate ratios comparing 1986 to 1994, 1994 to 1998 and 1998 to 2003, are of similar magnitudes.[4]

In addition to low overall life expectancy in Russia, healthy life expectancy is also low. This disproportionately affects women: at 65 women have a life expectancy of 15.2 years compared to men's 11.4 years, but healthy life expectancies are 5.8 and 6.7 years, respectively.[20] At 65, women have less than 50% probability of being healthy, whilst for men it is around 70%.[20]

Importantly, changes in life expectancy have been dependent upon SEC. Between the mid 1980s and mid 1990s, there was little change in mortality rates amongst men with university education, but a 75% increased mortality risk amongst men who did not complete high school.[21] This 'mortality advantage' associated with higher levels of education has also been observed amongst women.[18;22] The mortality gap between high and low educated groups continued to increase until at least 2001[18] and has been of a similar magnitude to that observed in western countries.[22]

2.1.2 Poland and the Czech Republic

The changes in mortality in Poland and the Czech Republic during and since transition have been much less dramatic than those observed in Russia and the former USSR, and since the trends have been similar, they will be described together.

Poland had a 1% reduction in age-standardised male mortality between 1980 and 1992, whilst other former socialist countries, including Bulgaria, Hungary and Romania, experienced increases.[23] These reductions were, however, of a much smaller magnitude than western European countries. The equivalent statistic amongst women was a more substantial reduction (6.4%), and was of comparable magnitude to those in the other former socialist countries.[23]

Increases in male life expectancy at birth in Poland in the 1980s were due to reduced infant mortality, whilst mortality increased amongst men aged 45-64,[24] so life expectancy at 15 fluctuated and decreased during the decade (figure 2.2).[4] Amongst women, there were improvements in older age groups (≥ 50 years) as well as infants[24] but life expectancy at 15 increased by only 0.5 years across the decade (figure 2.3).[4] There were increases in mortality from circulatory diseases amongst men,[24] and ischaemic heart disease and cerebrovascular disease in both genders.[23]

In the period immediately preceding Poland's transition to a market economy (1988-90), there were falls in life expectancy at birth amongst men and women of, respectively, 1.0 and 0.3 years, which were predominantly due to increasing mortality from circulatory diseases and, amongst men, from external causes.[25] Post-transition, Poland experienced improvements in life expectancy, of 2.0 and 1.2 years for men and women by 1997.[25] The majority of the improvement amongst men was attributable to reduced mortality amongst those aged 40-64, and secondarily amongst young men aged 15-39, whilst amongst women the changes were greatest in those aged over 65 years.[25]

Since the early 1990s, Polish men and women experienced gradual improvements in life expectancy (figures 2.2 and 2.3).[4] Middle to older aged men and women (45-74 years) showed annual mortality decreases of 1.8% and 2.0% between 1991 and 2000.[26]

Similarly to the situation in Poland, there were long-term reductions in infant mortality in what was then Czechoslovakia, however increases in mortality from circulatory diseases, mainly affecting men aged 45-69, lead to a 0.5 year decrease in male life expectancy at birth between 1979 and 1990.[24]

Between 1984 and 1999, Czech life expectancy at age 40 increased from 30.0 to 32.6 years for men and from 35.9 to 37.7 years for women.[27] This improvement also applies to life expectancy at 15, and was steady between 1986 and 2005, apart from a small reduction amongst men immediately following transition (figures 2.2 and 2.3).[4] Deaths due to circulatory diseases amongst men fell continuously between 1991 and 1999.[28]

In 2005 life expectancy at birth in the Czech Republic was 73.0 years for men and 79.3 years for women, respectively. These figures are 3.8 and 3.2 years lower than the EU averages (member states prior to 2004).[4] The gender gap in life expectancy in the Czech

Republic did not change substantially between 1970 and 2005, but fluctuated between 6.4 and 7.9 years and peaked in 1990 when male life expectancy fell.[4]

Since transition to a market economy, socioeconomic differentials in mortality have increased in the Czech Republic.[29] Changes in life expectancy between 1984 and 1999 were differential by educational level. Men and women with middle levels of education experienced the greatest increases in life expectancy at 40 (3.2 years for men and 2.4 years for women), whilst the smallest increases were amongst those with low education (2.1 and 1.5 years) whilst improvement in life expectancy amongst those with high education was approximately the same as the average for the population.[27]

Improvements in mortality in Poland and the Czech Republic in the period since transition seem to have been related to changes in lifestyle and diet, as the consumption of fresh fruits and vegetables and the proportion of vegetable to animal fats increased[30;31] and rates of smoking stabilised or decreased.[32;33]

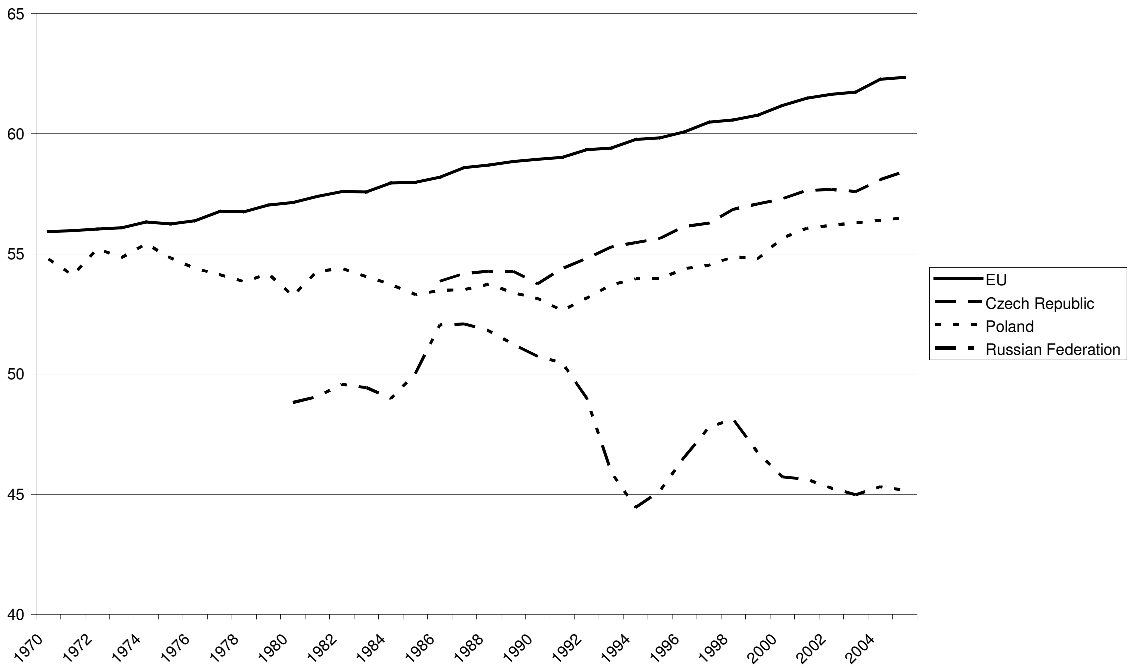

Figure 2.2. Male life expectancy at age 15 (years), in Russia, Poland, the Czech Republic and the European Union,[d] 1970-2005

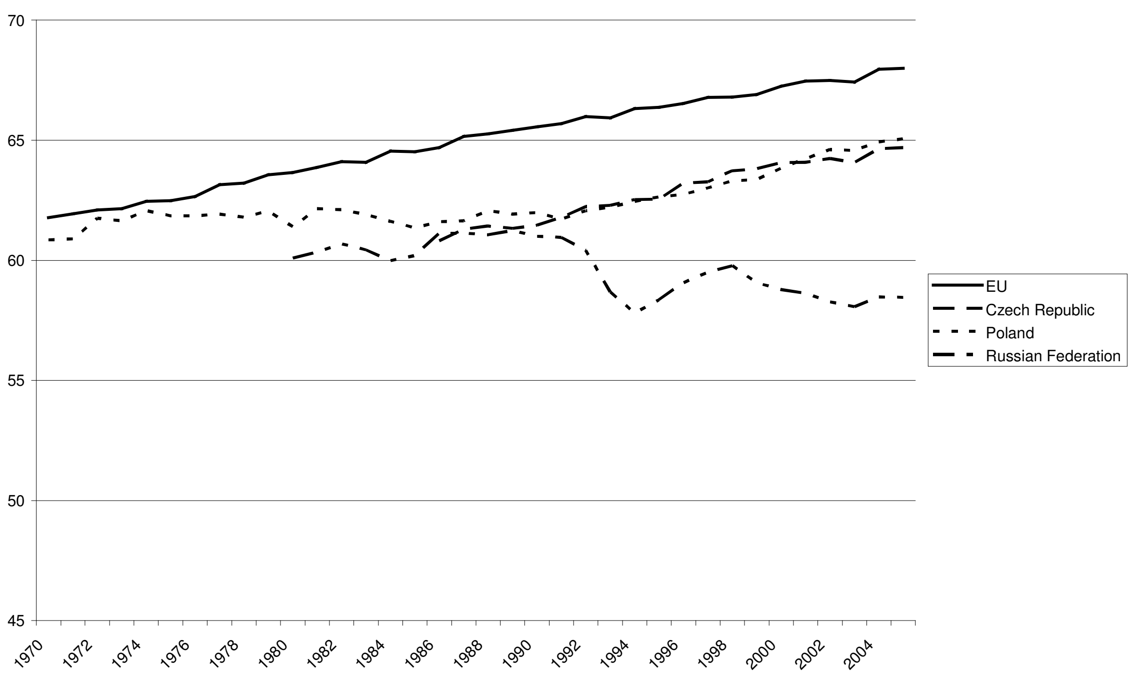

Figure 2.3. Female life expectancy at age 15 (years), in Russia, Poland, the Czech Republic and the European Union,[d] 1970-2005

[d] The 15 EU member states prior to the accession of CEE countries on 1st May 2004.

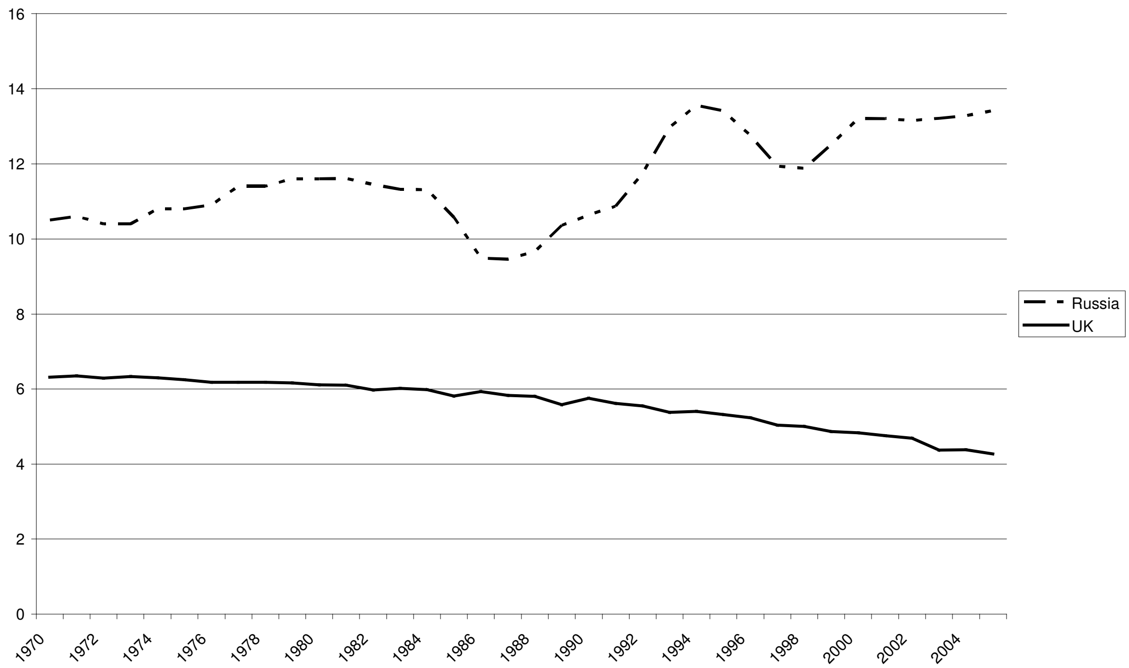

Figure 2.4. Gender gap in life expectancy at birth (years), comparing Russia to the UK, 1970-2005

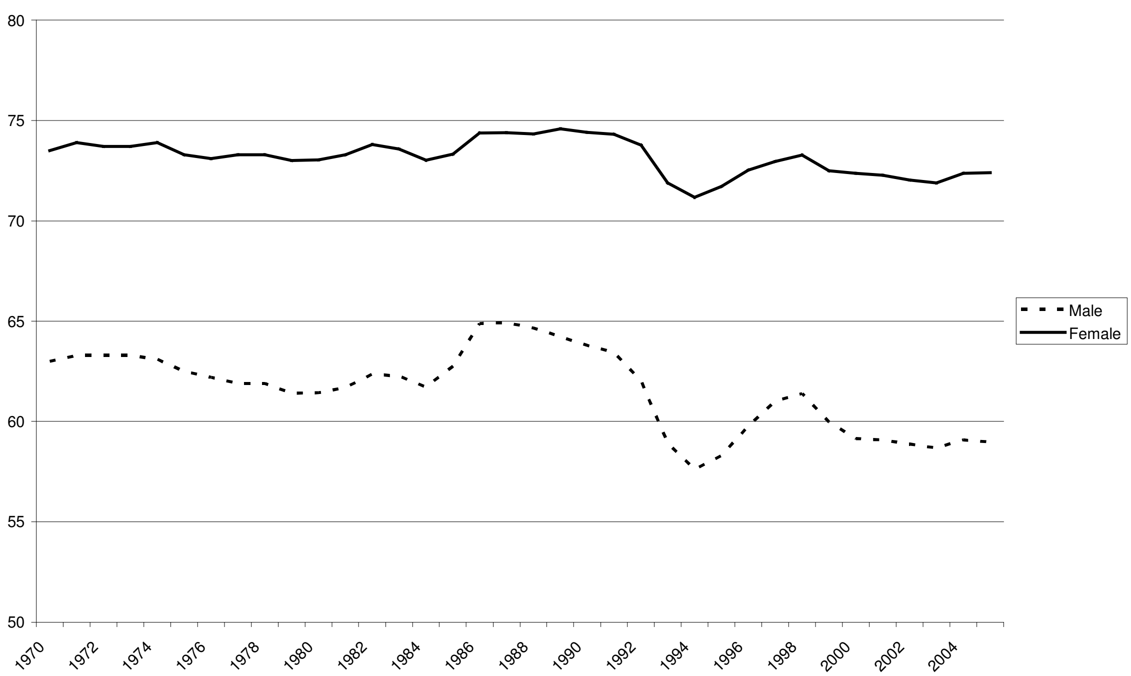

Figure 2.5. Life expectancy at birth in the Russian Federation (years), comparing men and women, 1970-2005

2.2 Childhood socioeconomic circumstances and health

The previous section outlined the mortality patterns in Russia, Poland and the Czech Republic over the last thirty years. Commentators have explored possible determinants of these patterns, and have emphasised proximal causes including alcohol consumption[8;11;12;14;16;34;35] and socioeconomic characteristics,[18;21;22;35;36] which have been shown to explain a substantial proportion of the gap. The increases in mortality in the period of transition to capitalism (section 2.1) may be reflective of economic changes over the same period.

During transition there were large decreases in real wages, which fell 42%, 26% and 12% in Russia, Poland and the Czech Republic, respectively, between 1988 and 1993,[37] and increases in unemployment. Additionally, income inequality increased in all CEE states in this period, so that they moved from levels of inequality similar to the Scandinavian countries to levels similar to the UK.[38] In 1989 the richest quintile in Russia earned 3.1 times that of the poorest quintile, but by 1999 this had increased to 8.8 times, whilst the less dramatic equivalent figures for Poland were 3.3 and 4.3.[28] Russia's gini index increased from 29 in the early 1990s to 40 in 1997,[39] and in 2007 it was still stable at 40, whilst gini indexes for the Czech Republic and Poland were 25 and 35, repectively.[28] This hierarchy of equality, with the Czech Republic the most equal country of the three and Russia the least so, is the same in the 1960s.[40]

2.2.1 Life course epidemiology

In western countries the study of life course epidemiology has generated a large body of evidence to support an impact of SEC in early life on morbidity and mortality.[41-46] Life course epidemiology is defined by Kuh and Ben Shlomo[44] as follows:

> 'Life course epidemiology is the study of long-term biological, behavioural, and psychosocial processes that link adult health and disease risk to physical or social exposures acting during gestation, childhood, adolescence, earlier in adult life, or across generations.'

This methodological approach recognises the influence that exposures throughout life can have on disease risk in later life. Early life influences on adult health have been recognised since the beginning of the twentieth century and during the first forty years of that century they were a major influence on British public health policy.[47] After the Second World War the focus of CVD epidemiology shifted to adult exposures and lifestyle habits, as researchers looked to identify the cause behind the rise in incidence of CVD and other non-communicable diseases.[47] In the early 1980s evidence of the long latency of CVD[48] lead to a shift in the emphasis of research to exposures at all life stages and particularly earlier life circumstances.

In their summary of the life course approach, Ben Shlomo and Kuh discuss two main models in use in life course epidemiology: the critical period model and the accumulation of risk model,[49] whilst other commentators have referred to three[50] or four models,[51] as discussed below.

According to Ben Scholmo and Kuh, the *critical periods model* assumes that there are stages in the life course when development of body systems is rapidly occurring, and when these biological systems are vulnerable to the effects of external factors.[49] This model shares similarities with the *latent effects model*, which hypothesises that early life experiences can affect adult disease risk in an irreversible manner, irrespective of later experiences.[50;51] The strict definition of a critical period requires that changes are irreversible; looser definitions allow for ‘sensitive periods’ during which changes occur which may be later modified by further exposures.[49] Ben Shlomo and Kuh suggest that critical periods are likely to be related to disease risk associated with biological systems and their development, and that sensitive periods may be more relevant to risk associated with development of behaviour.[49]

The *accumulation of risk model*, also referred to as the cumulative effects model,[50;51] suggests that there are influences on the body systems throughout the life course that will affect health outcomes in an additive manner, irrespective of the stage at which they occur.[49] There may be periods when systems are more or less sensitive to external effects, but exposure at any stage leads to risk accumulation, with increasing risk associated with increasing number and/or duration of exposures.

There are several variations of the accumulation of risk model. There may be independent insults which co-occur in an individual by chance, or risk clustering, whereby an individual is likely to be exposed to several associated insults, such as those associated with their SEC. Another theory is that of chains of risk, whereby one exposure tends to lead to another. This has been referred to as the *pathway model* by other authors, who posit that early life circumstances may determine an individual's 'life trajectory' which in turn determines health outcomes in adulthood.[50]

Related to the life course approach is the *social mobility model*[51] in which, in addition to the effects of life course SEC, there may be an effect of social mobility on disease risk. An example of how social mobility may act upon disease risk is suggested by Forsdahl,[52] who hypothesises that increased CVD risk may be associated with deprived SEC in early life followed by an affluent lifestyle in later life.

These life course models have been tested in a growing body of research and, in 2005, Pollitt and colleagues' systematic review of the literature on life course SEC and CVD[51] categorised studies by life course model, and summarised the evidence in support of each model. They found consistent evidence for a negative impact of disadvantage in both early and later life on CVD risk, and in support of the accumulation hypothesis. There was not consistent evidence, however, for an effect of social mobility on CVD independent of the effects of SEC at each life stage. Further research has also provided support for the accumulation hypothesis.[53;54]

Hallqvist and colleagues used data from a population based study in Sweden to attempt to separate the effects of critical periods, accumulation and social mobility in the relationship between SEC and myocardial infarction.[55] They found evidence to support all three models, and argued that with data on SEC at only three points across the life course they were ill-equipped to separate the effects of the models, at least statistically, and that they were all mutually confounded. They compared the problem to that of separating the effects of age, period and cohort effects, and concluded that interpretation of results should depend upon knowledge of specific causal mechanisms, rather than merely on the statistical associations observed.

2.2.2 Transitions and trends

When using life course methodology, it is imperative to consider, as well as individual circumstances and characteristics, the broader environment in which a person has lived. The study of secular trends and transitions can be useful when making comparisons between societies and across time. The demographic transition,[56] which states that, as societies modernise, they progress from high fertility and mortality to low fertility and mortality, was first described in 1934, and the nutrition[57] and epidemiologic[58] transitions are both closely related. These generalised transitions and trends are based upon the experience of western societies, so their generalisability to other settings may be limited. However, they provide a useful guide, and variation from the western experience has been used to modify the theory.

The *epidemiologic transition*, as described by Omran[58] is central to the study of life course social influences on health. It takes an interdisciplinary approach to discuss patterns of disease in populations along with their causes, be they social, economic or demographic. The four main stages of the transition are described below:

1. Age of pestilence and famine
    - Young population with high fertility and mortality
    - Mainly living in rural areas
    - Labour intensive, subsistence economy
    - Poor quality food and sanitation
    - High infant mortality, most mortality due to infectious and deficiency diseases

2. Early age of receding pandemics
    - High fertility and mortality, population starting to age slightly
    - Exodus to cities begins
    - Early industrialization
    - Poor but improving nutrition and sanitation
    - Infectious and deficiency diseases, plus industrial disease

3. Late age of receding pandemics
    - Mortality declines leading to population explosion and decades later, fertility declines
    - Continued rural to urban migration
    - Sustained economic growth
    - Women's employment outside the home increases
    - Hygiene, sanitation and nutrition improve
    - Non-communicable disease starts to become more significant

4. Age of degenerative and man-made disease
    - Mortality and fertility decline, and population growth slows
    - Mostly living in urban centres
    - Knowledge, rather than production, based economy
    - Over-nutrition through high fat foods
    - Heart disease, cancer and stroke are major causes of mortality

The nutritional transition is closely linked to the epidemiologic transition, and describes the progress of human societies through changes in diet and nutrition. In the third stage of the transition, which is analogous to the epidemiologic transition's age of degenerative diseases, salt and fat consumption increase, activity levels decrease and obesity and CVD are prevalent.[57]

Morbidity and mortality are subject to inequalities, and the social gradient in health extends across the socioeconomic spectrum so that relative as well as absolute poverty determines health.[59-63] However, passage through the stages of the epidemiologic transition involves changes in the social gradient, particularly of diseases which are closely linked to health behaviours, over time. Wealthier and more highly educated people are early adopters of negative health behaviours such as smoking and high fat diets, but they also quickly modify these habits when their negative effects are understood. Those who are uneducated or poor develop the unhealthy behaviours later and take longer to quit them.[64] In the age of receding pandemics (the nutritional transition's age of receding famine), therefore, non-communicable diseases tend to be considered to be diseases of affluence and are disproportionately experienced by more advantaged people,[65] whilst the opposite is true during the age of degenerative diseases.[66;67]

The epidemiologic transition model was first proposed in 1971, and was based on the experience of high income countries, which had progressed steadily through the four stages of the transition and were in the final stage. However, mortality due to the 'degenerative' diseases subsequently decreased in these countries, and life expectancy increased, leading Olshansky and Ault to propose a further stage, the *age of delayed degenerative diseases,*[68] in which the same causes of mortality are prevalent but they are incident at older ages.

In 1990, the CEE countries were classified by Pearson as being in the age of degenerative diseases,[69] whilst Western European and North American countries were classified as being in the age of delayed degenerative diseases.

Traditionally, middle income countries have been classified as being in the age of receding famine (analogous to the epidemiologic transition's age of receding pandemics) but there is increasing evidence to suggest that these countries are rapidly passing through the stages, and an inverse social gradient in obesity is emerging.[67] Under- and over-nutrition coexist in these settings[67;70] as the transition between the ages of receding famine and degenerative diseases occurs.

Yusuf and colleagues also proposed a further stage to the epidemic, the *age of health regression and social upheaval*.[71] This applies to countries, previously in the age of degenerative diseases, in which there has been a resurgence of communicable diseases following social upheaval or war. Russia in 2001 was an example, owing to the disruption caused by the collapse of the Soviet Union, which was associated with increased mortality from CVD, infectious disease, accidents and violence[71] and the mortality changes discussed earlier in this chapter.

2.2.3 Pathways from childhood SEC to CVD

There is a substantial literature on the impact of early life SEC on CVD in later life in western countries[41-43] (see section 11.1.2.2) and evidence that CVD risk factors are detectable in childhood and adolescence.[72-74] A number of pathways via which childhood SEC might impact upon CVD risk have been proposed in response to these observations.

Growth and development during critical periods in early life may lead to biological programming, as organs adapt to function in a particular way, which may then influence blood pressure,[75-77] lipid levels,[78] obesity and CVD[79-82] in later life.

The uterine environment is influenced by socially patterned factors including maternal nutrition, both before and during pregnancy,[83] and smoking and alcohol consumption in pregnancy.[84;85] This impacts upon growth and development in utero, birth weight[80] and post-natal catch-up growth,[86] all of which may have an influence on CVD risk.

Duration of breastfeeding also has an influence, in improving nutrition and reducing the risk of infection.[87] Additionally, breastfeeding may increase the ability to catabolise lipids[88] and reduce lipid levels later in life,[89;90] reduce the risk of obesity[91] and influence educational attainment and cognitive function in later life.[92]

In addition to these biological pathways, there are a number of complex and interrelated social pathways, whereby familial economic, social, psychological and educational factors impact upon opportunities, and therefore the socioeconomic trajectory across the life course, and biological characteristics. Additionally, CVD risk factors such as smoking[93-98] and obesity[99-101] are strongly influenced by the family socioeconomic environment.

Socioeconomic factors may influence health directly, through material disadvantage. Those who are more socioeconomically disadvantaged have fewer financial and material resources, which consequently limits access to, amongst other things, adequate housing, nutrition and healthcare.

The influences of SEC, both in adulthood and childhood, on health vary with economic development and by the stage of a given country in the epidemiologic and nutritional transitions. This partly underlies the rationale of the analyses described in this thesis. As much of life course epidemiology of CVD is based on the experience of western countries, which are all at similar stages of the epidemiologic transition, it is interesting to examine the same question in different settings.

Chapter 3. Aims and objectives

This chapter outlines the aims and objectives of the thesis, and provides the conceptual framework within which the thesis is conceived.

3.1 Aims

The socio-political history of CEE, together with the mounting evidence for influences of life course SEC on health in western countries, suggest that socioeconomic forces may have an influence on the recent high morbidity and mortality rates in CEE. There have been no studies to date which have examined the influences of childhood SEC on adult health in CEE. The aim of this thesis is to fill this gap in the evidence, and to examine the possible early life socioeconomic influences on major risk factors for CVD, the condition which is responsible for the greatest proportion of the mortality burden in the region. It will determine whether there are independent effects of early life SEC, by considering later life SEC as potential confounders or mediators.

This thesis will contribute to the debate regarding possible universal pathways between early life SEC and adult health. Findings will be discussed with regard to the CEE setting, taking secular trends and transitions into account, as well as the former socialist regimes which, as they aimed to achieve a greater economic equality, may lead us to expect smaller social inequalities in health than in western countries.

In order to fulfil these aims, data from a large population-based study in Russia, Poland and the Czech Republic will be used. The particular social histories of the three countries will be considered when making inter-country comparisons.

3.2 Objectives

The aims described above will be fulfilled with the guidance of the conceptual framework illustrated (figure 3.1), and a number of specific objectives will be met:

1. The relationship between parental education and household asset ownership in childhood will be examined, enabling a better understanding of the relationships between dimensions of SEC, in these three countries in the mid-twentieth century.

2. The thesis will investigate the associations of both parental education and asset ownership with adult height and its components. Evidence from Western European and North American populations suggests that adult anthropometric measures reflect childhood conditions. This will determine the validity of height, leg and trunk length and leg to trunk length ratio as proxy measures of childhood SEC in CEE, and discuss the universality of the associations observed in other settings.

3. The associations between childhood SEC and four measures of adult SEC will be investigated to explore life course SEC trajectories. In Western European populations the last half century has seen a trend towards upwards mobility, with a correlation between SEC at various stages of the life course, and this will determine whether the same applies in CEE.

4. The cohort effects on childhood assets and height will be investigated to assess secular trends in SEC and growth in Russia, Poland and the Czech Republic in the mid-twentieth century.

5. The prevalence and distribution of CVD risk factors (smoking, adiposity, blood pressure, cholesterol and a CVD risk score) in the study populations will be determined, to enable an estimation of the burden of CVD in these three CEE countries.

6. Finally, and most importantly, the thesis will investigate the associations of the recalled and proxy measures of childhood SEC with each cardiovascular risk factor (blood pressure, lipids, smoking and adiposity) and the composite CVD risk score. The independence, or otherwise, of these associations will be determined by considering measures of later life SEC as potential confounders or mediators of the relationship.

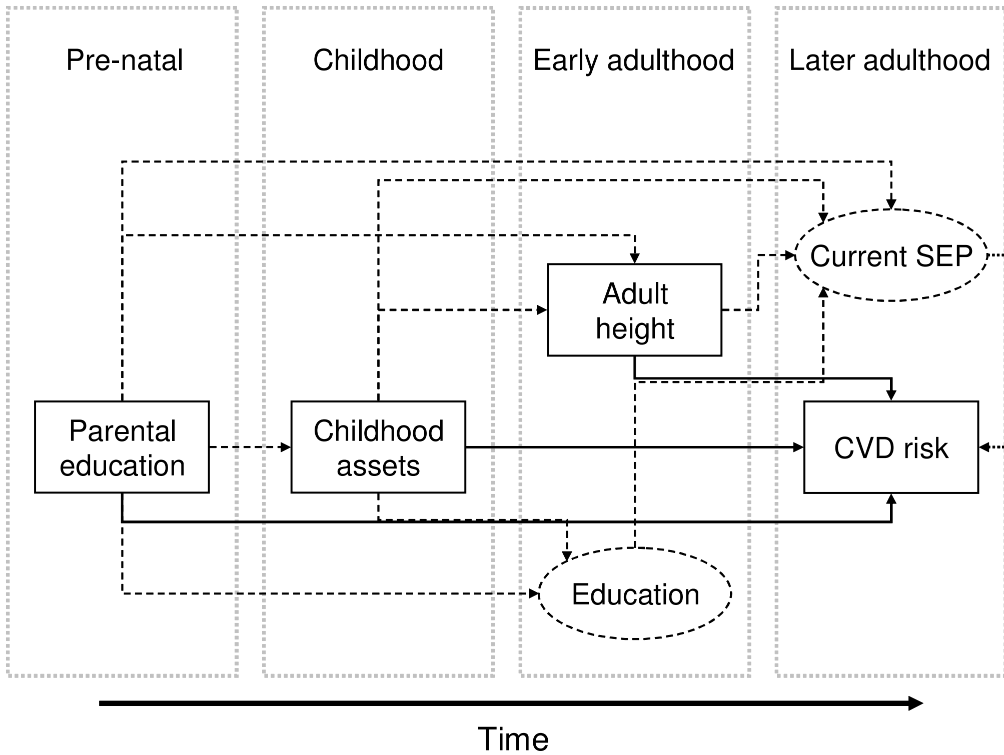

Figure 3.1. Diagrammatic representation of the conceptual framework for the thesis

Chapter 4. Methods

This chapter provides background details of the study from which the data used in the thesis were drawn and describes the study populations. It also discusses the specifics of the data collection, how the variables used in the analyses were measured, calculated and coded. It reports the response rates for the study and discusses the power of the study to address the objectives of the thesis. The chapter also outlines the distribution of missing data and the reasons for the missing data. The broad analysis plan for the thesis is provided here, although each results chapter (chapters 5 to 11) also has a specific analysis plan.

4.1 The HAPIEE study

This thesis is based on data from the baseline survey of the HAPIEE (Health, Alcohol and Psychosocial factors In Eastern Europe) study. The HAPIEE study was established to investigate the determinants of CVD and other non-communicable diseases in CEE, and initially comprised three cohorts, based in Novosibirsk (Russia), Krakow (Poland) and six towns in the Czech Republic (Havirov/Karvina, Hradec Kralove, Jihlava, Kromeriz, Liberec and Usti nad Labem).[102] Subsequently, Lithuania has also joined the project, but complete data from this cohort are not yet available, so this thesis is based on the three original cohorts. Figure 4.1 shows the location of the three study centres in Europe.

Novosibirsk, with a population of 1.4 million, is the third largest Russian city and the capital and major industrial centre of Western Siberia. Despite its Siberian location, Novosibirsk is a European city and is considered fairly typical for urban populations in Russia in terms of its social development, health and behaviours.[103;104] Two districts of the city, Oktyabrski and Kirovski, which have different social profiles, have been selected for inclusion in the study.

Krakow is an industrial city in South-west Poland, with a population of about 1 million. Although, as a whole, Krakow is more prosperous than the Polish average, the HAPIEE study includes four city districts which represent the full socioeconomic spectrum.

The six Czech towns, which have a total population of about 600,000, vary in their social profile. For example, Karvina is a former mining town and has the highest unemployment in the country (19.6% in 2003) while Hradec Kralove is a prosperous city with a services- and trade-based economy (unemployment 6.5%).

4.2 Data collection and variables

Men and women who were aged 45-69 years on 1st July 2002 were randomly selected from population registers after stratification by gender and five year age group. The study aimed to recruit 10,000 people from each of the three countries. The baseline survey, which included a structured questionnaire and a physical examination, was conducted between 2002 and 2005 and collected data on 28,947 individuals. Full details of the study rationale and protocol were described by Peasey and colleagues.[102]

The data collection included extensive questionnaires, physical examination and collection of blood samples. All participants gave informed consent, and all procedures were approved by local and UCLH ethical committees.

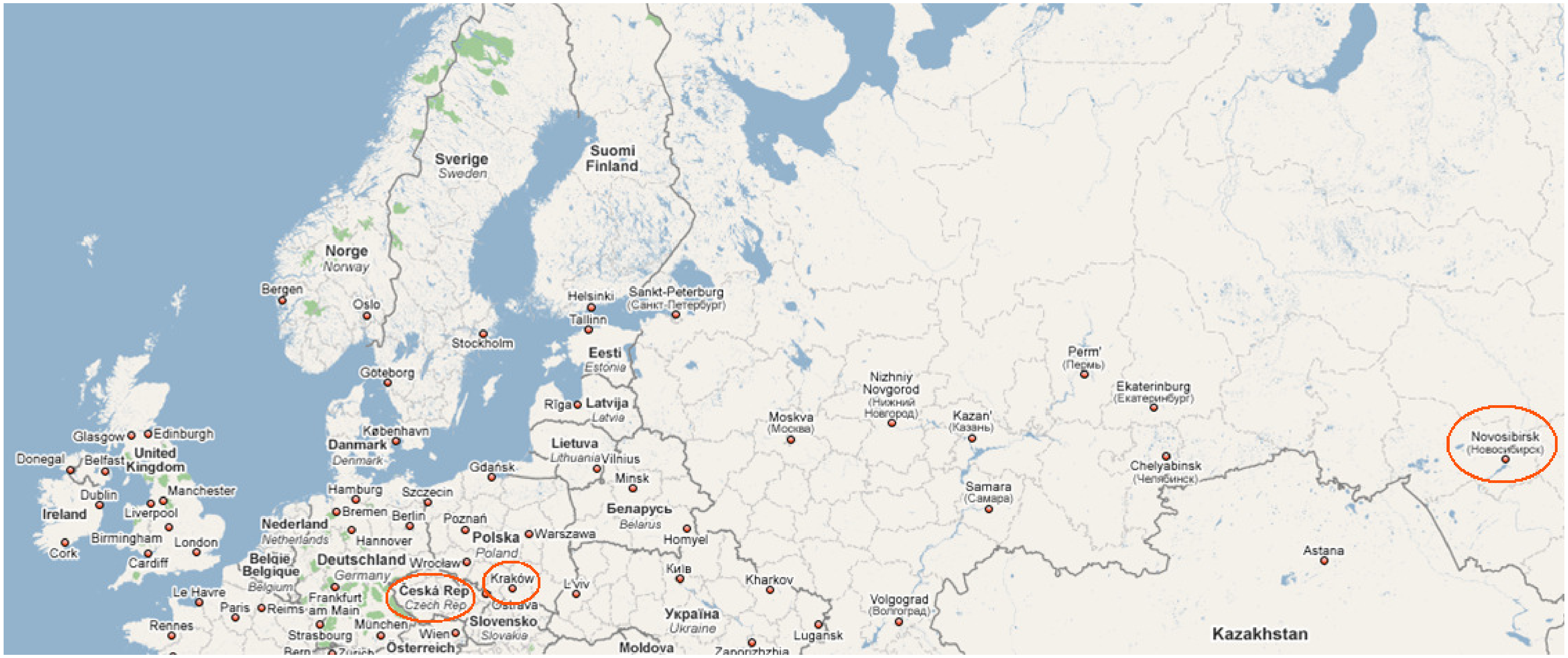

Figure 4.1. Map showing the locations of the study centres. Source: Google Maps

4.2.1 Questionnaire

The baseline questionnaire covered health, life style, food frequency, SEC and psychosocial factors. The demographic, SEC and lifestyle variables which were used in the thesis are described in detail below.

Questionnaires and protocols were translated from English into Russian, Polish and Czech, and then back translated into English to check accuracy.

In all countries, nurses assisted the participants in completing the questionnaire. In the Czech Republic and Poland the questionnaire was conducted in the participant's home (and this was followed by a visit to a clinic for the physical examination), whilst in Russia it took place in a clinic.

4.2.1.1 Demographics

Participants gave their name and date of birth, and the date the questionnaire took place was recorded. All data were anonymised and participants were given a unique identifying number. Age was calculated by subtracting date of birth from the date of the questionnaire.

4.2.1.2 Recalled childhood SEC measures

Three retrospectively assessed direct measures of childhood SEC were collected: ownership of household assets at age 10 and paternal and maternal education. Throughout the thesis they are referred to as recalled measures of childhood SEC.

Participants were asked if they had cold tap water, hot tap water, a kitchen, toilet, fridge and radio 'in their house' when they were a child, at about ten years of age. These six items were chosen because they were common household assets but were not universally available when participants were children. Participants could answer 'yes,' 'no' or 'I don't remember,' the latter of which constituted less than 1.4% of answers and was treated as a negative response for the purposes of all analyses. The assets were combined into an asset score with a range from zero to six, and the validity of the score was confirmed using factor analysis, which showed that the assets all loaded onto a single factor. The Chronbach's alpha statistic for the six assets was 0.8.

Paternal and maternal education were categorised as (i) less than complete primary, (ii) primary, (iii) vocational, (iv) secondary or (v) university education. Information on parental education was available in Russia and Poland only.

The retrospective collection of these data means that there is the potential for recall bias to be introduced. This is discussed in section 12.2.4.1.

4.2.1.3 Adult SEC variables

Four measures of adult and current SEC were collected: ownership of assets, education, material circumstances and living space. All SEC variables were coded such that less deprived people had a higher score.

The following twelve common household assets were included in the adult asset score: microwave, video recorder, colour television, washing machine, dishwasher, car, freezer, cottage, video camera, satellite/cable television, telephone and mobile phone. Participants were asked which of the assets they currently had 'in their household' and could answer either yes, no, because they do not want it, or no, because they cannot afford it. For the purposes of the thesis, the two negative responses were merged to give a binary variable. Assets were combined into a twelve point score, and factor analysis was used to confirm that all the assets loaded onto a single factor. The Chronbach's alpha statistic was 0.7.

Education was categorised in the same way as parental education, so participants had (i) less than complete primary, (ii) primary, (iii) vocational, (iv) secondary or (v) university education.

Material position was based on the answers to the following three questions:

> 'How often do you not have enough money for the food you and your family need?'
> 'How often do you not have enough money for the clothing you and your family need?'
> 'Do you have difficulties with paying bills (for housing, electricity, heating etc)?'

Participants responded either (i) all the time, (ii) often, (iii) sometimes, (iv) rarely or (v) never to each question, and these answers were attributed 0 to 4 points. The points for the three questions were summed, to give a score of zero to twelve.

Living space was a ratio of the number of rooms in the home (excluding kitchens and bathrooms) to the number of people (adults and children) living in the home.

4.2.1.4 Smoking

Participants were asked ‘Do you smoke cigarettes?’, and gave one of four possible answers: ‘Yes, regularly’; ‘Yes, occasionally’; ‘No, I smoked in the past but I stopped’; and ‘No, I have never smoked.’ Three aspects of smoking were examined: current smoking, starting smoking (i.e. ever having smoked) and quitting smoking.

Those who gave either of the first two answers were classified as current smokers, and the remaining participants were classified as non-smokers.

Where starting (ever) smoking was concerned, those who gave one of the first three answers (current or former smokers) were treated as cases, and those who gave the last answer (life-long non-smokers) were treated as non-cases.

Analyses focussing on quitting smoking were restricted to those who gave one of the first three answers (i.e. people who had previously or currently smoked). Those who gave the third answer were classed as quitters, and were compared to current smokers, who gave first two answers.

4.2.2 Physical examination

In the physical examination, anthropometric measures, blood pressure and a blood sample were taken, and lung and cognitive function were measured. The physical examination took place in a clinic in all three countries, and all measurements were taken by trained nurses. The protocols for measuring anthropometry and blood pressure are outlined below.

4.2.2.1 Anthropometric measures

Height was measured using a stadiometer. The participants stood with their feet together and flat on the base of the stadiometer, with their heels centrally placed against the back plate, their head tilted to the Frankfort plane position and arms held loosely by their side. Height and all other anthropometric measurements were taken to the nearest 0.1cm.

Sitting height was measured with the participant sat on a hard chair, upright and with their back against the column of the stadiometer. The participant's head was tilted to the Frankfort plane position and the distance from the seat of the chair to the top of the participant's head was measured.

Sitting height, which was used as an approximation of trunk length, was subtracted from total height to give leg length. Leg to trunk length ratio was calculated by dividing leg length by trunk length.

Waist circumference was measured at the height halfway between the costal margin and the iliac crest. The participant breathed out and stood with their arms held loosely at their side, looking straight ahead and with their abdominal muscles relaxed. The tape was held taut and level with the ground. The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATPIII)[105] provided guidelines for waist circumference, which indicated that a measurement of greater than 102cm for men or 88cm for women indicated obesity.

Hip circumference was measured with the participant in the same position as waist circumference, at the height of the greater trochanter of the femur, or at the widest gluteal point if this was not easily located. Waist to hip ratio was calculated by dividing waist circumference by hip circumference. WHO guidelines on waist to hip ratio provided values of >0.90 and >0.85 to indicate abdominal obesity in men and women.

Participants were weighed to the nearest 0.1kg and body mass index (BMI) was calculated as weight in kilograms divided by height in metres squared. WHO guidelines, which state that a BMI of ≥ 25 kg/m^2 indicates overweight and ≥ 30 kg/m^2 indicates obesity, were used where required.

4.2.2.2 Blood pressure and hypertension

Blood pressure was measured in a quiet room, separate from where the rest of the physical examination was taking place, using an Omron M5-I digital blood pressure monitor, which has been validated according to the international protocol.[106] Participants removed outer garments to expose their upper right arm and sat with their right arm resting, palm up, on a table. The blood pressure monitor was positioned so that the display was not in view of the participant. The brachial pulse was located and the cuff positioned so that the centre of the inflation bag lay over the brachial artery.

Blood pressure was measured three times for each participant. The participant sat quietly for five minutes before the first measurement was taken and for at least two minutes between each subsequent reading. The blood pressure values used in the analyses were the means of the second and third measurements. ‘White coat syndrome’ leads to elevation of blood pressure readings amongst around 20% of people when it is measured in a medical setting[107] and may affect the first measurement more severely. It is hoped that using the second and third readings will minimise such a bias.

Participants were asked in the questionnaire if they had been told by a doctor that they had high blood pressure, and if they answered positively they were asked ‘Have you been taking drugs for high blood pressure in the last two weeks?’ As blood pressure influences anti-hypertensive treatment and treatment also influences blood pressure, the relationship is too complex for treatment to be considered simply to be a confounder or mediator of the relationship between SEC and blood pressure. Those who reported taking anti-hypertensive treatment were therefore excluded from analyses where systolic blood pressure (SBP) and diastolic blood pressure (DBP) were the outcomes.

In addition to blood pressure readings, two hypertension variables were also used. For the first, a participant was defined as hypertensive if they had SBP greater than 140mmHg, DBP greater than 90mmHg or anti-hypertensive treatment, according to the current definition.[108] For the second, those with SBP greater than 160mmHg, DBP greater than 95mmHg or anti-hypertensive treatment were defined as hypertensive.

4.2.2.3 Lipids

Blood samples were collected in K_2-EDTA (10ml and 2 x 3ml) and Becton Dickinson SST II vacutainers (10ml) and were stored at 4℃ until processing.

Total and high density lipoprotein (HDL) cholesterol were investigated as continuous and binary variables. The cut-off used to define high total cholesterol was taken from the ESC guidelines (>5.0 mMol/l),[109] and for low HDL cholesterol, from the ATPIII guidelines (<1.0 mMol/l).[105]

4.2.3 CVD risk score

There are several CVD risk scores which use the classical CVD risk factors to predict CVD morbidity and mortality. The most commonly used in Europe, both in research and clinical practice, is the European Society of Cardiology (ESC) cardiovascular risk score (SCORE), which has been used in this thesis. Calculation of SCORE is outlined in detail in section 11.3.1.

4.3 Data

4.3.1 Response rates

Data were collected on 28,947 individuals and the overall response rate for the HAPIEE study was 59%, with country-specific rates of 55% from the Czech Republic and 61% from Russia and Poland (table 4.1). A short questionnaire was collected from a sub-sample of non-respondents at each study centre, which provided insight into any differences between responders and non-responders.

Table 4.1. Absolute numbers and response rates in the HAPIEE study (from Peasey et al, 2006[102])

	Men	Women	Total	Response rate (%)
Russia	4269	5094	9363	61
Poland	5230	5498	10728	61
Czech Republic	4125	4731	8856	55
Total	13624	15323	28947	59

Home visits were conducted on a further sub-sample of non-responders in Novosibirsk and Krakow, and the completeness of the population register in the largest Czech town was assessed. These measures were designed to ascertain what proportion of non-respondents were living at the address recorded in the population register.

The data obtained from the non-respondent questionnaire highlighted two important issues. Firstly, in each study centre a non-negligible proportion of those who did not respond had either moved home or died before the start of the study. After taking this into account, the response rates amongst those living at their registered address were at least 71%, 68% and 60% for Russia, Poland and the Czech Republic.

Secondly, the response rates differed by several individual characteristics. Response rates were higher amongst women and older people, and those who responded had higher levels of education, lower prevalence of smoking and better self-rated health.[102] This pattern of non-response is similar to that observed in other similar studies.[110-118]

4.3.2 Missing data

Table 4.2 shows the number and proportion of missing values for each variable used in the thesis, overall and by sex and country. Very few participants had missing demographic data. Maternal and paternal education were not available for participants from the Czech Republic, whilst amongst Polish and Russian participants the percentage of those with missing data was less than 5%. The same was true for childhood assets in all gender and country groups. Later life socioeconomic variables had low proportions of missing data overall (<5%), although both adult assets and living space had more than 5% missing in Czech participants.

Anthropometric variables had very low proportions of missing values amongst Russians, and more than 10% in Czechs and Poles. This is because both interview and physical examination took place in a clinic in Russia, whereas in the Czech Republic and Poland questionnaires were conducted during home visits and participants had to make a separate subsequent visit to a clinic for the physical examination. 18% of Czech and 13% of Polish participants who completed the questionnaire did not attend the physical examination, resulting in these high proportions of missing data.

CVD risk factors had 11-12% missing data. Again, the proportion of missing values is very low amongst Russian participants because all risk factors other than smoking were collected during the physical examination, for which there were much higher proportions missing amongst Czech and Polish participants.

Imputation of missing data, by a method such as multiple imputation, was unfeasible due to the missing values being missing not a random (MNAR), that is, missing values were not randomly distributed, and their being missing was not dependent on observed variables.[119] Complete case analysis, in which participants with missing values for one or more variables included in a model are excluded, was therefore performed throughout the thesis.

Data were imputed for child and adult asset scores, where there were up to one out of six and two out of twelve missing values. This applied, respectively, to 5.5% and 2.8% of the study population. The mean score of the non-missing values was imputed, for example, if 10 of 12 answers on the adult asset score were given, and eight were positive, the imputed score would be 9.6 (i.e. 8 + (2 x 0.8)). Where more values were missing, the asset score was coded as missing. In analyses which used the asset scores as linear variables, the score was used as calculated, whereas when they were used as categorical variables they were rounded to the nearest unit value.

Imputation of measured height and weight from self-reported values was considered. Amongst those who had both measures the correlations between measured and self-reported values were high (correlation coefficient=0.97). However, self-reported height tended to be overestimated and self-reported weight tended to be underestimated. These observations are supported by an extensive literature.[120-122] To impute the self-reported height and weight values without adjustment would therefore have introduced bias.

Table 4.2. Number [%] of missing values in variables used in the main analyses

	Overall	Czech Republic		Russia		Poland	
		Men	**Women**	**Men**	**Women**	**Men**	**Women**
N	28503	4058	4644	4140	4933	5230	5498
Demographic variables							
Age	172 [0.6]	69 [1.7]	41 [0.9]	17 [0.4]	26 [0.5]	26 [0.5]	8 [0.2]
Gender	0 [0.0]	0 [0.0]	0 [0.0]	0 [0.0]	0 [0.0]	0 [0.0]	0 [0.0]
Country	0 [0.0]	0 [0.0]	0 [0.0]	0 [0.0]	0 [0.0]	0 [0.0]	0 [0.0]
Early life socioeconomic variables							
Childhood assets	878 [3.1]	199 [4.9]	291 [6.3]	35 [0.9]	23 [0.5]	157 [3.0]	173 [3.2]
Maternal education	9014 [31.6]	4058 [100.0]	4644 [100.0]	97 [2.3]	105 [2.1]	52 [1.0]	58 [1.1]
Paternal education	9284 [32.6]	4058 [100.0]	4644 [100.0]	201 [4.9]	245 [5.0]	62 [1.2]	74 [1.4]
Anthropometric variables							
Height	3074 [10.8]	792 [19.5]	786 [16.9]	7 [0.2]	16 [0.3]	729 [13.9]	744 [13.5]
Leg length	3075 [10.8]	793 [19.5]	786 [16.9]	7 [0.2]	16 [0.3]	729 [13.9]	744 [13.5]
Trunk length	3075 [10.8]	793 [19.5]	786 [16.9]	7 [0.2]	16 [0.3]	729 [13.9]	744 [13.5]
Weight	3008 [10.6]	784 [19.3]	777 [16.7]	0 [0.0]	0 [0.0]	714 [13.7]	733 [13.3]
Later life socioeconomic variables							
Education	59 [0.2]	26 [0.6]	22 [0.5]	0 [0.0]	0 [0.0]	5 [0.1]	6 [0.1]
Material circumstances	287 [1.0]	76 [1.9]	89 [1.9]	2 [0.1]	0 [0.0]	61 [1.2]	59 [1.1]
Living space	1340 [4.7]	343 [8.5]	569 [12.3]	8 [0.2]	21 [0.4]	193 [3.7]	206 [3.8]
Adult assets	852 [3.0]	291 [7.2]	339 [7.3]	30 [0.7]	13 [0.3]	80 [1.5]	99 [1.8]
Cardiovascular risk factors							
Smoking	149 [0.5]	53 [1.3]	65 [1.4]	0 [0.0]	0 [0.0]	17 [0.3]	14 [0.3]
Waist circ.	3012 [10.6]	785 [26.2]	779 [16.8]	3 [0.1]	0 [0.0]	712 [13.6]	733 [13.3]
Waist to hip ratio	3024 [10.6]	788 [19.4]	784 [18.9]	3 [0.1]	0 [0.0]	714 [14.5]	735 [13.4]
BMI	3078 [10.8]	792 [19.5]	786 [16.9]	7 [0.2]	16 [0.3]	730 [14.0]	747 [13.6]
Systolic BP	3014 [10.6]	785 [19.3]	777 [16.7]	2 [0.1]	1 [0.0]	715 [13.7]	734 [13.4]
Hypertension	3071 [10.8]	793 [19.5]	785 [19.0]	7 [0.2]	3 [0.1]	731 [14.8]	752 [13.7]
Cholesterol	3374 [11.8]	913 [22.5]	977 [21.0]	7 [0.2]	23 [0.5]	713 [13.6]	741 [13.5]
HDL cholesterol	3397 [11.9]	928 [22.9]	983 [21.2]	7 [0.2]	23 [0.5]	714 [13.7]	742 [13.5]
ESC risk	3557 [12.5]	979 [24.1]	1038 [22.4]	9 [0.2]	25 [0.5]	740 [14.2]	766 [13.9]
Overall	**11702 [41.1]**	**4058 [100.0]**	**4644 [100.0]**	**292 [7.1]**	**350 [7.1]**	**1141 [21.8]**	**1217 [22.1]**

4.3.3 Power and sample size

This study, with its sample size of almost 29 000, is well powered enough to detect small effects, even where analyses are stratified by gender and country. Some effects which are too small to be important were detected, and consequently the relevance of statistical significance should not be overemphasised.

4.4 Analysis plan

Similar analyses were performed in each of chapters 7 to 11, so a general outline is given below. Specific plans for each section of analysis are described in each chapter, particularly chapters 5 and 6, which follow different analyses.

- Distributions of the relevant outcomes were examined, by age and measures of childhood SEC.
- Age-adjusted associations of each of the recalled measures of childhood SEC and anthropometry with the relevant outcome were examined using linear or logistic regression.
- Multivariate regression analyses were used to determine whether observed relationships with the recalled measures of childhood SEC were independent of i) measures of adult SEC; ii) measures of anthropometry; and iii) measures of adult SEC and anthropometry.
- Multivariate regression analyses were used to determine whether observed relationships with anthropometry were independent of i) measures of adult SEC; ii) recalled measures of childhood SEC; and iii) measures of adult and childhood SEC.

In adjustments for adult and childhood SEC, all measures were included. Adjustments for anthropometric measures included leg length and trunk length but not total height, as together leg and trunk length incorporate all the variation in height.

Other than some preliminary analyses, all analyses were done separately for each country and both genders. This stratification was designed to enable the comparison of effects between country and gender groups, and was hypothesis driven. Additional support for stratification was provided using likelihood ratio tests for possible interactions between the main exposure measures (childhood assets, maternal education, paternal education, height, leg length and trunk length) and country and gender in regressions with the main outcome measures (systolic and diastolic blood pressure, total and HDL cholesterol, starting and quitting smoking, BMI, waist circumference and waist to hip ratio). All tests showed good evidence against the null hypothesis ($p<0.01$), suggesting that there were interaction effects with both country and gender.

In all bi- and multivariate analyses, age at the time of the questionnaire was adjusted for, with the exception of those analyses in the secular trends chapter (chapter 6), where date of birth was used instead. This is because when looking at secular trends, date of birth is more relevant than age, and, as the data collection occurred over three years, to use age would introduce an error.

Chapter 5. Socioeconomic circumstances

This chapter will initially outline concepts of SEC, and the ways it is measured in epidemiological studies. It will review then the literature on, and explore the relationships between the exposure variables used in the thesis: the direct, recalled measures of childhood SEC (assets, maternal education and paternal education) and the indirect, anthropometric measures of childhood SEC (height, leg length and trunk length). It will also discuss the relationships of both direct and indirect measures of childhood SEC with measures of later life SEC (education, material position, living space and assets). The findings from these analyses will provide a greater understanding of the ways in which dimensions of SEC in these three CEE countries are related, as in the conceptual framework (section 3.2). They will also inform the analysis and the interpretation of results in the following results chapters (chapters 6 to 11).

5.1 Literature review

5.1.1 Definition and measurement of socioeconomic circumstances

Socioeconomic circumstances (SEC) are a complex of interrelated personal characteristics, which include educational, financial and occupational attributes, and the term is used roughly interchangeably with socioeconomic position (SEP) and social class.

Modern definitions are based on theories of social class from Marx, who categorised people in terms of their autonomy and economic resources, depending upon whether they owned the means of production, and Weber, who considered that social position incorporated class (ownership and control of resources), status (prestige in the community) and power (political empowerment). In epidemiological research, SEC classification based on these theoretical models is not usually possible, so studies use indicators which are either routinely available or practical to collect. The most commonly used indicators are described briefly below.

Education reflects social class and status, as well as individual's knowledge-related assets,[123] which are related to factors as wide-ranging as employment opportunities and receptivity to health education messages. Education may indicate family background, income, occupation, behaviour and lifestyle[124] and is therefore a particularly useful measure of SEC within a life course framework as it links early and later life experiences.[123] Education is easily measured and subject to little error in recall.

Income most directly measures material resources and is the usual measure of SEC in the United States, where position in the social class hierarchy can be defined by financial resources. Income may not, however, provide an accurate description of financial resources, as it does not take account of wealth, other income, such as benefits, pensions or gifts, or non-monetary exchange. Additionally, income is a short-term measure which is vulnerable to change. Disclosure of income may be refused,[125] and where it is reported it may be subject to social desirability bias.[126]

Occupational social class is commonly used in European research.[127;128] Occupations are grouped into hierarchical categories which aim to classify them according to the level of skill and responsibility they require, or are dichotomised into manual or non-manual jobs. Occupation can indicate various aspects of SEC, including income, education and social standing, but may be criticised due to the subjective nature of the classification of occupations.[123]

Income, education and occupation are each useful indicators with which to classify SEC in established market economies. In societies where these traditional measures cannot usefully be applied, asset indices are a useful measure.[129] Where the informal economy has a substantial role, *asset scores* offer a simple and reliable measure of financial resources, which is less subject to economic fluctuations than income.[130] There are, however, some important considerations when using asset indices. The direct and indirect impacts of assets upon health may be difficult to separate and, because asset indices are setting-specific, comparisons between populations can be difficult. Further, where assets are publicly provided, ownership indicates community or state level, rather than individual or household, wealth.[130] This may be of particular relevance in communist societies.

Although all measures of SEC aim to classify people according to a social class hierarchy, they are each limited in this ambition, and only capture some dimensions of SEC. Correlations between measures of SEC may be low, and their influences on health outcomes may vary and be independent of one another.[131] Additionally, the meaning and utility of measures of SEC are dependent upon the context of the research, so SEC measures should be carefully chosen according to the ambitions and setting of the research, and results should be interpreted accordingly.

5.1.2 Socioeconomic circumstances in socialist CEE

The primary aim of the 1917 Russian revolution and subsequent establishment of the USSR was to remove the privileges of the aristocracy and to create a classless society. In 1928, Stalin's first five year plan turned the ambitions of the state to industrialisation, collectivisation and economic development. A new class order developed which was exported to the post-WWII CEE socialist countries, although the existence of a social hierarchy and the study of social class remained taboo.[39]

Income distribution tended to be relatively egalitarian in socialist CEE compared to western capitalist economies, however privilege and power were granted to persons favoured by the regime, particularly the bureaucratic class, the *nomenklatura*. The state monopoly of trade and resources enabled scarce goods to be removed from the open market and reserved for allocation to favoured persons.[40] Asset ownership may, therefore, be a better indicator of SEC in socialist CEE than income, as it captures some of the social advantage which accompanied membership of a favoured social group.

With the removal of property and birth as routes to privilege, education was afforded a more central role in individuals' circumstances. As education, including university education, was free and stipends were available for living expenses, access to education was more meritocratic than in capitalist societies and greater proportions of university students had lower socioeconomic origins.[40]

5.1.3 Relationships between measures of socioeconomic circumstances

5.1.3.1 Maternal and paternal education

The relationship between maternal and paternal educational levels can be conceptualised as a dimension of partner choice. Education is an important factor in partner choice because it is an indicator both of family background and of potential future labour market success,[132] although this presumption relies upon a close association between education and income. From western populations, there is evidence of assortative pairing by socioeconomic status and a high degree of correlation between partners' educational levels.[132-134] In socialist countries, the links between family background, education and economic success may have been less strong, and the role of educational level in partner choice may, therefore, have been less important, leading to a weaker correlation between educational levels of partners. This would apply to the Russian study population, and less so in Poland or the Czech Republic, where many parents of participants would have met prior to WWII, before the onset of communism in these countries.

The levels of educational homogamy are affected by other factors, for instance it can be interpreted as an indication of the openness, and the degree of social mobility in a society.[135] Education is expected to be a more important factor in partner choice in times of economic uncertainty,[135] and in societies where both partners are expected to be engaged in paid employment, which provides symmetrical incentives for men and women to select partners who are as highly qualified as possible.[135]

5.1.3.2 Education and assets

The economic literature refers to the relationship between education and income as the 'returns to education,' that is the increase in income in relation to increasing levels of education. In the west this link has been well established,[136] but some Russian data on the subject are contradictory. A household survey in southern Russia found that returns to education amongst adults living in southern Russia were similar in 1989 to those in Scandinavian countries and West Germany, higher than in Britain but much lower than in the USA.[137] In contrast, The Russian Longitudinal Monitoring Survey showed that returns to education between 1992 and 1999 were lower in Russia than in most other countries, and did not increase during this period.[138]

These two studies took place towards or after the end of the Soviet period. Across CEE under communism, an established aim was to reduce income inequality, so, at least anecdotally, education was not rewarded by higher incomes. Correlations earlier in the twentieth century may, therefore, be hypothesised to have been less strong. In the USSR in the 1930s to 1950s, however, income inequality was similar to that observed in contemporary capitalist economies, and higher than other socialist economies.[40] During the middle of the twentieth century the greatest income inequality in the socialist countries of CEE was in the USSR, whilst Czechoslovakia was the most equal and the other countries, including Poland, were intermediate between these extremes.[40]

5.1.3.3 Childhood socioeconomic circumstances and anthropometry

In addition to the influence of genetic factors, adult height reflects environmental exposures throughout childhood and adolescence.[139-142] These influences include diet and disease,[143] both of which are closely related to SEC.[144-146]

Height in adulthood is inversely associated with various measures of SEC in childhood, including parent's educational level,[147] father's socioeconomic status,[148-151] family income,[152] and overcrowding in the home.[147;148] Height in childhood and adolescence[148;153;154] and the tempo of growth throughout childhood[148;153] are both similarly associated with socioeconomic position of origin.

Leg length is inversely associated with childhood SEC,[155] and it has been proposed that there are critical periods of growth when leg growth is the more substantial proportion and that are particularly sensitive to socioeconomic material position.[139;156] However, the evidence as to whether leg length is a more specific correlate of childhood conditions than adult height is mixed.[147-152;154-172]

The vast majority of evidence on the effect of childhood SEC on height so far derives from western countries, in particular the UK[147;148;150;151;154] and Sweden.[149;152] One study of Polish conscripts found that height increased as paternal social status improved,[173] however the relationships between early life SEC and adult height and it's components have not been explored in CEE.

5.1.3.4 Intergenerational social mobility

Social mobility is movement between social groups, and intergenerational social mobility, indicates movement between generations. This is a richly explored topic in the economic and sociological literature, in which researchers investigate the relationship between an individual's destination SEC (e.g. educational level) and their SEC of origin (e.g. parental educational level).

In the 1940s and 50s, there were similar degrees of social mobility in all western industrialised countries, with a quarter to a third of men moving between manual and non-manual social classes, in either direction.[174] The children who comprised the 1958 British birth cohort, however, may have experienced limited intergenerational mobility, both in terms of education and earnings.[175]

Most instances of large scale social mobility are a product of historical changes, for instance to the political, cultural or religious influences within a society,[123] rather than improvements in equality of opportunity, therefore are not sustained beyond a limited period. Although commentators made claims that there were no barriers to social mobility in the USSR,[176] which could not be substantiated due to the lack of published data on social class or mobility during this era, this is true of much of the social mobility in the USSR, and indeed wider CEE, in the twentieth century. Social mobility which turned large numbers of peasants in the socialist states into workers was a product of industrialisation and collectivisation[40] and long range social mobility in the USSR after the 1917 revolution was due to the expansion of the non-manual strata, which required an influx from the manual groups.[40]

A 1967 Czechoslovakian nationwide study comparing the social status of fathers and sons provides evidence of highly socially mobile society, with substantial long range upward mobility, in addition to the more commonly observed movement between adjacent classes.[40] A similar study in Poland in 1972 showed mobility between adjacent social classes to be moderately common, whilst long range downward social mobility appeared to be more common than in Czechoslovakia.[40] This may be partly attributable to the inclusion of daughters as well as sons in the Polish dataset, as daughters retained their father's occupational status less frequently.[40]

Although little data were collected during the Soviet era, in a representative sample of Russians adults in 1991, Russian women were shown to have been more socially mobile than their contemporaries in the UK, but the same could not be said for Russian men.[177] Most social mobility was between adjacent classes, but longer range mobility was also common and there was a general tendency towards upward mobility.[177]

5.1.3.5 Anthropometry and adult socioeconomic circumstances

In addition to the predicted association between direct measures of childhood SEC and adult SEC, there may also be an independent positive association of adult SEC with anthropometry. An established economic literature which investigates the relationship between success in the labour market and physical appearance in western countries[178-181] includes evidence for earnings advantages associated with taller height.[181;182] These associations have been variously ascribed to employer prejudice[179] and higher self-esteem[182] and greater ability amongst taller people.[183] Additionally, a Polish study of 19 year old males found a positive association between adult height and educational attainment, which was independent of both cognitive ability and parental SEC,[184] and this finding has been replicated.[185]

There appear to be gender differences in the association between anthropometry and adult SEC, however, with some studies in the US and UK showing that women's height affected their earnings, whilst men's did not.[179;186]

5.2 Objectives

The aim of this chapter is to establish the nature of the associations between the measures of SEC, that is, the exposures and the covariates, examined in the thesis. This will give a broader understanding of the relationships between different measures of life course SEC in CEE, which are indicated in the conceptual framework for the thesis.

The first section will explore the mutual relationships between the recalled measures of childhood SEC (maternal and paternal education, household assets at age ten).

In the second section, the associations of the recalled indicators of childhood SEC with adult height and its components (leg and trunk length, leg to trunk length ratio) will be examined. This will determine the value of anthropometric measures as proxy indicators of childhood SEC. An additional objective is to determine whether leg length is associated with childhood conditions more specifically than full adult height.

The third section will investigate relationships between SEC at different stages of the life course, by examining the strength of association between the recalled measures of childhood SEC and the measures of adult SEC (education, material position, living space and household assets).

The final section will examine the associations of the anthropometric measures with measures of adult SEC.

5.3 Methods

5.3.1 Variables

Each of the measures of SEC used in the thesis will be explored in this chapter. These are as follows: the recalled measures of childhood SEC (maternal and paternal educational level and household ownership of assets at age ten); the indirect measures of childhood SEC, adult height and its components (leg length, trunk length and leg/trunk ratio); and the measures of adult SEC (education, availability of household assets, material position and living space). The details of how these variables were measured were given in the methods chapter (Chapter 4).

5.3.2 Statistical analysis

The five stages of statistical analysis for this chapter are outlined below:

1. The study populations were described in terms of the various measures of SEC.

2. The mean asset score at each level of parental education was calculated and the correlations between maternal and paternal education and assets in childhood were investigated. A test for trend was used to determine whether there was a linear trend in assets across educational levels. Linear regression determined the age-adjusted associations between each pair of childhood SEC measures.

Initial analyses in this section were preformed separately for men and women, and for Russia and Poland, but as there was no effect of, or interaction with gender, men and women were grouped for the regression analyses. All further analyses in this chapter were performed separately by gender and country due to positive tests for interaction.

No analyses were performed for the Czech Republic here, as only one recalled measure of childhood SEC (assets) was available.

3. The associations between recalled measures of childhood SEC (as exposures) and anthropometric measures (as outcomes) were analysed using linear regression. Regression analyses were adjusted for age.

4. The pairwise correlations between the measures of childhood SEC and the measures of adult SEC were investigated. Linear regression was used to test the age-adjusted associations between measures of SEC at the different life stages.

5. Pairwise correlations between adult height and SEC were calculated. The associations between height and adult SEC were investigated using linear regression, firstly in age-adjusted analyses, and secondly with additional adjustments for direct measures of childhood SEC.

5.4 Results

5.4.1 Descriptive analysis

Table 5.1 shows some demographic data and the distribution of the recalled and proxy measures of childhood SEC, and the measures of adult SEC in men and women in the three countries.

The cohort is approximately equally split between the three countries (30.5% Czech, 31.8% Russian and 37.6% Polish) and is 52.9% female. The mean number of assets in the home at age ten was highest in the Czech Republic and lowest in Russia and with respect to specific items, all assets other than hot water and radio ownership were least common in Russia and most common in the Czech Republic (data not shown). Proportions of parents with the upper three levels of education (vocational, secondary, university) were similar in Russia and Poland but, of those who had the lower two levels, nearly three times more Russians than Poles had parents who had not completed their primary education.

Czech men and women were the tallest and Russian men and women the shortest ($p<0.001$). A similar pattern was seen with leg length. Mean trunk length showed little between country variation, although this was still highly statistically significant ($p<0.001$) and consequently mean leg/trunk ratio was lowest in Russia and highest in the Czech Republic for both men and women ($p<0.001$).

University education was least common amongst Czech participants, and Czechs also showed the greatest gender inequality in education: 18% of women and only 6% of men had no more than primary school education. The equivalent figures were 10% and 12% amongst Russians, and 14% and 10% amongst Poles.

Material circumstances were best in the Czech Republic, and worst in Russia ($p<0.001$), and in each country women rated their material circumstances as worse ($p>0.001$). Adult SEC as measured by living space and assets suggested similar patterns.

Table 5.1. Description of SEC measures. Mean [SD] or percentage

		Czech Republic		Russia		Poland	
		Men	**Women**	**Men**	**Women**	**Men**	**Women**
N		4058	4644	4140	4933	5230	5498
Age		58.7 [7.0]	58.1 [7.0]	58.7 [6.8]	58.4 [6.9]	58.0 [7.0]	57.4 [7.0]
Direct measures of childhood SEC							
Childhood assets		4.1 [1.4]	4.2 [1.4]	2.2 [1.7]	2.2 [1.7]	3.3 [1.9]	3.5 [1.9]
Maternal education	< primary	-	-	25.5	28.7	10.5	10.0
	Primary	-	-	31.8	30.3	51.7	51.8
	Secondary	-	-	15.7	16.9	13.3	13.6
	Vocational	-	-	21.4	19.8	20.4	20.2
	University	-	-	5.5	4.3	4.1	4.5
Paternal education	< primary	-	-	19.7	21.9	8.9	8.5
	Primary	-	-	35.5	30.8	42.2	41.8
	Secondary	-	-	18.0	19.5	20.9	20.9
	Vocational	-	-	20.2	19.3	16.8	18.1
	University	-	-	9.6	8.4	11.2	10.7
Indirect measures of childhood SEC (anthropometry)							
Height (cm)		174.8 [6.5]	161.9 [6.1]	171.0 [6.4]	158.1 [6.0]	172.2 [6.3]	159.4 [5.9]
Leg length (cm)		84.8 [6.3]	77.1 [4.3]	80.7 [4.4]	73.0 [4.2]	81.8 [4.5]	74.3 [4.3]
Trunk length (cm)		90.0 [3.9]	84.8 [3.8]	90.3 [3.5]	85.1 [3.3]	90.4 [3.6]	85.1 [3.4]
Leg to trunk ratio		0.94 [0.1]	0.89 [0.1]	0.91 [0.1]	0.91 [0.1]	0.86 [0.1]	0.87 [0.1]
Adult SEC							
Education	< primary	0.7	0.5	1.3	1.1	0.3	0.3
	Primary	5.4	17.9	10.3	8.8	9.3	13.2
	Secondary	44.2	31.3	21.6	30.3	27.4	15.2
	Vocational	31.6	40.5	34.8	33.8	32.9	44.3
	University	18.1	9.8	32.0	26.1	30.2	27.0
Material circumstances		10.5 [2.2]	10.2 [2.4]	8.7 [3.5]	7.5 [3.5]	9.9 [2.9]	9.3 [3.2]
Living space		1.4 [1.0]	1.4 [0.9]	0.9 [0.4]	1.0 [0.5]	1.0 [0.6]	1.1 [0.6]
Assets		7.1 [2.3]	6.6 [2.2]	6.0 [2.2]	5.4 [2.1]	6.7 [2.2]	6.1 [2.2]

5.4.2 Childhood socioeconomic circumstances

Pairwise correlation coefficients for measures of childhood SEC are shown in table 5.2. The correlations were stronger in Poland than in Russia (test for interaction, $p=0.002$) but were similar for men and women. In both countries the strongest correlations were between maternal and paternal education, rather than between assets and education.

Mean asset score increased linearly with parental education (table 5.3). The associations were similar for maternal and paternal education, and were stronger in Poland than in Russia ($p<0.001$).

In the age and sex-adjusted analyses relationships between measures of childhood SEC remained highly statistically significant, and stronger in Poland than in Russia ($p<0.001$) (table 5.4).

Table 5.2. Correlation coefficient between direct measures of childhood SEC

		Paternal education	Assets at age 11
		Russia	
Men	Maternal education	0.71	0.35
	Paternal education	-	0.33
Women	Maternal education	0.71	0.35
	Paternal education	-	0.33
		Poland	
Men	Maternal education	0.79	0.47
	Paternal education	-	0.50
Women	Maternal education	0.79	0.48
	Paternal education	-	0.51

Table 5.3. Mean [SD] number of assets by parental education

	Men		Women	
	Russia	**Poland**	**Russia**	**Poland**
Paternal education				
< primary	1.3 [1.2]	1.9 [1.5]	1.5 [1.3]	2.0 [1.4]
Primary	1.9 [1.5]	2.6 [1.7]	2.0 [1.4]	2.7 [1.7]
Vocational	2.7 [1.7]	3.8 [1.8]	2.5 [1.7]	3.9 [1.7]
Secondary	2.4 [1.7]	4.3 [1.6]	2.7 [1.7]	4.5 [1.6]
University	3.5 [2.0]	4.9 [1.4]	3.4 [2.0]	5.1 [1.4]
p for trend	<0.001	<0.001	<0.001	<0.001
Maternal education				
< primary	1.3 [1.2]	2.1 [1.7]	1.5 [1.3]	2.2 [1.6]
Primary	2.0 [1.6]	2.8 [1.7]	2.0 [1.5]	2.9 [1.7]
Vocational	2.9 [1.8]	4.0 [1.7]	2.8 [1.8]	4.2 [1.7]
Secondary	2.5 [1.7]	4.6 [1.6]	2.7 [1.7]	4.8 [1.5]
University	3.7 [2.0]	4.9 [1.4]	3.7 [1.9]	5.1 [1.3]
p for trend	<0.001	<0.001	<0.001	<0.001

Table 5.4. Age and sex adjusted linear regression of direct measures of childhood SEC

Independent variable	Russia			Poland		
	Coeff. [95% CI]	p-value	Beta coeff.	Coeff. [95% CI]	p-value	Beta coeff.
Maternal education						
Paternal education	0.65 [0.64, 0.67]	<0.001	0.67	0.71 [0.70, 0.72]	<0.001	0.78
Assets at age 10	0.17 [0.16, 0.19]	<0.001	0.24	0.26 [0.25, 0.27]	<0.001	0.46
Paternal education						
Maternal education	0.73 [0.71, 0.74]	<0.001	0.71	0.87 [0.85, 0.88]	<0.001	0.79
Assets at age 10	0.20 [0.18, 0.22]	<0.001	0.27	0.31 [0.30, 0.32]	<0.001	0.51
Assets at age 10						
Maternal education	0.29 [0.27, 0.32]	<0.001	0.21	0.75 [0.70, 0.75]	<0.001	0.40
Paternal education	0.30 [0.28, 0.33]	<0.001	0.23	0.72 [0.70, 0.75]	<0.001	0.44

5.4.3 Childhood socioeconomic circumstances and anthropometry

Mean height for men and women in the three countries, by asset score and parental educational level, is given in table 5.5. In both genders, height was linearly associated with both assets in childhood and parental education. Similar associations were seen for maximum height and leg and trunk length, and consequently no association was observed with leg/trunk ratio (see appendix 3).

After adjusting for age, childhood assets were positively and linearly associated with measured and maximum height, leg length and trunk length in both sexes and in all countries (tables 5.6 and 5.7). Adjustment for parental education weakened the associations, more so in Poland than in Russia, but the trends, other than between assets and leg length amongst Polish women, were still statistically significant at the 95% level (tables 5.6 and 5.7). In men, the associations of measured and maximum height, leg length and trunk length with childhood assets were similar across countries. Amongst women, associations of childhood assets with measured and maximum height and leg length were stronger amongst Poles but associations with trunk length were stronger amongst Russians ($p<0.001$ for all). Leg/trunk ratio did not show a consistent relationship with assets in childhood, although there was some indication of an association amongst Polish and Czech women (tables 5.6 and 5.7).

After adjusting for age, both parents' educational levels were associated with measured and maximum height, leg length and trunk length in both genders in Poland and Russia (tables 5.6 and 5.7). Further adjustment for assets in childhood weakened the relationships but all, other than the association between leg length and paternal education in Russian women, remained statistically significant at the 95% level (tables 5.6 and 5.7). There was no effect of parent's education on leg/trunk ratio in Russian men or women or Polish women, but the educational level of both parents showed an association in Polish men (tables 5.6 and 5.7).

Age- and asset-adjusted associations of maternal education and anthropometric measures were similar to those with paternal education, although Russian women's leg length remained statistically significantly related to maternal education after adjustment for assets (tables 5.6 and 5.7).

The R^2 values showed that the contribution of childhood socioeconomic factors to the variation in anthropometric measures was statistically significant but small (tables 5.6 and 5.7). The proportion of variation explained by childhood socioeconomic factors is greater for height and trunk length than for leg length. None of the variation in leg/trunk ratio was explained by these factors.

Maternal and paternal education are very closely linked (correlation coefficient=0.75, see section 5.4.2) so adjusting the association of one parent's education with an anthropometric measure for the other parent's education was not appropriate due to colinearity. It was therefore not possible to determine whether there are any separate effects of maternal and paternal education on anthropometric measures.

To assess which anthropometric indices were most closely associated with childhood circumstances, ratios of the age-adjusted regression coefficients (per unit change in assets or parental education as shown in tables 5.6 and 5.7) to the standard deviation of the given anthropometric measure were calculated (figure 5.1). With the exception of assets in Russian women, height was associated with childhood conditions more strongly than leg length in all comparisons. Leg/trunk ratio was only weakly related to parental education and assets. Leg length appears to be more strongly influenced than trunk length by parents' education in Poland, but the opposite is true for the Russian population.

Table 5.5. Mean [SD] height for given measures of childhood SEC, with test for trend

	Men			**Women**		
	Czech Republic	**Russia**	**Poland**	**Czech Republic**	**Russia**	**Poland**
			Childhood asset score			
0	172.7 [7.4]	169.3 [6.2]	170.1 [6.1]	159.5 [7.2]	156.8 [5.5]	157.5 [5.7]
1	171.7 [6.2]	170.3 [6.4]	170.1 [6.2]	159.0 [6.2]	157.3 [5.8]	157.8 [5.7]
2	173.6 [6.2]	170.9 [6.1]	171.5 [5.9]	160.4 [5.2]	158.0 [5.8]	158.6 [5.7]
3	173.9 [6.1]	171.6 [5.8]	171.6 [6.0]	160.8 [6.0]	159.1 [5.9]	158.8 [5.8]
4	174.4 [6.4]	172.6 [6.0]	172.8 [6.1]	161.4 [5.9]	159.0 [6.1]	159.5 [5.8]
5	175.9 [6.4]	173.1 [7.0]	173.0 [6.1]	162.9 [6.0]	160.0 [6.0]	160.0 [5.8]
6	176.6 [6.3]	173.7 [6.5]	174.5 [6.6]	163.7 [6.0]	161.1 [6.1]	161.3 [5.6]
p for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
			Maternal education			
< primary	-	169.5 [5.9]	170.6 [6.3]	-	156.8 [5.7]	158.0 [5.8]
Primary	-	170.7 [6.4]	171.5 [6.1]	-	158.3 [5.9]	158.9 [5.6]
Vocational	-	171.8 [6.5]	172.8 [6.3]	-	158.5 [6.1]	160.2 [5.9]
Secondary	-	172.0 [6.1]	173.9 [6.2]	-	159.2 [5.9]	160.4 [5.9]
University	-	174.5 [6.0]	175.4 [6.8]	-	160.8 [6.1]	161.9 [6.4]
p for trend	-	<0.001	<0.001	-	<0.001	<0.001
			Paternal education			
< primary	-	169.5 [6.0]	170.1 [6.2]	-	156.7 [5.7]	158.0 [5.7]
Primary	-	170.7 [6.2]	171.2 [6.1]	-	158.3 [6.1]	158.7 [5.6]
Vocational	-	171.9 [6.5]	172.6 [5.9]	-	158.5 [6.1]	159.7 [5.6]
Secondary	-	171.6 [6.5]	173.6 [6.2]	-	158.8 [5.7]	160.4 [6.1]
University	-	172.8 [6.4]	174.7 [6.8]	-	159.8 [5.8]	161.2 [6.2]
p for trend	-	<0.001	<0.001	-	<0.001	<0.001

Table 5.6. Change [SE] in men's anthropometric measures for a one unit increase in childhood SEC†

Country	Adjustment	Height		Maximum height		Leg length		Trunk length		Leg/trunk length ratio	
		Coeff. [SE]	r^2	Coeff. [SE]	r^2	Coeff. [SE]	r^2	Coeff. [SE]	r^2	Coeff. [SE]	r^2
Assets											
Czech Rep.	Age	0.44*** [0.09]	0.06	0.44*** [0.09]	0.02	0.23*** [0.06]	0.02	0.21*** [0.05]	0.07	0.36 [0.83]	0.00
Russia	Age	0.37*** [0.06]	0.07	0.37*** [0.06]	0.03	0.20*** [0.04]	0.03	0.16*** [0.03]	0.08	0.69 [0.52]	0.00
	+ parental education	0.27*** [0.07]	0.08	0.27*** [0.07]	0.03	0.16*** [0.05]	0.04	0.10** [0.04]	0.08	0.83 [0.55]	0.00
Poland	Age	0.49*** [0.05]	0.09	0.49*** [0.05]	0.04	0.31*** [0.04]	0.04	0.18*** [0.03]	0.08	1.58** [0.48]	0.00
	+ parental education	0.25*** [0.06]	0.10	0.25*** [0.06]	0.05	0.15*** [0.04]	0.05	0.10** [0.03]	0.09	0.74 [0.54]	0.00
Paternal education											
Russia	Age	0.43*** [0.08]	0.07	0.43*** [0.08]	0.02	0.21*** [0.06]	0.03	0.23*** [0.04]	0.08	-0.14 [0.67]	0.00
	+ assets	0.35*** [0.08]	0.07	0.34*** [0.08]	0.03	0.15** [0.06]	0.03	0.20*** [0.05]	0.08	-0.46 [0.69]	0.00
Poland	Age	0.92*** [0.08]	0.10	0.92*** [0.08]	0.05	0.57*** [0.06]	0.05	0.35*** [0.05]	0.08	2.83*** [0.72]	0.00
	+ assets	0.76*** [0.09]	0.10	0.76*** [0.09]	0.05	0.47*** [0.07]	0.05	0.29*** [0.05]	0.09	2.35** [0.82]	0.00
Maternal education											
Russia	Age	0.59*** [0.08]	0.08	0.59*** [0.08]	0.03	0.33*** [0.06]	0.03	0.26*** [0.05]	0.08	0.95 [0.69]	0.00
	+ assets	0.51*** [0.09]	0.08	0.51*** [0.09]	0.03	0.29*** [0.06]	0.03	0.23*** [0.05]	0.08	0.79[0.71]	0.00
Poland	Age	0.84*** [0.09]	0.09	0.84*** [0.09]	0.04	0.53*** [0.06]	0.04	0.31*** [0.05]	0.08	2.73** [0.80]	0.00
	+ assets	0.62*** [0.10]	0.10	0.62*** [0.10]	0.05	0.40*** [0.07]	0.05	0.23*** [0.06]	0.08	2.09* [0.89]	0.00

† One additional asset or one higher level of parental education

*** $p < 0.001$; ** $0.001 \le p \le 0.01$; * $0.01 < p < 0.05$

Table 5.7. Change [SE] in women's anthropometric measures for a one unit increase in childhood SEC†

Country	Adjustment	Height		Maximum height		Leg length		Trunk length		Leg/trunk length ratio	
		Coeff. [SE]	r^2	Coeff. [SE]	r^2	Coeff. [SE]	r^2	Coeff. [SE]	r^2	Coeff. [SE]	r^2
Assets											
Czech Rep.	Age	0.39*** [0.08]	0.09	0.39*** [0.08]	0.02	0.26*** [0.06]	0.02	0.13** [0.05]	0.12	1.64* [0.80]	0.02
Russia	Age	0.23*** [0.06]	0.10	0.24*** [0.06]	0.03	0.09* [0.04]	0.03	0.14*** [0.03]	0.14	-0.28 [0.51]	0.01
	+ parental education	0.19** [0.06]	0.11	0.20** [0.06]	0.03	0.07 [0.04]	0.03	0.12*** [0.03]	0.15	-0.32 [0.54]	0.01
Poland	Age	0.38*** [0.05]	0.08	0.38*** [0.05]	0.02	0.25*** [0.04]	0.02	0.13*** [0.03]	0.10	1.62** [0.48]	0.01
	+ parental education	0.24*** [0.05]	0.09	0.24*** [0.05]	0.03	0.18*** [0.04]	0.03	0.07* [0.03]	0.11	1.43** [0.55]	0.01
Paternal education											
Russia	Age	0.25*** [0.07]	0.10	0.26*** [0.07]	0.03	0.11* [0.05]	0.02	0.14*** [0.04]	0.14	-0.15 [0.64]	0.01
	+ assets	0.19** [0.07]	0.11	0.19** [0.07]	0.03	0.09 [0.05]	0.03	0.11** [0.04]	0.15	-0.05 [0.66]	0.01
Poland	Age	0.63*** [0.07]	0.08	0.62*** [0.07]	0.02	0.37*** [0.06]	0.02	0.26*** [0.04]	0.10	1.56* [0.73]	0.01
	+ assets	0.44*** [0.08]	0.09	0.44*** [0.08]	0.03	0.24*** [0.06]	0.02	0.21*** [0.05]	0.11	0.56 [0.84]	0.01
Maternal education											
Russia	Age	0.33*** [0.07]	0.10	0.33*** [0.07]	0.03	0.16** [0.05]	0.03	0.16*** [0.03]	0.14	0.26 [0.67]	0.01
	+ assets	0.27*** [0.07]	0.11	0.27*** [0.07]	0.03	0.14** [0.05]	0.03	0.13** [0.04]	0.15	0.37 [0.69]	0.01
Poland	Age	0.59*** [0.08]	0.08	0.59*** [0.08]	0.02	0.38*** [0.06]	0.02	0.21*** [0.05]	0.10	2.15** [0.80]	0.01
	+ assets	0.39*** [0.09]	0.08	0.39*** [0.09]	0.03	0.23** [0.07]	0.02	0.16** [0.05]	0.10	1.00 [0.91]	0.01

† One additional asset or one higher level of parental education

*** $p < 0.001$; ** $0.001 \le p \le 0.01$; * $0.01 < p < 0.05$

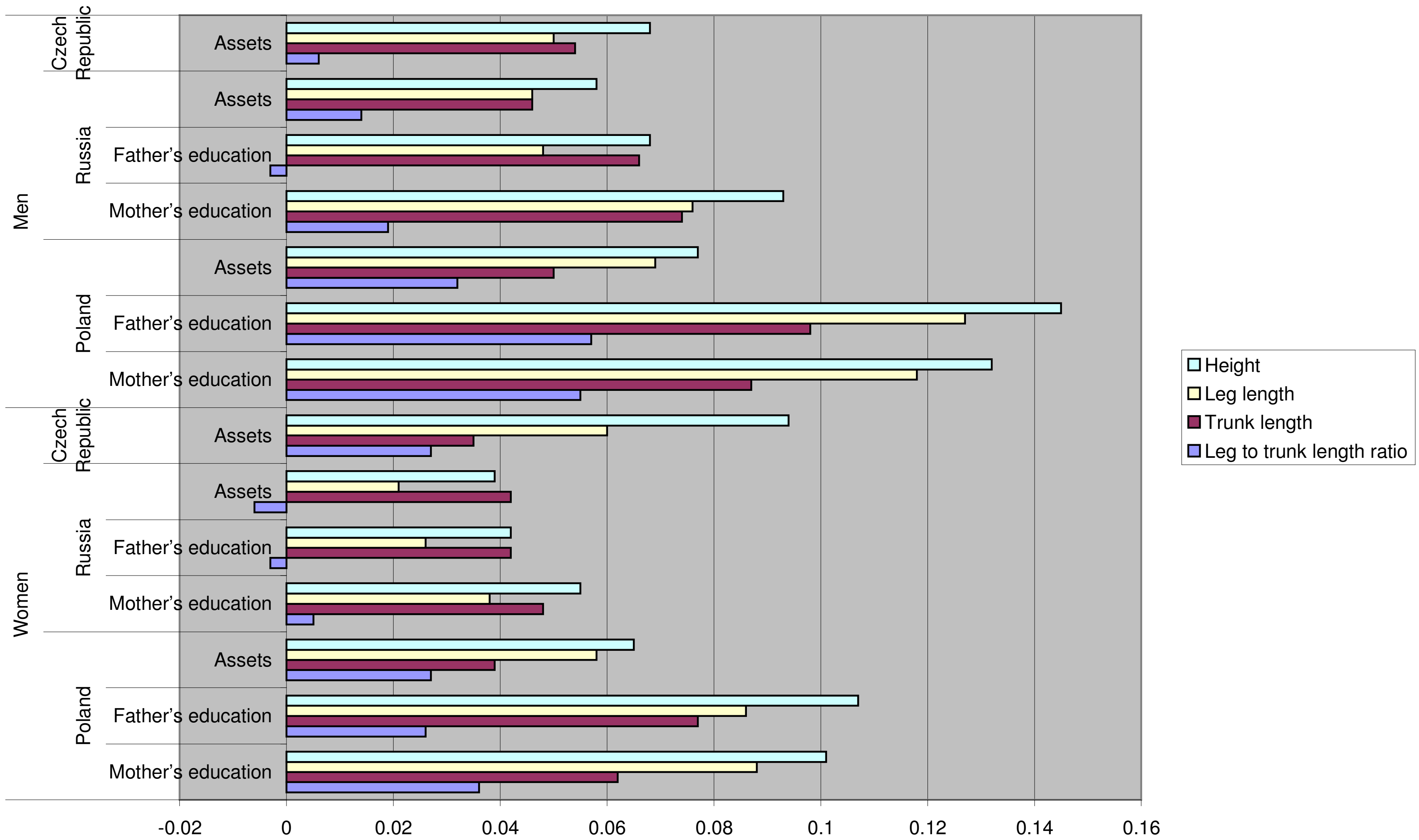

Figure 5.1. Change in anthropometric measure relative to their standard deviation, by childhood SEC measures

5.4.4 Childhood and adult socioeconomic circumstances

Correlations between childhood and adult SEC measures varied between countries but were of similar strength in men and women within each country (table 5.8). The correlations between assets in childhood and own education were stronger in Poles and Czech women ($p<0.001$), whilst between assets in childhood and other measures of adult SEC they were similar between countries. Correlations between both maternal and paternal education and both own education and living space were stronger amongst people in Poland than in Russia ($p<0.001$ for all, other than maternal education and living space amongst men where $p=0.02$). The reverse was true for correlations between maternal and paternal education and current material position, which were extremely weak in Poland but moderately strongly negative in Russia.

There were strongly statistically significant positive linear associations between the majority of measures of childhood SEC and own education and assets for both men and women in all three countries (table 5.9). Current material position was positively associated with maternal and paternal education, in men and women in Russia and Poland, and with assets in childhood in both genders in the Czech Republic and Poland, but not in Russia. Living space was positively associated with each measure of childhood SEC in Poland, and with childhood assets in the Czech Republic. Amongst Russians living space was weakly, but statistically significantly, associated with maternal education amongst men and paternal education amongst both genders.

Comparisons of participant's own education with the same sex parent's education show a trend to increasing education levels, or upward intergenerational educational mobility (table 5.10). In all subgroups more than 65% of participants' educational levels were higher than their same sex parent, whilst fewer than 10% were lower. This trend was stronger amongst women ($p<0.001$), but in all subgroups the majority of participants had one level higher education than their same sex parent.

Table 5.8. Correlation coeffiecients between measures of childhood and adult SEC

		Education	Material position	Living space	Assets in adulthood
		Czech Republic			
Male	Maternal ed.	-	-	-	-
	Paternal ed.	-	-	-	-
	Assets	0.15	0.03	0.00	0.21
Female	Maternal ed.	-	-	-	-
	Paternal ed.	-	-	-	-
	Assets	0.26	0.02	-0.03	0.25
		Russia			
Male	Maternal ed.	0.28	0.22	-0.02	0.24
	Paternal ed.	0.30	0.22	0.01	0.22
	Assets	0.14	-0.08	-0.05	0.18
Female	Maternal ed.	0.27	0.20	-0.03	0.26
	Paternal ed.	0.25	0.19	-0.01	0.24
	Assets	0.15	0.09	-0.06	0.24
		Poland			
Male	Maternal ed.	0.42	0.02	0.13	0.25
	Paternal ed.	0.45	0.01	0.12	0.25
	Assets	0.31	0.00	0.05	0.26
Female	Maternal ed.	0.45	0.06	0.11	0.26
	Paternal ed.	0.50	0.04	0.11	0.26
	Assets	0.39	0.04	0.03	0.30

Table 5.9. Age-adjusted linear regression between measures of childhood and adult SEC

Gender	Dependent variable	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
				Own education			
Male	Maternal education	-	-	0.22 [0.20, 0.25]	<0.001	0.39 [0.37, 0.42]	<0.001
	Paternal education	-	-	0.23 [0.21, 0.26]	<0.001	0.38 [0.36, 0.41]	<0.001
	Childhood assets	0.12 [0.09, 0.14]	<0.001	0.06 [0.04, 0.08]	<0.001	0.18 [0.17, 0.20]	<0.001
Female	Maternal education	-	-	0.19 [0.17, 0.22]	<0.001	0.40 [0.38, 0.43]	<0.001
	Paternal education	-	-	0.18 [0.16, 0.20]	<0.001	0.41 [0.39, 0.43]	<0.001
	Childhood assets	0.17 [0.15, 0.19]	<0.001	0.06 [0.04, 0.07]	<0.001	0.20 [0.19, 0.22]	<0.001
				Material position			
Male	Maternal education	-	-	0.54 [0.45, 0.63]	<0.001	0.12 [0.04, 0.20]	0.002
	Paternal education	-	-	0.53 [0.44, 0.61]	<0.001	0.08 [0.02, 0.15]	0.015
	Childhood assets	0.15 [0.09, 0.20]	<0.001	0.01 [-0.06, 0.08]	0.787	0.10 [0.05, 0.14]	<0.001
Female	Maternal education	-	-	0.48 [0.40, 0.57]	<0.001	0.23 [0.15, 0.31]	<0.001
	Paternal education	-	-	0.44 [0.36, 0.52]	<0.001	0.16 [0.09, 0.23]	<0.001
	Childhood assets	0.15 [0.09, 0.20]	<0.001	0.04 [-0.02, 0.11]	0.182	0.12 [0.07, 0.17]	<0.001
				Living space			
Male	Maternal education	-	-	0.01 [0.00, 0.03]	0.012	0.10 [0.08, 0.12]	<0.001
	Paternal education	-	-	0.02 [0.01, 0.03]	0.003	0.08 [0.07, 0.10]	<0.001
	Childhood assets	0.06 [0.03, 0.08]	<0.001	0.01 [0.00, 0.01]	0.160	0.05 [0.04, 0.05]	<0.001
Female	Maternal education	-	-	0.01 [0.00, 0.02]	0.063	0.10 [0.08, 0.12]	<0.001
	Paternal education	-	-	0.01 [0.00, 0.02]	0.037	0.09 [0.07, 0.10]	<0.001
	Childhood assets	0.03 [0.01, 0.05]	0.016	0.00 [-0.01, 0.01]	0.506	0.05 [0.04, 0.06]	<0.001
				Adult assets			
Male	Maternal education	-	-	0.29 [0.23, 0.34]	<0.001	0.47 [0.41, 0.53]	<0.001
	Paternal education	-	-	0.27 [0.22, 0.32]	<0.001	0.43 [0.38, 0.49]	<0.001
	Childhood assets	0.24 [0.18, 0.30]	<0.001	0.08 [0.04, 0.12]	<0.001	0.27 [0.24, 0.30]	<0.001
Female	Maternal education	-	-	0.29 [0.24, 0.34]	<0.001	0.44 [0.39, 0.50]	<0.001
	Paternal education	-	-	0.28 [0.24, 0.33]	<0.001	0.41 [0.36, 0.46]	<0.001
	Childhood assets	0.23 [0.17, 0.28]	<0.001	0.14 [0.11, 0.18]	<0.001	0.26 [0.23, 0.29]	<0.001

Table 5.10. Educational social mobility compared to same sex parent (%)

Gender	Direction of mobility	Same sex parent's educational level					
		All	<primary	Primary	Vocational	Secondary	University
		Russia					
Male	Upward	68.0	94.6	88.1	72.1	38.0	-
	Stable	22.4	5.4	11.1	23.1	37.9	62.1
	Downward	9.6	-	0.8	4.8	24.2	37.9
Female	Upward	73.3	97.0	92.5	60.2	36.9	-
	Stable	18.3	3.0	7.1	37.4	31.0	65.4
	Downward	8.4	-	0.4	2.5	32.1	34.6
		Poland					
Male	Upward	66.9	99.1	86.5	64.4	48.5	-
	Stable	27.0	0.9	13.4	32.7	39.2	70.5
	Downward	6.1	-	0.1	3.0	12.4	29.5
Female	Upward	74.2	99.1	82.7	80.0	52.8	-
	Stable	23.2	0.9	17.1	15.3	43.0	76.2
	Downward	2.7	-	0.2	4.7	4.2	23.8

5.4.5 Anthropometry and adult socioeconomic circumstances

The correlations of height with measures of adult SEC were low (<0.2), particularly those with material position and living space (table 5.11). Differences between genders and countries were small.

Height was consistently associated with each measure of adult SEC in the age-adjusted analyses: with increasing height there were improving SEC (table 5.12). These associations held after adjustment for the direct measures of childhood SEC (assets, maternal and paternal education). There were exceptions amongst Russian women, where there was no association between height and either material position or living space, and amongst Polish women where, after adjustment for childhood SEC, the association with material position was only of borderline significance.

Table 5.11. Correlation coefficient of height with measures of adult SEC

	Czech Republic	Russia	Poland
	Male		
Education	0.16	0.15	0.19
Material position	0.02	0.11	0.05
Living space	0.03	0.01	0.02
Assets	0.13	0.19	0.19
	Female		
Education	0.19	0.16	0.17
Material position	0.04	0.07	0.02
Living space	0.00	-0.03	0.01
Assets	0.16	0.16	0.16

Table 5.12. Age-adjusted change [95% CI] in adult SEC associated with a 10cm increase in height

Adult SEC measure	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Male							
Education	Age	0.23 [0.18, 0.27]	<0.001	0.19 [0.14, 0.24]	<0.001	0.30 [0.25, 0.34]	<0.001
	+ childhood SEC	0.20 [0.16, 0.25]	<0.001	0.15 [0.10, 0.20]	<0.001	0.16 [0.12, 0.21]	<0.001
Material position	Age	0.16 [0.04, 0.28]	0.008	0.40 [0.23, 0.57]	<0.001	0.43 [0.29, 0.56]	<0.001
	+ childhood SEC	0.13 [0.00, 0.25]	0.042	0.33 [0.16, 0.50]	<0.001	0.38 [0.24, 0.51]	<0.001
Living space	Age	0.10 [0.04, 0.16]	0.001	0.03 [0.01, 0.05]	0.002	0.07 [0.05, 0.10]	<0.001
	+ childhood SEC	0.09 [0.03, 0.15]	0.004	0.03 [0.01, 0.05]	0.011	0.04 [0.01, 0.07]	0.004
Assets	Age	0.36 [0.23, 0.48]	<0.001	0.44 [0.34, 0.54]	<0.001	0.53 [0.17, 0.42]	<0.001
	+ childhood SEC	0.29 [0.17, 0.42]	<0.001	0.38 [0.28, 0.49]	<0.001	0.38 [0.27, 0.48]	<0.001
Female							
Education	Age	0.25 [0.20, 0.30]	<0.001	0.20 [0.16, 0.25]	<0.001	0.24 [0.19, 0.29]	<0.001
	+ childhood SEC	0.22 [0.17, 0.27]	<0.001	0.17 [0.12, 0.22]	<0.001	0.13 [0.08, 0.17]	<0.001
Material position	Age	0.27 [0.14, 0.40]	<0.001	0.15 [-0.02, 0.32]	0.079	0.22 [0.06, 0.37]	0.007
	+ childhood SEC	0.22 [0.09, 0.35]	0.001	0.09 [-0.08, 0.26]	0.289	0.16 [0.00, 0.32]	0.056
Living space	Age	0.06 [0.01, 0.11]	0.011	0.02 [-0.01, 0.04]	0.195	0.08 [0.04, 0.11]	<0.001
	+ childhood SEC	0.05 [0.00, 0.10]	0.042	0.01 [-0.01, 0.04]	0.279	0.05 [0.02, 0.08]	0.003
Assets	Age	0.31 [0.19, 0.43]	<0.001	0.25 [0.15, 0.35]	<0.001	0.34 [0.24, 0.45]	<0.001
	+ childhood SEC	0.26 [0.14, 0.38]	<0.001	0.18 [0.08, 0.28]	<0.001	0.21 [0.10, 0.32]	<0.001

5.5 Discussion

5.5.1 Summary of results

Assets in childhood, maternal education and paternal education were all positively and linearly associated, and these associations were stronger in Poland than in Russia. Maternal and paternal education were more strongly associated with each other than either was with assets.

Height, leg length and trunk length increased with improved parental education and increasing numbers of assets in childhood.

Higher childhood SEC was linked to higher adult SEC. Parental education predicted adult SEC better than assets in childhood, and, of the measures of adult SEC, education and assets were best predicted. There was an overall trend to upward social mobility, as more than two thirds of participants were more highly educated than their parents. Women experienced more upward mobility than men.

Taller height was associated with higher adult SEC, even when the effects of age and childhood SEC were taken into account.

5.5.2 Limitations

The most important limitation here is the retrospective collection of information on childhood circumstances. This is likely to have introduced errors in recall, as is discussed in section 12.2.4.1.

Participants' heights were measured at ages 45 to 69 years, which is after the onset of age related loss of height,[187-190] so the heights measured are not the maximum attained adult heights of participants. Adjustment for age, as in all regression analyses, should remove bias introduced. This error in the measurement of adult height is discussed further in the following chapter (section 6.3.2).

5.5.3 Discussion of results

5.5.3.1 Childhood socioeconomic circumstances

As educational level is only one of many criteria involved in choosing a partner, and there is no information available here on other factors involved, the use of these data to investigate partner choice is limited. Additionally, an assumption has been made here that the two parents were in a relationship, and it is not, therefore, known whether the observed association between their educational levels actually indicates partner choice. The temporality of the relationship cannot be discussed, as the timing of the partner selection is not known. As participants' dates of birth span 25 years, partner choice will have occurred over a wide time range and adjustments for age of the participant at the point of the questionnaire will have only removed some of this variability.

Despite these caveats, the strong positive associations observed suggest that educational level was a factor in partner choice, particularly in Poland. As discussed in the introduction, the stronger association observed in Poland may be due to the fact that when most parental partnerships were established, Poland was not a communist country. In capitalist countries, where the relationship between education and income may be more apparent, the incentive to select a highly qualified partner may be greater.

To fully investigate the financial returns to education, data on parental incomes would have been required, whilst here only household assets, a proxy measure for income, was available. However, the observed increases in assets associated with higher education levels suggest a link between earnings and education in these socialist economies in the mid-twentieth century, which is in agreement with previous research,[137;138] if not with official policies of redistribution. The links between education and assets were similar to findings in western populations.[94] That they were stronger amongst Poles than Russians is in contradiction with previous research, which has suggested that income inequalities were greater in the USSR than in other socialist countries in the mid-twentieth century.[40] This highlights the inherent weakness associated with using assets as a proxy for income in societies where access to such assets may be determined more by factors such as membership of the nomenklatura[39] than by financial resources.

Patterns of ownership of durable goods in socialist countries differed from those seen in a capitalist economy. Socialist households were more likely to have a radio or television than other durable goods: these goods, via which the state communicated with citizens, were more easily available.[40] This is reflected in the data here, where the overall rate of ownership of a radio was 83%, 2.8 times higher than refrigerator ownership, and 1.6 times higher than having running cold water in the household. In many socialist households, the radio was built into the property, so possession was automatic with habitation of the property.[191] These state-level influences on asset ownership may have had more impact in the USSR than in Poland, as state control of industry, and therefore supply of goods, was tighter there.

5.5.3.2 Childhood socioeconomic circumstances and anthropometry

Adult height was shortest in Russia, and virtually all the difference between countries was due to shorter leg length. Childhood circumstances were also least favourable in Russia, and the ecological pattern is consistent with the hypothesis that childhood conditions are related to adult height, and fits with the social histories of the three countries. The Czech Republic, formerly the more affluent part of Czechoslovakia, was among the most developed countries between the wars (infant mortality 123 per 1000[192] and life expectancy at birth for men and women combined 57.9 years[193] in 1935) and remained prosperous until 1948. Russia, on the other hand, struggled both before and after WWII, as illustrated by infant mortality of 198 per 1000 live births and life expectancy at birth of 39.6 years (men and women combined) in 1935.[39] Poland, not as affluent as Czechoslovakia, occupied an intermediate position. Thus the rank of the countries, in terms of their development before and around WWII, corresponds with their ranking in terms of height.

Adult height and leg length were shorter in Russia than the other countries for people of equivalent childhood SEC, suggesting that an important aspect of inter-country variation in growth was not captured by the measures used here. One reason for this might be that the measures of SEC used here did not explain the full range of experience. As discussed in section 5.1.2, parental membership of the nomenklatura could have an impact on growth and adult height which was not explained here.

On the individual level, childhood conditions were positively associated with adult height, leg length and trunk length. The direction and magnitude of the associations were similar to those observed in most previous studies.[147;149;149;150;155;156;173;194] The presence of these associations in CEE populations further supports the view that the effects of childhood circumstances on adult height are a genuine phenomenon, not specific to western populations. Disadvantage during childhood, in terms of either parental education or household assets, negatively affects height.

These results did not confirm that leg length was correlated more strongly with childhood SEC than full height, as height seemed to reflect childhood circumstances better. Associations with leg/trunk ratio were weak and inconsistent, indicating that anthropometric proportions do not vary systematically across the socioeconomic spectrum. This result contradicts some British studies, which have suggested that leg length is the most plastic anthropometric measure and leg growth that which is most vulnerable to stunting where children are exposed to poor SEC.[139;155;156] These data suggest that both leg and trunk length are affected by poor childhood SEC, and that overall height is the most useful summary measure of effects of childhood circumstances on growth.

The strength of the conclusions drawn from these results must be tempered, due to the lack of data on some potential confounding factors. Genetic factors and parent's height clearly have an influence on height but, unfortunately, these data are not available. The potential for inaccuracies in recalled parental height was considered to be sufficiently great that such data would be unusable. All three study populations are comprised almost exclusively of Slavic people but there are no specific data to show an absence of genetic difference between the populations. However, colleagues in Novosibirsk analysed a limited number of genetic markers related to cardiovascular diseases and found no differences in their distribution between Novosibirsk and other European populations.[195]

5.5.3.3 Childhood and adult socioeconomic circumstances

The general trend to upward educational social mobility in Russia and Poland reflects the rapid industrialisation of both countries in the post-war period,[40] and is mirrored by similar trends in other European populations.[196] The stronger upward trends amongst women in Russia and Poland reflect trends to increasing women's participation in education in the post-war period across CEE.

The continuity between childhood and later life SEC in these three CEE societies suggests that the aims of the socialist governments in the middle of the twentieth century, to flatten out the socioeconomic hierarchy, were not successful, and that the inheritance of status continued under the socialist regimes.

As different assets were measured in childhood and adulthood direct comparisons cannot be drawn, however the assets in childhood were more basic than those in later life. It is assumed that majority of participants were in possession of most or all of the assets measured in childhood by the time of the survey in middle age, reinforcing the suggestion of a general trend towards improving SEC.

5.5.3.4 Anthropometry and adult socioeconomic circumstances

The results, which suggest that higher adult SEC may, at least partly, have been a consequence of taller adult height, are in agreement with patterns observed in western countries, where taller people have higher earnings.[181;182] There must be caution when drawing conclusions from these results, however, because the SEC variables (material position, living space and assets), which have been used the absence of income data, are probably insufficiently sensitive proxies to detect differences between genders and countries in the impact of height on earnings.

The relationship between taller height and higher education, however, which is observed in men and women in all countries, reflects the previous finding that taller young Polish men attained higher education.[184] These associations, although attenuated by adjustment for childhood SEC, are independent of early life circumstances and suggest that better educational opportunities were open to taller individuals. Whether this is due to higher cognitive abilities amongst taller people, as suggested by Case and Paxon,[183] or to some other factor such as the self-confidence of participants, cannot be tested in the absence of such data.

5.5.4 Conclusions

Overall, the results of this chapter have been as would be expected in any industrialised country setting. Partnerships were between men and women of similar educational backgrounds, although this correlation was greater in Poland than in Russia. Those who were more highly educated owned more assets. People who were less advantaged in childhood grew up to be shorter adults with shorter legs, taller adults had greater educational opportunities and possibly higher earnings, and those who were less advantaged in childhood were also less advantaged in adulthood.

Chapter 6. Secular trends

Having provided evidence of the positive association between SEC in childhood and adult anthropometric measures in the previous chapter, this chapter investigates population level patterns of SEC between 1943 and 1967 in Russia, Poland and the Czech Republic. It also examines the trends in adult height in people born in these three CEE countries between 1933 and 1957 and assesses the impact of the hardships associated with WWII and family SEC on these height trends.

6.1 Literature review

A trend of increasing adult height has been observed in European populations since the middle of the nineteenth century,[197;198] such that, when they reach adult height, children are on average taller than their same-sex parent.[141] Such trends have been referred to as secular trends, and defined as ‘changes in growth and development of successive generations living in the same territories.’[199] The major influences on these secular trends are the affluence and health of populations, therefore trends in height and health outcomes can be linked. In times of hardship, for example during wars, the secular trend may slow or reverse, followed by a period of quickening of the trend when conditions improve.[200-202] This is not observed in all populations, however, including those who experienced the 1941-44 siege of Leningrad.[203]

Studies of Polish adolescents suggest strong secular trends towards increasing height after the Second World War,[204-206] and these results are mirrored in children, who showed continuous increases in height from 1880 to 1990.[207] Czech children’s height also increased between 1950 and 2000.[208] Evidence of secular trends in height of adults in CEE, especially of persons born before and around the Second World War, is sparse. Given the social and economic history of the region, such trends could provide evidence of how rates of change are linked to changing SEC.

Estimates of the secular trend in adult height in those born in the post-war period in Russia vary between 1.7cm/decade and 2.4cm/decade,[201;209;210] but generally suggest a steeper trend than those observed in other European populations over the same period.[150;200;211;212] These trends were mirrored by a similarly dramatic increase in life expectancy over the same period (between 1930 and 1958 the combined life expectancy for men and women increased by more than 30 years).[39] One would expect that the rapid secular trends to increasing height are at least partly due to the very poor SEC of Russians born in the 1930s and during World War II, and improvements after the war.

6.2 Objectives

The main objectives of this chapter are to investigate the nature of the secular trends in SEC in the post-war period in the areas which now include Russia, Poland and the Czech Republic, and in adult height in those who were children during this time. Trends in height will be estimated by adjusting for age-related height loss, and the amount of the observed trend which can be explained by changes in childhood SEC will be assessed, as will the impact of World War II.

6.3 Methods

6.3.1 Variables

In these analyses date of birth, adult height and three recalled childhood SEC variables were used. The SEC measures were maternal and paternal education and household asset ownership when participants were 10 years old (see methods chapter, chapter 4).

6.3.2 Analysis

The mean asset score for each country and age group was calculated and the linear trend by date of birth was assessed. The increase in mean asset score per year was calculated using linear regression, and other measures of childhood SEC (maternal and paternal education) were adjusted for in a multivariate analysis. Analyses were performed separately by country, for comparative purposes, but as there were no differences between the genders, men and women's data were pooled.

An estimate of maximum achieved adult height was calculated, using the method described below. In the HAPIEE Study participants' heights were measured when they were aged between 45 and 69, by which point age-related loss of height would have begun.[187-190;213] Height loss begins at around age 40, accelerates with increasing age and is more substantial amongst women.[213] As this investigation into secular trends in adult height utilises cross-sectional data, these adjustments are necessary in order to avoid over-estimating the strength of a positive secular trend.

Maximum adult height was estimated by calculating the amount of height lost in ageing (cumulative height change, *chc*) using the following equations:[213]

Men: $$chc = -0.0021age^2 + 0.1258age - 1.8829$$

Women: $$chc = -0.0027age^2 + 0.1727age - 2.7616$$

These equations are based on data from 16 longitudinal studies, reviewed in Sorkin and colleagues' article,[213] which measured height at least twice during adulthood. The loss of height in ageing is illustrated below (figure 6.1). More than 34 000 men and women, aged 18-97 years and from 16 populations in Western Europe, Australia and the USA and another in the Czech Republic were surveyed. The estimate of lost height was added to measured height to give an estimate of the maximum achieved adult height of participants.

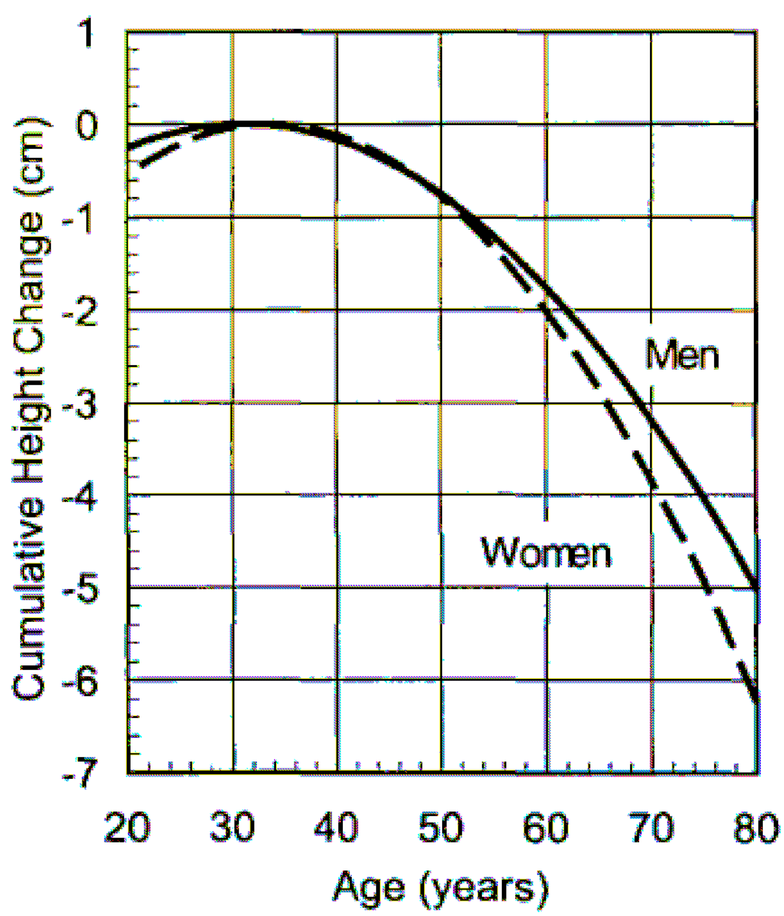

Figure 6.1. Cumulative change in height associated with ageing, from Sorkin et al.[213]

The associations between date of birth and both measured height and estimated maximum adult height were examined using linear regression. Childhood conditions have been shown in this and other populations to be positively associated with adult height,[147;164;214] and are associated here with age, so were adjusted for as potential confounding factors. Due to the rapid expansion of the population of Novosibirsk, where the Russian cohort is based, around WWII, the possible effects on any secular trend in height of migration to the region were also investigated. These analyses were conducted separately by gender and country.

As discussed in the methods chapter (chapter 4) all analyses in this chapter used adjustments by date of birth, rather than by age as in other chapters. Date is the relevant factor here, and as data collection spanned over three years, using age at interview to adjust for date would introduce error.

6.4 Results

Mean number of assets was highest in the Czech Republic and lowest in Russia, and increased linearly with year of birth in all countries, such that those in the oldest age groups had, on average, approximately two fewer assets than the youngest group (table 6.1, figure 6.2). The trends were of a similar strength in each country, and were weakened after adjustment for parental education (table 6.2).

Table 6.1. Mean [SD] number of assets in childhood, by year of birth

Year of birth	Czech Republic	Russia	Poland
Overall	4.2 [1.4]	2.2 [1.7]	3.4 [1.9]
1933-37	3.2 [1.4]	1.2 [1.0]	2.3 [1.6]
1938-42	3.8 [1.2]	1.5 [1.2]	2.8 [1.7]
1943-47	4.2 [1.3]	2.1 [1.5]	3.3 [1.8]
1948-52	4.6 [1.2]	2.7 [1.7]	3.9 [1.8]
1953-57	5.1 [1.1]	3.3 [1.9]	4.5 [1.7]
p for trend	<0.001	<0.001	<0.001

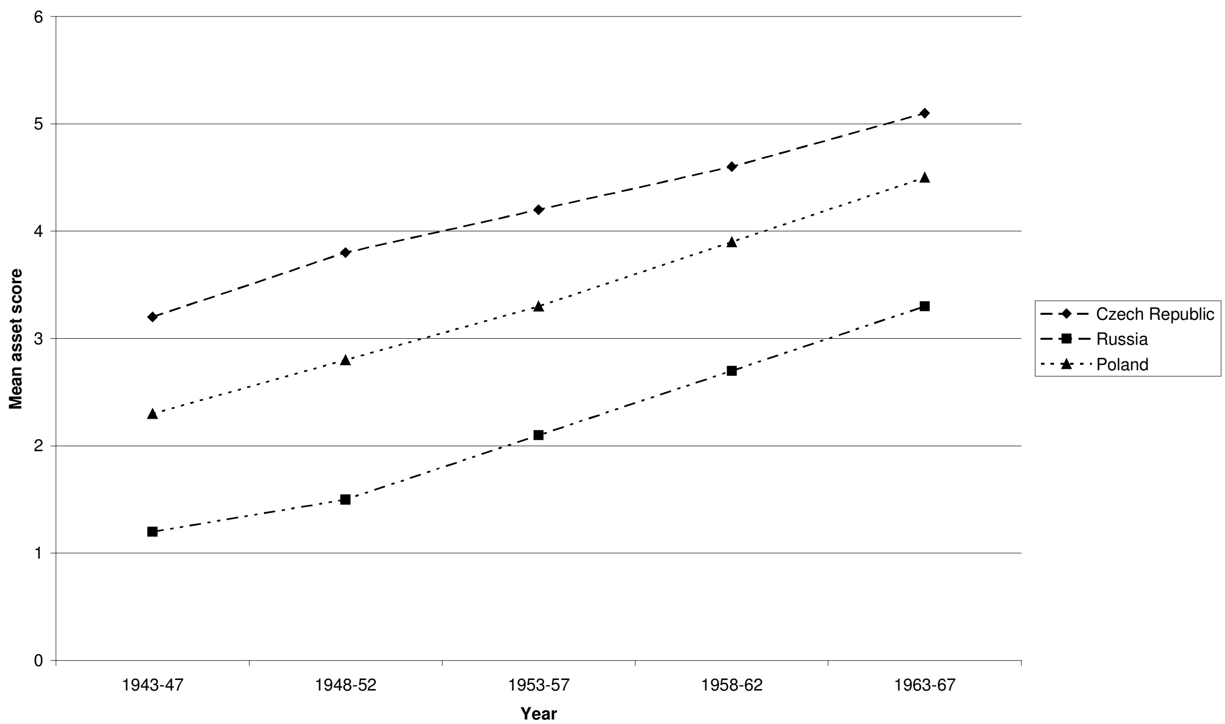

Figure 6.2. Secular trend in number of assets between 1943 and 1967

Table 6.2. Change [95% CI] in number of assets per year (1943-1967)

Adjustment	**Czech Republic**		**Russia**		**Poland**	
	Coeff. [95% CI]	p	Coeff. [95% CI]	p	Coeff. [95% CI]	p
-	0.10 [0.09, 0.10]	<0.001	0.11 [0.11, 0.12]	<0.001	0.11 [0.10, 0.11]	<0.001
Parental ed.	-	-	0.09 [0.09, 0.10]	<0.001	0.08 [0.08, 0.09]	<0.001

Men and women born earlier lost more height than those born later (as calculated using the equations provided above) with losses of more than 3cm in men and nearly 3.5cm in women aged 65-69 years (table 6.3). Mean height increased linearly with year of birth in both genders and in all countries (table 6.4). Using maximum adult height attenuated the association with year of birth (table 6.4).

Table 6.3. Mean [SD] age-related height loss, by year of birth, based on equations from Sorkin et al[213]

Year of birth	**Cumulative height change (mean [SD])**	
	Men	**Women**
1933-37	3.03 [0.22]	3.49 [0.26]
1938-42	2.37 [0.22]	2.68 [0.26]
1943-47	1.69 [0.19]	1.86 [0.22]
1948-52	1.18 [0.16]	1.26 [0.19]
1953-57	0.74 [0.12]	0.75 [0.13]

Table 6.4. Mean [SD] measured and maximum heights and assets in childhood, by year of birth

Year of birth	Men			Women		
	Czech Republic	Russia	Poland	Czech Republic	Russia	Poland
Measured height (cm)						
1933-37	172.7 [6.4]	169.1 [6.2]	170.0 [6.0]	159.2 [5.7]	155.6 [5.5]	157.1 [5.5]
1938-42	174.0 [6.0]	169.4 [5.9]	171.0 [6.0]	161.0 [5.6]	156.5 [5.6]	158.2 [5.6]
1943-47	175.2 [6.4]	171.4 [6.2]	171.8 [5.9]	161.6 [5.9]	158.2 [5.7]	159.3 [5.6]
1948-52	176.3 [6.2]	172.4 [6.1]	173.1 [6.1]	163.3 [5.9]	159.5 [5.7]	160.2 [6.0]
1953-57	176.9 [6.4]	173.1 [6.4]	174.9 [6.5]	164.3 [5.8]	160.8 [5.8]	161.4 [5.6]
p for trend	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*
Maximum height (cm)						
1933-37	175.7 [6.4]	172.1 [6.2]	173.0 [6.0]	162.7 [5.7]	159.1 [5.5]	160.6 [5.5]
1938-42	176.3 [6.0]	171.9 [5.9]	173.3 [6.0]	163.6 [5.6]	159.3 [5.6]	160.8 [5.6]
1943-47	176.8 [6.4]	173.1 [6.2]	173.5 [5.9]	163.5 [5.9]	160.0 [5.7]	161.2 [5.6]
1948-52	177.5 [6.2]	173.6 [6.1]	174.2 [6.1]	164.6 [5.9]	160.8 [5.7]	161.4 [5.9]
1953-57	177.7 [6.4]	173.9 [6.4]	175.6 [6.4]	165.0 [5.8]	161.6 [5.8]	162.1 [5.6]
p for trend	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*
Number of assets						
1933-37	3.1 [1.4]	1.2 [1.0]	2.2 [1.6]	3.3 [1.3]	1.2 [1.0]	2.4 [1.6]
1938-42	3.7 [1.2]	1.5 [1.2]	2.7 [1.7]	3.7 [1.2]	1.5 [1.1]	2.9 [1.7]
1943-47	4.2 [1.2]	2.1 [1.5]	3.2 [1.8]	4.1 [1.2]	2.1 [1.4]	3.3 [1.8]
1948-52	4.6 [1.3]	2.7 [1.7]	3.9 [1.9]	4.6 [1.2]	2.8 [1.7]	3.9 [1.8]
1953-57	5.1 [1.1]	3.4 [2.0]	4.4 [1.7]	5.2 [1.0]	3.3 [1.8]	4.5 [1.8]
p for trend	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*

The long-term linear trends in height were statistically significant, but it is noteworthy that among Russian men, the mean maximum height actually decreased between the birth cohorts 1933-37 and 1938-42 (table 6.4). The possible effect on height of being born during the war further was explored, restricting the dataset to persons born before 1950 (table 6.5). In a linear regression of estimated maximum height against year of birth a dummy variable for being born in 1940-45 was included. There were small negative departures from the longer term trends in maximum height for subjects born during the war, which, however, were only statistically significant in Russian participants (when men and women were combined).

Table 6.5. Beta coefficient [95% CI] for being born in 1940-45 in a regression model of maximum height against year of birth (restricted to persons born before 1950)

	Czech Republic	Russia	Poland
Men	-0.14 [-0.69, 0.42]	-0.38 [-0.88, 0.12]	-0.06 [-0.52, 0.40]
Women	-0.07 [-0.54, 0.41]	-0.34 [-0.78, 0.09]	-0.05 [-0.48, 0.38]
Both genders*	-0.10 [-0.46, 0.26]	-0.36 [-0.69, -0.03]	-0.05 [-0.37, 0.26]

* also adjusted for gender

Table 6.6 shows linear associations of measured and maximum heights with date of birth. The associations of year of birth with maximum height are also illustrated in figures 6.2 and 6.3, which show mean maximum heights for 5 year age groups, OLS of height against year of birth, and regression lines adjusted for childhood SEC. In both sexes and all countries, adjustment for childhood assets led to a substantial attenuation of the associations between year of birth and height, and the relationship was further weakened after controlling for parent's education. After adjustments, the strength of the secular trend in maximum height was similar for men in each country (around 0.7 cm per decade); in women, the height increase seemed steepest in Russia (1.1 cm per decade) and shallowest in Poland (0.4 cm per decade). Further adjustment for current socioeconomic position did not substantially change these estimates (not shown in table). Even after adjustment for childhood conditions, however, men and women in Russia remained shortest in each birth cohort (figures 6.2 and 6.3).

Table 6.6. Change [95% CI] in measured and maximum heights (cm) associated with each 10 year increase in year of birth amongst persons born 1933-57

Gender	Adjustment	Czech Republic	Russia	Poland
		Measured height		
Men	-	2.24 [1.92, 2.56]	2.33 [2.05, 2.61]	2.45 [2.19, 2.71]
	Childhood assets	1.79 [1.43, 2.16]	1.93 [1.62, 2.24]	1.92 [1.63, 2.20]
	Childhood assets, parental education	-	1.71 [1.39, 2.03]	1.91 [1.63, 2.20]
Women	-	2.52 [2.25, 2.79]	2.72 [2.48, 2.95]	2.20 [1.96, 2.43]
	Childhood assets	2.17 [1.85, 2.48]	2.46 [2.19, 2.72]	1.80 [1.54, 2.05]
	Childhood assets, parental education	-	2.36 [2.09, 2.63]	1.81 [1.55, 2.06]
		Maximum height		
Men	-	1.05 [0.73, 1.37]	1.16 [0.88, 1.44]	1.27 [1.01, 1.53]
	Childhood assets	0.61 [0.24, 0.97]	0.76 [0.44, 1.07]	0.74 [0.45, 1.02]
	Childhood assets, parental education	-	0.54 [0.22, 0.86]	0.73 [0.45, 0.10]
Women	-	1.13 [0.86, 1.40]	1.33 [1.09, 1.56]	0.80 [0.57, 1.04]
	Childhood assets	0.77 [0.46, 1.08]	1.06 [0.80, 1.32]	0.40 [0.15, 0.66]
	Childhood assets, parental education	-	0.96 [0.69, 1.23]	0.42 [0.16, 0.67]

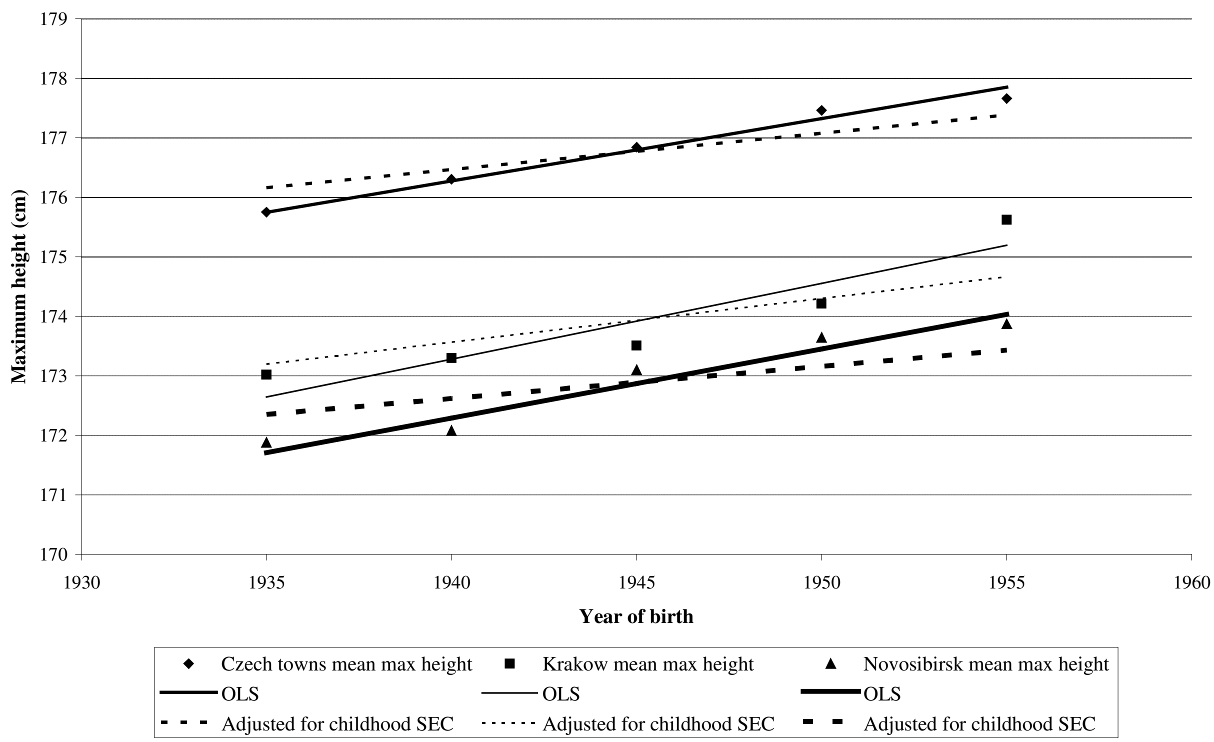

Figure 6.3. Secular trend in men's maximum height

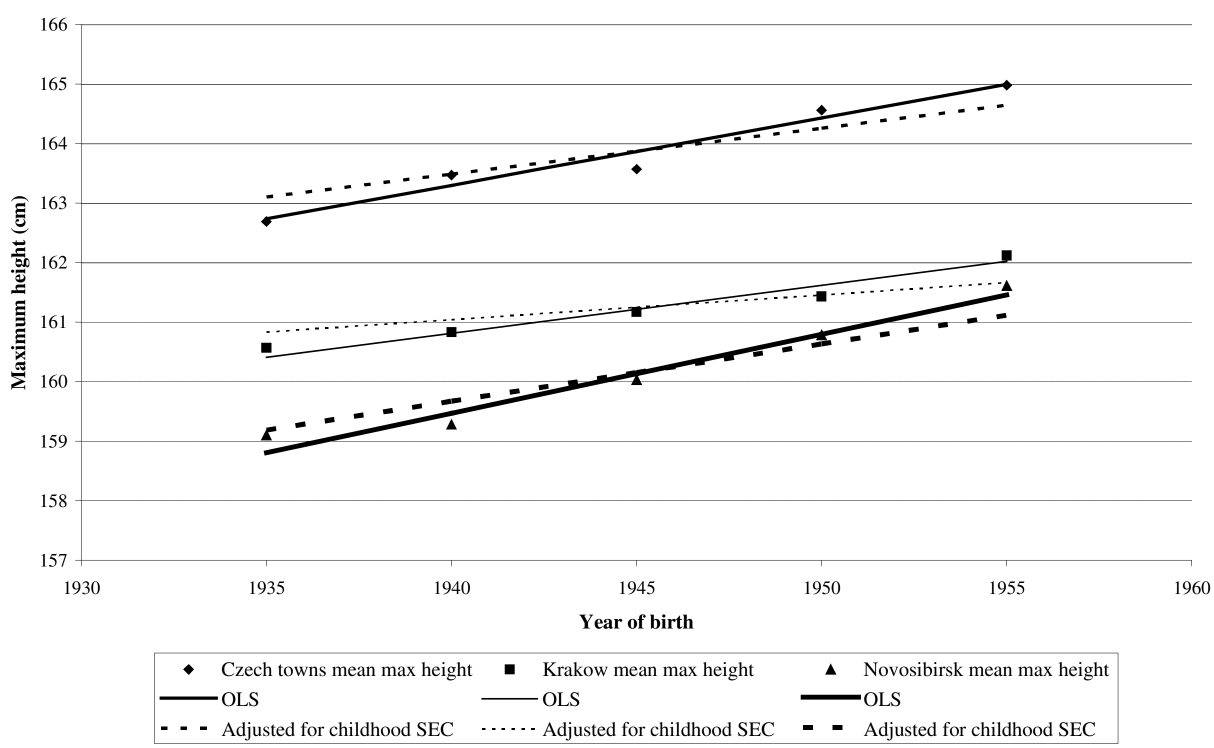

Figure 6.4. Secular trend in women's maximum height

Because the population of Novosibirsk expanded rapidly before and during the World War II [215] I examined whether there were differences in height trends by migration status. Table 6.7 shows the difference in the strength of the trend in height by year of birth between those in the Russian study population who were born in Novosibirsk Oblast (region) and those who migrated there after birth. The trends were stronger in males born in Novosibirsk Oblast, but there were no differences for women. Despite this pattern, however, additional adjustment for migration status did not alter the figures for the Russian study population shown in table 6.7 by more than 1mm in either direction.

Table 6.7. Change [95% CI] in measured and maximum heights (cm) associated with 10 year increase in year of birth, comparing those born in and outside Novosibirsk Oblast

Gender	Adjustment	Born outside Novosibirsk	Born in Novosibirsk
N (men / women)		1850 / 2023	2042 / 2618
		Measured height (cm)	
Men	-	2.05 [1.63, 2.47]	2.67 [2.29, 3.05]
	Childhood assets	1.61 [1.14, 2.08]	2.31 [1.88, 2.74]
	Childhood assets, parental education	1.45 [0.97, 1.93]	2.01 [1.56, 2.45]
Women	-	2.84 [2.49, 3.19]	2.69 [2.38, 3.00]
	Childhood assets	2.71 [2.31, 3.11]	2.34 [1.98, 2.69]
	Childhood assets, parental education	2.57 [2.15, 2.98]	2.29 [1.92, 2.65]
		Maximum height (cm)	
Men	-	0.88 [0.46, 1.29]	1.52 [1.13, 1.90]
	Childhood assets	0.42 [-0.04, 0.89]	1.15 [0.72, 1.58]
	Childhood assets, parental education	0.26 [-0.21, 0.73]	0.85 [0.40, 1.29]
Women	-	1.43 [1.08, 1.79]	1.31 [1.00, 1.63]
	Childhood assets	1.30 [0.89, 1.70]	0.95 [0.60, 1.31]
	Childhood assets, parental education	1.14 [0.74, 1.56]	0.90 [0.54, 1.27]

6.5 Discussion

6.5.1 Summary of results

There was evidence of secular trends in both childhood SEC and adult height among persons born between 1933 and 1957 in urban areas of in Russia, Poland and the Czech Republic. The positive secular trend in measured height, derived from cross-sectional data, was partially explained by loss of height in ageing and by improvements in social conditions in childhood over the birth cohorts covered by the study. However, even after adjustment for these factors, the trends remained positive and statistically significant. The trends were approximately linear and did not generally show variations among those born in the years immediately preceding, during or following WWII, with a possible exception was Russian subjects born around WWII whose estimated maximum heights were slightly shorter than expected.

6.5.2 Limitations

Several features of this study require consideration when interpreting the results. The major potential limitation of the study is its cross-sectional design and the fact that participant's height was measured at an age when age-related loss of height had begun. Height loss will be differential by age, with those oldest participants having lost the most height. This leads to an overestimation of the strength of the secular trend in height. To minimize this problem, adjustments were made for the probable loss of height with age. [213] The equations used, however, were based on height loss observed in western populations, and it is possible that the age-related shrinkage is different in these Eastern European populations. It is also possible that factors other than age and height, which were not accounted for in the calculation of maximum height, have an effect on height lost in older age. To our knowledge there is no evidence that this is the case, and data from the British Regional Heart Study[216] and the Whitehall II study (M. Shipley, unpublished) suggest that age-related height loss is not related to occupation, education or other measures of adult SEC. The validity of the calculations is supported by the similarity between the estimated maximum heights of the Polish participants born in 1952-53 and the measured heights of a cohort of 18-19 year olds born in the same years reported in another study.[217]

This work uses recalled household ownership of assets to investigate the secular trends in SEC and as a covariate in the analyses of secular trends in height. The limitations associated with using recalled data are covered in detail in the discussion chapter (chapter 12), however the potential for differential error in recall by age is a particular issue here. Participants were asked about assets when they were aged between 45 and 69 years old, and as memory worsens with increasing age recall of childhood SEC may be less accurate in older age groups. If this inaccuracy of recall tended to be in a particular direction it would cause an under- or over-estimation of the strength of the trend.

All participants were living in urban areas. In industrialised countries, urban-rural differences in height are well recognised, and have been consistently observed in Poland.[173;218;219] Participants cannot, therefore, be considered representative of the whole populations of their countries. Secular trends in height may be of a steeper gradient in rural than urban communities,[219] therefore the estimates of secular trends reported here may underestimate the overall secular trends of the three countries.

A further point for consideration is that the population of Novosibirsk expanded rapidly around the time of WWII, mainly through in migration from other areas of the Soviet Union. In fact, 45% of the Russian study population was born outside the Novosibirsk Oblast (region). As the majority of inhabitants of Novosibirsk originally came from European Russia and are ethnic Russians, genetic differences are unlikely to be an important factor here. The trend to increasing height was stronger amongst men born in the Novosibirsk region, while there were no differences amongst women. However, adjustment for migration status did not suggest that it was an important confounding factor in the relationship between height and year of birth. Admittedly, this is necessarily only a crude assessment of the effect of migration, as the date of, and reasons for, migration are not known.

6.5.3 Discussion of results

There are several note-worthy findings here. Firstly, there is a linear trend in assets in the home at age 10. Participants were aged 10 between 1943 and 1967 so this trend indicates a steady improvement in living conditions in the post-war period in Russia, Poland and the Czech Republic. This improvement in social conditions was reflected in Russia by an increase in life expectancy at birth between 1946 and 1956 from 41.5 to 61.0 years in men and 51.0 to 68.9 years in women.[39] In Poland and the Czech Republic, life expectancy was also improving in the post-war years until the mid 1960s.[220]

Secondly, the secular trend towards increasing height persists after controlling for both age-related loss of height and childhood SEC. In all three study populations both men and women show an increase in height of approximately 1 cm per decade, as suggested by

Tanner.[221] After adjustment for height loss and childhood SEC, the secular trend was strongest amongst Russian women. The magnitude of these secular trends is within the range of those observed in other European populations;[150;211;219;222-225] however, they seem weaker than have been shown previously in eastern European populations. Bielicki and colleagues' studies of Polish conscripts suggest a secular trend of 2.5 cm per decade between those born in 1946 and 1957 [204;205] (although this may be confounded by a trend to earlier maturation) and Dubrova and colleagues have shown a 1.8 cm per decade increase in height in Russian women born between 1930 and 1965.[201]

Third, although childhood conditions were strongly associated with height across all countries and birth cohorts, and although they improved markedly over time, they failed to explain fully the secular trend in height. Perhaps this is not surprising, given the possible problems associated with measuring childhood conditions retrospectively.

The generally linear pattern of the trends in height observed in those born between 1933 and 1957 suggests an absence of major differences in height (and growth) among adults born in the period immediately before, during or after WWII. There were only minor reductions in the estimated maximum heights of people born in the war years (N=6662), most notably in Russia, but these differences were small and of low statistical significance. It is interesting that the strongest effect of WWII on growth appears to be amongst the Russian study population, as Novosibirsk, where the study is based, was far removed from the violence experienced across much of Europe.

There are three potential explanations for the lack of observed effect of WWII on trends in height. Firstly, this study may not have adequate statistical power to identify small effects, as only about one in five participants were born during the war.

Secondly, during the wartime years of hardship, there may have been a delay in the onset of decreasing growth rates at the end of adolescence. Vignerova and colleagues noted growth of Czech children slowed and stopped at older ages during the period of food scarcity during and immediately after World War II.[208] This would provide the opportunity for catch-up growth in those whose rate of growth had been slowed.

Thirdly, hardship may not affect only a specific birth cohort. This was observed by Brundtland and colleagues, who investigated heights of children in Oslo between 1920 and

1975, and showed that all age groups were similarly affected by WWII and that there was a temporary reversal of the secular trend during that period.[226] It is not clear, unfortunately, whether in those Oslo children the effects were equally long lasting in all age groups, or whether those who experienced the insult earlier in life were able to compensate with catch-up growth. This, however, seems an unlikely explanation for the absence of an interruption in the secular trend in these Eastern European cohorts, as some participants were born more than ten years after the end of WWII. Although hardships began before, and persisted after the end of the war in most places, it is unlikely that the growth of the youngest participants, who were born in the later 1950s, would have been affected as severely as that of those who lived through the war or were born during it.

6.5.4 Conclusions

In summary, there are observable secular trends towards increasing height amongst persons born between 1933 and 1957. These trends are not explained by parallel trends towards improving childhood SEC or by loss of height in ageing. Being born during WWII had only small negative effect, most notably in the Russian population.

Chapter 7. Blood pressure

Following on from the previous two chapters, the first of which established the relationships between measures of SEC across the life course, and the second of which looked into the trends across time in SEC and in adult height, this chapter is the first to investigate the relationship between SEC and a CVD risk factor. It takes the results of the previous chapters into account, and aims to determine the relationship between SEC in early life and blood pressure and hypertension in middle and older age, in Russia, Poland and the Czech Republic.

7.1 Literature review

Of the classic cardiovascular disease risk factors, blood pressure (BP) is perhaps that for which there is the greatest body of evidence in support of an association with SEC. The majority of studies have investigated associations with measures of adult SEC, in particular education, but BP has also been linked with early life exposures such as low birth weight and childhood SEC. Given the focus of this thesis, this review will focus primarily on the relationships of systolic blood pressure (SBP), diastolic blood pressure (DBP) and hypertension with childhood SEC, and only briefly summarises the evidence with regard to adult SEC.

7.1.1 Blood pressure and adult socioeconomic circumstances

As adult SEC is not the main risk factor of interest here, this section of the review will be largely confined to prospective studies of the relationship. Colhoun and colleagues reviewed the 57 studies published between 1966 and 1996 on the association between SEC and blood pressure in developed countries,[227] and the majority found inverse associations, with a difference in systolic blood pressure of 2-3mmHg between the highest and lowest SEC groups. A substantial part of the social gradient in blood pressure was explained by BMI.

In addition to this review, there were five longitudinal analyses, each of which used incident hypertension as the outcome and utilised large US datasets; three use NHANES I[228-230] and two use CARDIA data.[231;232]

Both analyses of CARDIA data included more than 3800 men and women, all of whom were normotensive and aged 18 to 30 years at baseline, and who were followed up for ten years. Financial difficulties at baseline, and throughout follow-up, were both independently and inversely associated with incident hypertension.[231] In analyses adjusted for lifestyle factors and SBP at baseline, having fewer than 12 years of education predicted increased incidence of hypertension in white women and men.[232]

NHANES I participants were also followed up for 10 years. Amongst white participants aged 45-64 years at baseline, incidence of hypertension did not vary by educational level, although amongst white participants aged 25-44 years at baseline, those with fewer than 12 years of education had more than twice the risk of developing hypertension than those with more education.[228]

Education was inversely related to hypertension incidence amongst white women aged 25-74 at baseline, and a similar relationship was of borderline statistical significance amongst white men.[229] Household income at baseline was not related to incidence of hypertension in any demographic group. The models included age and both biological and behavioural CVD risk factors.

In an analysis restricted to white males aged 25-55 at baseline, the risk of developing hypertension was higher in men who remained in lower social classes, and in some groups of both upwardly and downwardly socially mobile men, compared to those who remained in the highest social class throughout the follow-up period, suggesting that lower SEC at any stage of adulthood has negative effects.[230] These analyses were adjusted for age, BMI and alcohol use.

The majority of studies of the relationship between adult SEC and BP have utilised cross-sectional data, often from follow-up studies of CVD where BP and SEC were measured as baseline variables, and as a consequence appropriate adjustments for covariates have often not been made.[233-241] Compounded by the issue of reverse causality, which cross-sectional studies are vulnerable to, the results from these studies may overestimate the strength of the association.

Cross-sectional studies of the relationship between hypertension and adult SEC virtually all used data from European[236;240;242-244] or North American[233;237;239;241;245] populations, and showed inverse associations.[233;236;237;239-242;244;245] Only one study found no association,[243] although two studies from India showed higher rates of hypertension amongst higher SEC people.[235;238] Studies which compared the association between the sexes tended to find stronger associations amongst women.[233;236;240;241]

The majority of the cross-sectional studies of the relationship between BP and adult SEC found an inverse association, such that those who are of higher SEC have lower SBP/DBP.[234;246-254] There were a few studies which did not find a link,[250;253;255] but none found a positive association. Again, each study was based on data from North American[246;249-251;253;254;256] or Western European populations,[60;247;248;255;257-259] other than one multi-centre study which also included populations from around the world[252] and one study based in Nigeria.[234]

A study which investigated the relation of a binary measure of education with several measures of BP in adulthood found that the relationship varied with age.[257] In those aged over 40, SBP was higher in the low educated group, and the disparity was greater and widening with age in women, but not men. For DBP, in those in early middle age (40-55 years) there was little variation by educational level amongst men, whilst low educated women had higher DBP. In those older than 55 years of age the DBP of the two educational groups diverged, and for both genders those with higher education showed higher blood pressure. As the study was cross-sectional cohort effects cannot be disregarded as a potential explanation of the observed patterns.

7.1.2 Blood pressure and childhood socioeconomic circumstances

There are many fewer studies into the association of blood pressure in adulthood with childhood SEC than with adult SEC, and none which investigated the relationship of childhood SEC with hypertension. All five of the studies reviewed here utilised data from western European populations; one from Spain and two each from Finland and the UK. All but the Spanish study were longitudinal, so measured early life SEC prospectively.

The two Finnish reports used the same data, from a cohort of Finnish children and adolescents, to investigate the relationships between SEC in childhood and SBP and DBP in early adulthood.[260;261] SBP, measured between 24 and 39 years, was elevated in association with decreases in both parental occupational social class and household income, even after adjustment for birth weight, breastfeeding, BMI, smoking and alcohol consumption.[260] DBP, also measured between 24 and 39 years, was associated with parental social class amongst women but not men.[261]

Using data from 3634 men and women in the British 1946 Birth Cohort, Hardy and colleagues investigated the association of childhood SEC with systolic blood pressure at 36, 43 and 53 years, as well as the change in blood pressure between ages 36 and 53.[262] People whose fathers were in a manual occupation when participants were aged 4 years old had higher systolic and diastolic blood pressures. The strength of the effect grew with age, as the mean BP of people of lower social class of origin increased at a faster rate.

Data from the British 1958 Birth Cohort were used by Power and colleagues to examine the association of blood pressure at age 45 with father's occupational social class at birth.[263] In an analysis adjusted for age, sex and antihypertensive treatment, as SEC improved blood pressure decreased.

Regidor and colleagues analysed cross-sectional data on more than 3000 men and women, over the age of 60 years, who were representative of the Spanish non-institutionalised population.[264] They found no evidence for an association between SBP or DBP and childhood SEC. The indicator of childhood SEC used was father's occupation, which was recalled and therefore subject to recall error, and was binary so may not have been sufficiently sensitive to detect any association.

Of these five studies, therefore, each of those which measured childhood SEC contemporaneously showed them to be associated with BP measures, and only the sole cross-sectional study did not find a relationship. Some measurement error may have occurred in the cross-sectional study, possibly relating to inaccurate recall of childhood conditions, which would prevent a true association from being observed. The cross-sectional study was also the one in which the participants were oldest when their BP measurements were taken, so the lack of observed association here may be due to weakening of the relationship between childhood SEC and BP with increasing age.

In addition, a study of adult residents of St Petersburg compared those who lived there as children and experienced the WWII siege of Leningrad, during which food was severely rationed, and those who lived elsewhere. It found that SBP in later life was elevated amongst exposed women and men who were aged 6-8 and 9-15 years, respectively, during the height of the siege,[260-263;265] providing further evidence for an effect on adult SBP of deprivation in childhood.

Only one study has been found which investigated the relationships between measures of SEC from across the life course and blood pressure in adulthood. In 958 women, who had a mean age of 47 years and were working in Scotland, the relationships between DBP and with five measures of life course SEC were investigated, and no statistically significant associations were found.[266] The data were collected cross-sectionally, and the SEC measures were father's and current occupational social class, educational level, a measure of social mobility and current material position. A social gradient in DBP may not have been detected because of the relatively small sample size, because of recall bias in the retrospectively collected measures of childhood SEC, or because the participants' SEC backgrounds were too homogenous. In addition, adjustments were not made for use of antihypertensives, nor were analyses restricted to those not on such medication.

7.1.3 Blood pressure and anthropometry

The majority of the literature appears to suggest a positive association between stature (whether measured by height or leg length) and DBP,[264;267] and the reverse for SBP.[264;267;268] These associations may be indicative of the relationship between childhood SEC and BP, with height acting as a proxy measure for childhood SEC, or may be due to links between both height and blood pressure and birth weight and growth in utero.[269]

Cross-sectional data on more than 3000 Spanish men and women over the age of 60 years showed inverse age-adjusted associations between SBP and height, and a positive association with DBP amongst women.[264] The associations persisted after adjustment for several potential confounding variables, including antihypertensive treatment, adult SEC, smoking and other classical risk factors for elevated blood pressure.

Data from the 1946 Birth Cohort showed inverse associations of height and leg length with SBP, but not DBP, at age 53.[268] These associations, other than that with height amongst men, were only slightly weakened by adjustments for use of antihypertensives, BMI, smoking and birth weight. Trunk length was not associated with SBP or DBP.

In a cohort of more than 10,000 Chinese older people (mean age 65 years) height was inversely associated with SBP and positively associated with DBP, and these associations remained after adjustment for age, gender, antihypertensive use, SEC, smoking, BMI and other relevant lifestyle factors.[267] There were similar associations with sitting height, although in the fully adjusted analysis the association with DBP was no longer significant. Leg length showed a positive association with DBP in the fully adjusted analysis.

7.2 Objectives

The overarching aim of this chapter is to determine whether there is a relationship between measures of childhood SEC and blood pressure in middle to older age in CEE. Specifically, each of SBP, DBP and hypertension will be investigated as outcomes, and it will be determined whether childhood SEC, in particular, have effects on the outcomes independent of those of other life course SEC.

7.3 Methods

7.3.1 Variables

Three main measures of elevated blood pressure were used in the analyses: continuous variables for systolic and diastolic blood pressure and a binary measure of hypertension.

The protocol for the measurement of systolic and diastolic blood pressure is outlined in detail in the methods chapter (chapter 4). Briefly, they were measured three times by a nurse and the values used here were the means of the final two measurements.

The main definition of hypertension required at least one of the following conditions in order for a participant to be defined as hypertensive: SBP of ≥ 140 mmHg, DBP of ≥ 90mmHg or treatment with anti-hypertensives in the two weeks prior to interview. The older, more stringent definition of hypertension, which required SBP ≥ 160 mmHg, DBP ≥

95mmHg or treatment, was also investigated for comparison, but the results of these analyses are not discussed in full. All remaining results are shown in appendix 3.

The main exposure variables are measures of childhood SEC (assets at age 10, paternal education, maternal education) and anthropometric measures (height, leg length, trunk length), details of which are given in the main methods section. Covariates, which are also discussed in further detail in the main methods section, include:

- Age at interview, which was used as a continuous variable in all analyses, except for the descriptive analysis, where five year age groups were used;
- Use of antihypertensives in the two weeks prior to interview;
- Current BMI;
- Current smoking;
- Adult SEC (education, material position, living space and assets).

7.3.2 Analysis

Firstly, the three samples were described in terms of SBP, DBP and hypertension prevalence, in relation to age and the three measures of childhood SEC. All analyses were performed separately by gender and country, owing to the interactions discussed in section 4.4.

Secondly, the relationships of each measure of SEC and each anthropometric measure with SBP and DBP, and with hypertension, were investigated using linear and logistic regression, respectively. All regression analyses were adjusted for age, BMI and smoking. Further adjustments were made for alternative SEC measures (recalled childhood SEC, adult SEC, anthropometric measures).

As discussed in the methods chapter (chapter 4) analyses of SBP and DBP excluded those who had taken medication for high blood pressure in the two weeks prior to the day the questionnaire was completed.

7.4 Results

7.4.1 Systolic blood pressure

7.4.1.1 Descriptive analysis

Mean SBP varied by country and gender (table 7.1). In the Czech Republic and Poland, men had significantly higher mean SBP than women ($p<0.001$), whilst in Russia there was no gender difference ($p=0.58$).

In the crude analyses there were strong positive linear trends between age and SBP in each country and both genders (table 7.1). Similarly, linear trends in SBP were observed with each measure of childhood SEC (assets, paternal and maternal education) in each country and gender group. Those who had lower SEC in childhood had higher SBP at examination.

Table 7.1. Mean [SD] systolic blood pressure (mmHg), by age and childhood SEC

	Men			Women		
	Czech Republic	**Russia**	**Poland**	**Czech Republic**	**Russia**	**Poland**
SBP	144.4 [18.6]	143.0 [23.2]	142.3 [20.4]	135.0 [19.8]	143.3 [26.0]	134.6 [21.4]
Age						
45-49	136.7 [16.0]	133.8 [19.7]	136.1 [17.9]	126.2 [17.0]	129.8 [20.3]	125.2 [17.6]
50-54	140.7 [17.3]	136.9 [20.9]	137.2 [20.2]	130.5 [17.5]	136.0 [22.4]	128.9 [18.9]
55-59	143.2 [17.3]	143.0 [21.8]	142.5 [20.2]	133.5 [18.0]	141.8 [24.3]	135.0 [21.4]
60-64	147.3 [19.1]	146.3 [23.5]	145.1 [20.0]	138.5 [19.8]	150.2 [27.2]	139.3 [21.1]
65-69	150.0 [19.3]	150.3 [24.6]	149.0 [21.6]	143.7 [20.9]	153.6 [26.5]	145.4 [21.9]
p for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Assets in childhood						
0	149.3 [13.7]	146.9 [23.6]	144.8 [21.1]	142.0 [23.0]	150.8 [26.5]	140.8 [22.2]
1	146.0 [19.4]	144.4 [23.9]	145.3 [20.0]	139.8 [20.9]	146.5 [26.1]	139.1 [21.3]
2	147.3 [19.7]	142.7 [23.5]	144.9 [21.3]	141.3 [21.3]	144.1 [25.7]	137.3 [21.8]
3	147.9 [18.7]	141.1 [22.0]	143.7 [20.4]	139.1 [19.9]	138.6 [24.5]	135.3 [21.7]
4	144.2 [18.9]	141.2 [21.2]	143.3 [20.4]	135.2 [19.4]	136.5 [26.4]	134.6 [21.1]
5	143.2 [18.5]	141.7 [22.1]	139.2 [19.6]	131.1 [17.8]	137.5 [24.5]	132.4 [20.9]
6	141.2 [17.3]	137.1 [20.3]	137.3 [18.6]	130.8 [18.5]	134.3 [23.0]	128.8 [19.5]
p for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Paternal education						
< primary	-	145.8 [24.8]	144.5 [20.0]	-	148.5 [27.3]	140.4 [23.4]
Primary	-	143.0 [22.9]	144.7 [21.2]	-	143.2 [25.9]	136.7 [21.7]
Vocational	-	142.0 [22.2]	141.1 [19.8]	-	141.3 [25.5]	133.3 [21.4]
Secondary	-	142.0 [22.2]	139.6 [19.0]	-	140.5 [24.7]	131.8 [20.2]
University	-	141.7 [23.9]	138.3 [19.1]	-	138.7 [25.0]	128.3 [17.8]
p for trend	-	0.001	<0.001	-	<0.001	<0.001
Maternal education						
< primary	-	146.4 [24.5]	144.3 [19.8]	-	148.7 [27.0]	139.6 [22.9]
Primary	-	143.1 [23.0]	144.1 [21.0]	-	142.8 [25.6]	136.3 [21.9]
Vocational	-	141.5 [22.1]	141.0 [20.6]	-	141.2 [25.1]	132.3 [21.0]
Secondary	-	140.5 [22.6]	138.8 [18.8]	-	139.6 [24.9]	130.8 [19.0]
University	-	140.8 [21.8]	137.1 [17.8]	-	134.3 [23.0]	127.1 [17.7]
p for trend	-	<0.001	<0.001	-	<0.001	<0.001

7.4.1.2 Systolic blood pressure and adult SEC

In analyses adjusted for age, BMI and smoking, men's SBP was inversely associated with measures of adult SEC: in Poland, with each measure; in Russia, with education, material position and assets; and in the Czech Republic, with assets (table 7.2). SBP was also positively associated with living space amongst Czech men.

Women's SBP was inversely associated with education in all countries, and Russian women's SBP was also inversely associated with living space and assets (table 7.2).

Further adjustments for childhood SEC and anthropometric measures did not, in general, have substantial effects on effect estimates (data not shown).

Table 7.2. Change [95% CI] in systolic blood pressure (mmHg) associated with unit increase in adult SEC†, adjusted for age, BMI and smoking

Adult SEC measure	Czech Republic		Russia		Poland	
	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Men						
Education	-0.83 [-1.71, 0.06]	0.066	-1.41 [-2.14, -0.69]	<0.001	-2.22 [-2.92, -1.52]	<0.001
Material position	-0.25 [-0.59, 0.09]	0.148	-0.31 [-0.52, -0.10]	0.005	-0.38 [-0.62, -0.14]	0.002
Living space	1.52 [0.34, 2.71]	0.011	-1.41 [-3.15, 0.34]	0.114	-1.43 [-2.73, -0.13]	0.031
Assets	-0.48 [-0.82, -0.14]	0.006	-0.64 [-1.00, -0.29]	<0.001	-0.59 [-0.91, -0.27]	<0.001
Women						
Education	-0.83 [-1.60, -0.07]	0.033	-1.12 [-1.95, -0.30]	0.007	-1.27 [-1.92, -0.61]	<0.001
Material position	0.09 [-0.20, 0.38]	0.533	0.06 [-0.17, 0.29]	0.594	0.09 [-0.10, 0.29]	0.342
Living space	-0.66 [-1.62, 0.30]	0.175	-3.21 [-4.81, -1.62]	<0.001	-0.62 [-1.62, 0.39]	0.228
Assets	-0.11 [-0.44, 0.22]	0.512	-0.49 [-0.88, -0.09]	0.016	-0.28 [-0.57, 0.00]	0.052

† One higher level of education, one point higher on material position scale, one more room per person in home or one more asset

7.4.1.3 Systolic blood pressure and childhood SEC

Men

There were no statistically significant relationships between SBP and assets, or with parental education amongst Russian men, either in the basic model, which adjusted for age, current BMI and smoking, or the models which included further adjustments for adult SEC and anthropometry (table 7.3). Amongst Polish men, there were inverse associations between SBP and paternal and maternal education in the basic model, however after adjustment for adult SEC neither of these associations remained statistically significant.

There were no statistically significant relationships between measures of anthropometry and SBP in the basic model, but following adjustments for childhood and adult SEC positive associations between SBP and height and leg length amongst Polish and Czech men were revealed (table 7.3).

Women

An inverse association between paternal education and SBP amongst Polish women was no longer statistically significant after adjustment for adult SEC (table 7.4). No other relationships with childhood SEC measures were statistically significant.

Women showed inverse associations between leg length and SBP (table 7.4). Inverse associations of height with SBP in Czech and Polish women were mirrored, but not statistically significant, amongst Russian women. Following adjustments for childhood and adult SEC the relationships were weakened, and most were no longer statistically significant.

Table 7.3. Change [95% CI] in men's systolic blood pressure (mmHg) associated with unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	0.25 [-0.36, 0.85]	0.422	-0.12 [-0.59, 0.35]	0.617	-0.30 [-0.69, 0.09]	0.133
	+ adult SEC	0.40 [-0.26, 1.06]	0.230	-0.03 [-0.51, 0.44]	0.890	0.11 [-0.31, 0.53]	0.620
	+ anthropometry	0.22 [-0.39, 0.82]	0.481	-0.10 [-0.57, 0.38]	0.694	-0.33 [-0.72, 0.06]	0.100
	+ adult SEC, anthropometry	0.33 [-0.33, 0.99]	0.323	-0.02 [-0.50, 0.45]	0.922	0.08 [-0.35, 0.50]	0.727
Maternal education	Age, BMI and smoking	-	-	-0.52 [-1.15, 0.11]	0.104	-0.90 [-1.55, -0.24]	0.008
	+ adult SEC	-	-	-0.10 [-0.76, 0.56]	0.764	-0.08 [-0.82, 0.67]	0.842
	+ anthropometry	-	-	-0.49 [-1.12, 0.14]	0.130	-0.94 [-1.60, -0.27]	0.006
	+ adult SEC, anthropometry	-	-	-0.09 [-0.75, -0.57]	0.788	-0.11 [-0.86, 0.63]	0.762
Paternal education	Age, BMI and smoking	-	-	-0.52 [-1.12, 0.08]	0.089	-0.97 [-1.56, -0.38]	0.001
	+ adult SEC	-	-	-0.14 [-0.77, 0.50]	0.669	-0.24 [-0.92, 0.44]	0.482
	+ anthropometry	-	-	-0.51 [-1.11, 0.10]	0.100	-1.04 [-1.64, -0.44]	0.001
	+ adult SEC, anthropometry	-	-	-0.14 [-0.78, 0.49]	0.662	-0.31 [-0.99, 0.37]	0.374
Anthropometry							
Height	Age, BMI and smoking	0.10 [-0.01, 0.22]	0.086	-0.08 [-0.20, 0.04]	0.182	0.03 [-0.08, 0.14]	0.566
	+ child SEC	0.07 [-0.05, 0.19]	0.230	-0.05 [-0.17, 0.07]	0.402	0.09 [-0.02, 0.21]	0.113
	+ adult SEC	0.17 [0.04, 0.29]	0.010	-0.04 [-0.16, 0.07]	0.461	0.11 [0.00, 0.23]	0.056
	+ child and adult SEC	0.16 [0.03, 0.29]	0.017	-0.02 [-0.14, 0.10]	0.718	0.13 [0.02, 0.25]	0.025
Leg length	Age, BMI and smoking	0.16 [0.00, 0.33]	0.056	-0.13 [-0.30, 0.04]	0.127	0.06 [-0.09, 0.22]	0.422
	+ child SEC	0.13 [-0.04, 0.30]	0.142	-0.10 [-0.28, 0.07]	0.248	0.13 [-0.03, 0.28]	0.116
	+ adult SEC	0.18 [0.00, 0.35]	0.052	-0.09 [-0.26, 0.08]	0.279	0.13 [-0.02, 0.29]	0.093
	+ child and adult SEC	0.17 [-0.01, 0.35]	0.069	-0.07 [-0.25, 0.10]	0.424	0.15 [-0.01, 0.31]	0.069
Trunk length	Age, BMI and smoking	0.06 [-0.13, 0.26]	0.526	-0.06 [-0.28, 0.16]	0.607	0.00 [-0.20, 0.19]	0.993
	+ child SEC	0.03 [-0.17, 0.23]	0.781	-0.01 [-0.23, 0.22]	0.951	0.08 [-0.12, 0.28]	0.429
	+ adult SEC	0.23 [0.01, 0.44]	0.042	0.00 [-0.22, 0.22]	0.973	0.13 [-0.08, 0.33]	0.226
	+ child and adult SEC	0.21 [-0.01, 0.43]	0.065	0.04 [-0.18, 0.27]	0.714	0.17 [-0.04, 0.37]	0.111

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table 7.4. Change [95% CI] in women's systolic blood pressure (mmHg) associated with unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	0.06 [-0.54, 0.65]	0.853	-0.05 [-0.57, 0.46]	0.839	-0.15 [-0.50, 0.20]	0.409
	+ adult SEC	-0.08 [-0.75, 0.59]	0.821	0.06 [-0.46, 0.57]	0.825	0.11 [-0.27, 0.50]	0.564
	+ anthropometry	0.11 [-0.49, 0.71]	0.714	-0.04 [-0.55, 0.48]	0.891	-0.11 [-0.47, 0.24]	0.523
	+ adult SEC, anthropometry	-0.05 [-0.72, 0.62]	0.875	0.07 [-0.45, 0.58]	0.803	0.13 [-0.25, 0.51]	0.507
Maternal education	Age, BMI and smoking	-	-	0.12 [-0.57, 0.82]	0.731	-0.54 [-1.12, 0.04]	0.069
	+ adult SEC	-	-	0.48 [-0.24, .20]	0.192	-0.02 [-0.67, 0.64]	0.958
	+ anthropometry	-	-	0.16 [-0.53, 0.86]	0.644	-0.48 [-1.07, 0.10]	0.103
	+ adult SEC, anthropometry	-	-	0.49 [-0.23, 1.21]	0.181	0.01 [-0.65, 0.67]	0.977
Paternal education	Age, BMI and smoking	-	-	0.20 [-0.47, 0.86]	0.565	-0.64 [-1.17, -0.11]	0.017
	+ adult SEC	-	-	0.50 [-0.19, 1.18]	0.158	-0.20 [-0.81, 0.42]	0.528
	+ anthropometry	-	-	0.21 [-0.45, 0.88]	0.529	-0.59 [-1.12, -0.06]	0.030
	+ adult SEC, anthropometry	-	-	0.49 [-0.20, 1.18]	0.164	-0.17 [-0.78, 0.44]	0.586
Anthropometry							
Height	Age, BMI and smoking	-0.16 [-0.28, -0.04]	0.007	-0.13 [-0.27, 0.01]	0.060	-0.11 [-0.21, 0.00]	0.044
	+ child SEC	-0.14 [-0.26, -0.02]	0.020	-0.16 [-0.30, -0.02]	0.024	-0.09 [-0.20, 0.02]	0.108
	+ adult SEC	-0.15 [-0.28, -0.02]	0.020	-0.10 [-0.24, 0.03]	0.138	-0.07 [-0.18, 0.04]	0.236
	+ child and adult SEC	-0.14 [-0.27, -0.01]	0.034	-0.14 [-0.28, 0.00]	0.058	-0.07 [-0.18, 0.05]	0.246
Leg length	Age, BMI and smoking	-0.18 [-0.34, -0.02]	0.029	-0.23 [-0.42, -0.04]	0.018	-0.16 [-0.30, -0.02]	0.024
	+ child SEC	-0.15 [-0.32, 0.01]	0.063	-0.26 [-0.46, -0.07]	0.008	-0.14 [-0.29, 0.00]	0.051
	+ adult SEC	-0.17 [-0.34, 0.01]	0.062	-0.20 [-0.39, -0.01]	0.039	-0.12 [-0.26, 0.03]	0.119
	+ child and adult SEC	-0.16 [-0.33, 0.02]	0.080	-0.24 [-0.43, -0.04]	0.019	-0.12 [-0.27, 0.03]	0.108
Trunk length	Age, BMI and smoking	-0.19 [-0.38, 0.01]	0.063	-0.04 [-0.29, 0.21]	0.733	-0.05 [-0.24, 0.13]	0.565
	+ child SEC	-0.17 [-0.36, 0.03]	0.102	-0.09 [-0.34, 0.17]	0.496	-0.03 [-0.22, 0.17]	0.797
	+ adult SEC	-0.18 [-0.39, 0.04]	0.108	0.00 [-0.25, 0.25]	0.984	0.00 [-0.20, 0.19]	0.983
	+ child and adult SEC	-0.15 [-0.37, 0.06]	0.165	-0.05 [-0.31, 0.20]	0.693	0.01 [-0.19, 0.21]	0.935

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

7.4.2 Diastolic blood pressure

7.4.2.1 Descriptive analysis

Amongst women DBP increased linearly with age (table 7.5). The same pattern was seen amongst Russian, but not Czech and Polish, men.

In the crude analyses, women showed increasing DBP with worsening childhood SEC, whilst amongst men there were no crude associations between childhood SEC and DBP (table 7.5).

Table 7.5. Mean [SD] diastolic blood pressure (mmHg) by age and childhood SEC

	Men			Women		
	Czech Republic	Russia	Poland	Czech Republic	Russia	Poland
DBP	90.7 [10.6]	90.3 [13.3]	88.0 [10.8]	87.1 [10.8]	89.9 [13.4]	84.6 [11.6]
Age						
45-49	89.7 [10.8]	87.9 [12.8]	87.1 [12.2]	85.3 [11.1]	86.5 [12.9]	82.1 [11.1]
50-54	90.8 [11.0]	90.0 [13.3]	87.7 [11.8]	86.6 [10.9]	89.3 [13.4]	83.6 [11.3]
55-59	91.4 [10.0]	91.5 [13.4]	88.9 [11.9]	87.2 [10.5]	90.3 [13.1]	85.4 [12.2]
60-64	91.6 [10.6]	90.5 [13.0]	88.7 [11.6]	87.7 [10.4]	91.5 [13.9]	85.7 [11.4]
65-69	90.6 [10.4]	90.7 [13.5]	87.6 [11.5]	88.2 [10.7]	91.0 [13.3]	86.4 [11.5]
p for trend	0.796	0.002	0.165	<0.001	<0.001	<0.001
Assets in childhood						
0	89.9 [10.5]	90.0 [13.1]	87.8 [12.3]	86.0 [10.4]	91.0 [13.1]	86.2 [12.1]
1	89.5 [10.4]	90.4 [13.6]	88.3 [10.9]	86.7 [10.2]	90.5 [13.1]	85.3 [11.1]
2	90.2 [10.5]	90.4 [13.2]	88.3 [12.0]	88.4 [11.0]	90.3 [13.6]	85.2 [11.7]
3	91.4 [10.5]	89.4 [12.9]	88.3 [11.4]	88.2 [10.3]	89.1 [13.3]	84.7 [11.6]
4	90.4 [10.5]	90.7 [13.1]	89.4 [11.9]	86.9 [10.7]	87.7 [14.2]	84.9 [11.2]
5	91.1 [10.6]	91.2 [13.1]	87.0 [12.0]	86.0 [10.4]	88.3 [13.2]	84.3 [11.8]
6	90.7 [10.5]	89.6 [13.1]	87.3 [12.0]	86.6 [11.0]	88.7 [13.9]	83.3 [11.7]
p for trend	0.518	0.700	0.050	0.002	<0.001	<0.001
Paternal education						
< primary	-	90.0 [13.7]	86.9 [10.9]	-	90.8 [13.5]	86.1 [12.5]
Primary	-	90.1 [13.1]	88.6 [11.9]	-	89.9 [13.5]	85.1 [11.6]
Vocational	-	90.8 [13.0]	87.9 [12.2]	-	89.5 [13.3]	84.7 [11.8]
Secondary	-	90.8 [13.3]	87.6 [11.8]	-	89.6 [13.6]	84.1 [11.7]
University	-	90.2 [13.6]	88.0 [11.5]	-	88.5 [13.1]	82.4 [10.2]
p for trend	-	0.301	0.650	-	0.005	<0.001
Maternal education						
< primary	-	90.3 [13.6]	86.7 [11.1]	-	90.8 [13.4]	86.2 [12.4]
Primary	-	90.4 [13.3]	88.7 [12.0]	-	89.8 [13.4]	85.0 [11.7]
Vocational	-	90.9 [13.0]	87.5 [12.0]	-	89.8 [13.4]	84.4 [12.0]
Secondary	-	90.0 [13.3]	87.7 [11.5]	-	89.6 [13.6]	83.7 [10.9]
University	-	90.4 [12.7]	86.4 [11.5]	-	87.0 [12.7]	81.8 [9.2]
p for trend	-	0.836	0.147	-	0.001	<0.001

7.4.2.2 Diastolic blood pressure and adult SEC

Amongst Czech men and women, none of the measures of adult SEC were associated with DBP (table 7.6). In Russian and Polish men and women, DBP decreased with improving adult SEC. Amongst Russian men, there were relationships with education and living space, and amongst Polish men, with education, material position and assets. Russian women showed associations with living space, and Polish women, with assets.

The associations, amongst both men and women, were largely unchanged after further adjustments for childhood SEC and anthropometry (data not shown).

Table 7.6. Change [95% CI] in diastolic blood pressure (mmHg) associated with unit increase in adult SEC measures†

Adult SEC measure	Czech Republic		Russia		Poland	
	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Men						
Education	-0.19 [-0.73, 0.34]	0.482	-0.56 [-0.99, -0.14]	0.010	-0.45 [-0.87, -0.03]	0.038
Material position	-0.05 [-0.26, 0.15]	0.609	-0.11 [-0.24, 0.01]	0.077	-0.21 [-0.36, -0.07]	0.003
Living space	0.68 [-0.05, 1.40]	0.067	-1.15 [-2.18, -0.12]	0.028	-0.35 [-1.13, 0.43]	0.374
Assets	-0.18 [-0.39, 0.03]	0.094	-0.19 [-0.40, 0.02]	0.079	-0.19 [-0.38, 0.00]	0.049
Women						
Education	-0.03 [-0.48, 0.42]	0.905	-0.29 [-0.74, 0.17]	0.216	-0.23 [-0.62, 0.17]	0.262
Material position	0.08 [-0.09, 0.25]	0.363	0.05 [-0.07, 0.18]	0.409	-0.01 [-0.13, 0.11]	0.845
Living space	-0.14 [-0.70, 0.42]	0.620	-1.80 [-2.69, -0.92]	<0.001	-0.24 [-0.85, 0.36]	0.431
Assets	-0.04 [-0.23, 0.16]	0.718	-0.18 [-0.40, 0.04]	0.112	-0.19 [-0.36, -0.02]	0.030

† One higher level of education, one point higher on material position scale, one more room per person in home or one more asset

7.4.2.3 Diastolic blood pressure and childhood SEC

Men

Men's childhood SEC were not associated with DBP, either before or after adjustment for adult SEC and anthropometry (table 7.7).

As men's anthropometric measures increased, their DBP also increased (table 7.7). In each country DBP was associated with height, Czech and Polish men showed associations with leg length and there was an association with trunk length amongst Russian men. These associations were not affected by adjustments for SEC. A positive association between trunk length and DBP amongst Polish men was statistically significant after adjustment for adult SEC.

Women

There were few statistically significant associations between women's DBP and childhood SEC or anthropometry, although in several instances a positive association was suggested (table 7.8). An inverse association between leg length and DBP amongst Russian women remained marginally statistically significant after adjustments for life course SEC.

Table 7.7. Change [95% CI] in men's diastolic blood pressure (mmHg) associated with unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	0.21 [-0.16, 0.58]	0.266	0.02 [-0.25, 0.30]	0.864	-0.03 [-0.26, 0.20]	0.808
	+ adult SEC	0.26 [-0.14, 0.66]	0.204	0.04 [-0.24, 0.32]	0.802	0.06 [-0.19, 0.32]	0.636
	+ anthropometry	0.17 [-0.20, 0.53]	0.376	-0.01 [-0.29, 0.27]	0.959	-0.07 [-0.31, 0.16]	0.542
	+ adult SEC, anthropometry	0.20 [-0.21, 0.60]	0.336	0.00 [-0.28, 0.29]	0.974	0.03 [-0.22, 0.29]	0.794
Maternal education	Age, BMI and smoking	-	-	-0.02 [-0.39, 0.35]	0.919	-0.04 [-0.44, 0.35]	0.828
	+ adult SEC	-	-	0.15 [-0.24, -0.54]	0.446	0.16 [-0.29, 0.61]	0.487
	+ anthropometry	-	-	-0.06 [-0.44, 0.31]	0.735	-0.11 [-0.51, 0.28]	0.580
	+ adult SEC, anthropometry	-	-	0.11 [-0.27, 0.50]	0.565	0.12 [-0.33, 0.57]	0.596
Paternal education	Age, BMI and smoking	-	-	-0.03 [-0.38, 0.33]	0.875	0.14 [-0.22, 0.49]	0.453
	+ adult SEC	-	-	0.12 [-0.25, 0.49]	0.534	0.34 [-0.07, 0.75]	0.108
	+ anthropometry	-	-	-0.07 [-0.42, 0.29]	0.718	0.06 [-0.30, 0.42]	0.753
	+ adult SEC, anthropometry	-	-	0.09 [-0.28, 0.47]	0.623	0.28 [-0.13, 0.69]	0.183
Anthropometry							
Height	Age, BMI and smoking	0.12 [0.05, 0.19]	0.001	0.07 [0.00, 0.14]	0.040	0.08 [0.01, 0.15]	0.017
	+ child SEC	0.10 [0.03, 0.18]	0.005	0.08 [0.01, 0.15]	0.027	0.10 [0.03, 0.16]	0.006
	+ adult SEC	0.15 [0.07, 0.23]	<0.001	0.09 [0.02, 0.15]	0.016	0.11 [0.04, 0.18]	0.002
	+ child and adult SEC	0.14 [0.06, 0.22]	<0.001	0.09 [0.02, 0.16]	0.012	0.11 [0.04, 0.18]	0.002
Leg length	Age, BMI and smoking	0.19 [0.09, 0.29]	<0.001	0.07 [-0.03, 0.17]	0.153	0.10 [0.01, 0.19]	0.029
	+ child SEC	0.17 [0.07, 0.27]	0.001	0.08 [-0.02, 0.18]	0.134	0.11 [0.02, 0.20]	0.021
	+ adult SEC	0.21 [0.10, 0.32]	<0.001	0.09 [-0.01, 0.19]	0.087	0.12 [0.03, 0.22]	0.010
	+ child and adult SEC	0.20 [0.09, 0.31]	<0.001	0.09 [-0.01, 0.19]	0.083	0.12 [0.02, 0.21]	0.017
Trunk length	Age, BMI and smoking	0.07 [-0.05, 0.19]	0.231	0.13 [0.00, 0.26]	0.046	0.09 [-0.3, 0.20]	0.142
	+ child SEC	0.05 [-0.07, 0.17]	0.430	0.15 [0.01, 0.28]	0.030	0.12 [0.00, 0.24]	0.059
	+ adult SEC	0.13 [-0.01, 0.26]	0.065	0.15 [0.02, 0.28]	0.023	0.13 [0.01, 0.25]	0.036
	+ child and adult SEC	0.12 [-0.02, 0.25]	0.092	0.16 [0.03, 0.30]	0.016	0.15 [0.03, 0.27]	0.018

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table 7.8. Change [95% CI] in women's diastolic blood pressure (mmHg) associated with unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
		Childhood socioeconomic circumstances					
Assets	Age, BMI and smoking	0.33 [-0.02, 0.68]	0.061	0.06 [-0.22, 0.35]	0.655	0.11 [-0.10, 0.32]	0.323
	+ adult SEC	0.32 [-0.07, 0.72]	0.110	0.11 [-0.18, 0.39]	0.466	0.15 [-0.08, 0.38]	0.207
	+ anthropometry	0.33 [-0.01, 0.68]	0.060	0.05 [-0.23, 0.34]	0.721	0.11 [-0.10, 0.33]	0.289
	+ adult SEC, anthropometry	0.33 [-0.08, 0.72]	0.108	0.09 [-0.19, 0.38]	0.525	0.16 [-0.08, 0.39]	0.188
Maternal education	Age, BMI and smoking	-	-	0.32 [-0.06, 0.70]	0.103	0.16 [-0.19, 0.51]	0.367
	+ adult SEC	-	-	0.44 [0.04, 0.84]	0.029	0.32 [-0.07, 0.72]	0.107
	+ anthropometry	-	-	0.30 [-0.08, 0.69]	0.121	0.17 [-0.18, 0.52]	0.344
	+ adult SEC, anthropometry	-	-	0.42 [0.02, 0.82]	0.038	0.33 [-0.06, 0.73]	0.100
Paternal education	Age, BMI and smoking	-	-	0.23 [-0.14, 0.60]	0.231	0.09 [-0.23, 0.40]	0.593
	+ adult SEC	-	-	0.31 [-0.07, 0.69]	0.112	0.19 [-0.18, 0.56]	0.322
	+ anthropometry	-	-	0.21 [-0.16, 0.58]	0.277	0.09 [-0.23, 0.41]	0.572
	+ adult SEC, anthropometry	-	-	0.29 [-0.10, 0.67]	0.144	0.19 [-0.18, 0.56]	0.321
		Anthropometry					
Height	Age, BMI and smoking	-0.01 [-0.08, 0.06]	0.737	0.01 [-0.07, 0.08]	0.829	-0.02 [-0.08, 0.04]	0.540
	+ child SEC	0.00 [-0.07, 0.07]	0.907	0.00 [-0.08, 0.08]	0.986	-0.02 [-0.09, 0.04]	0.452
	+ adult SEC	-0.02 [-0.09, 0.06]	0.655	0.02 [-0.06, 0.10]	0.616	0.00 [-0.06, 0.07]	0.941
	+ child and adult SEC	-0.01 [-0.09, 0.06]	0.712	0.01 [-0.07, 0.09]	0.770	-0.01 [-0.07, 0.06]	0.833
Leg length	Age, BMI and smoking	-0.03 [-0.13, 0.06]	0.490	-0.07 [-0.18, 0.03]	0.178	-0.07 [-0.15, 0.01]	0.106
	+ child SEC	-0.02 [-0.12, 0.07]	0.639	-0.08 [-0.19, 0.03]	0.154	-0.08 [-0.16, 0.01]	0.090
	+ adult SEC	-0.02 [-0.12, 0.09]	0.738	-0.06 [-0.17, 0.04]	0.254	-0.04 [-0.13, 0.05]	0.352
	+ child and adult SEC	-0.02 [-0.12, 0.09]	0.776	-0.07 [-0.18, 0.04]	0.237	-0.06 [-0.15, 0.03]	0.221
Trunk length	Age, BMI and smoking	0.02 [-0.10, 0.13]	0.784	0.15 [0.01, 0.29]	0.031	0.06 [-0.05, 0.17]	0.290
	+ child SEC	0.02 [-0.09, 0.14]	0.708	0.13 [-0.01, 0.27]	0.067	0.05 [-0.06, 0.17]	0.360
	+ adult SEC	-0.02 [-0.15, 0.10]	0.735	0.17 [0.03, 0.31]	0.016	0.08 [-0.04, 0.20]	0.170
	+ child and adult SEC	-0.02 [-0.15, 0.11]	0.788	0.15 [0.01, 0.29]	0.038	0.08 [-0.04, 0.20]	0.209

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

7.4.3 Hypertension

7.4.3.1 Descriptive analysis

The prevalence of hypertension was at least 50% in each gender and country group, although this was slightly lower when the alternate definition (160/95mmHg or treatment) was used (table 7.9). In the Czech Republic and Poland there was a higher prevalence of hypertension amongst men than in women, but the reverse was true in Russia.

There were linear trends towards increasing hypertension prevalence with age: amongst Polish and Czech women hypertension was more than twice as common amongst the oldest age group as amongst the youngest (table 7.9).

In these crude analyses, hypertension prevalence tended to decrease as childhood SEC improved, and the linear trend was statistically significant in most cases (table 7.9). There were exceptions amongst Russian men, who did not show a statistically significant association of hypertension prevalence with assets in childhood or paternal education.

The trends in hypertension prevalence with age and childhood SEC were similar when the alternate definition was used (table A3.5).

Table 7.9. Prevalence (%) of hypertension (140/90mmHg) by age and measures of childhood SEC

	Men			Women		
	Czech Republic	Russia	Poland	Czech Republic	Russia	Poland
N	3265	4133	4499	3859	4930	4746
Hypertension						
140/90mmHg	73.1	63.8	66.3	59.1	67.4	55.6
160/95mmHg	60.0	47.4	53.3	50.9	56.7	48.9
Age						
45-49	55.8	50.2	52.6	39.6	46.9	34.4
50-54	64.2	56.5	55.9	48.3	45.8	45.8
55-59	75.2	66.4	69.8	60.5	57.7	57.7
60-64	77.3	67.0	73.2	65.3	65.8	65.8
65-69	83.1	72.0	76.3	76.8	76.0	79.0
p for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Assets in childhood						
0	88.6	66.5	70.8	77.3	77.6	65.7
1	82.4	64.6	72.2	67.4	71.5	66.8
2	78.3	63.2	69.0	71.0	68.7	62.0
3	80.9	61.5	68.0	66.2	61.7	53.8
4	72.3	61.5	69.1	60.5	56.1	54.9
5	71.2	67.7	60.2	50.6	58.8	53.4
6	65.0	59.3	58.8	51.5	57.0	44.7
p for trend	<0.001	0.076	<0.001	<0.001	<0.001	<0.001
Paternal education						
< primary	-	66.4	67.1	-	73.6	64.1
Primary	-	62.5	69.1	-	67.6	59.4
Vocational	-	65.7	65.0	-	64.2	54.1
Secondary	-	61.7	62.9	-	63.5	50.3
University	-	62.7	62.5	-	63.6	45.7
p for trend	-	0.189	0.001	-	<0.001	<0.001
Maternal education						
< primary	-	68.6	66.9	-	74.6	64.1
Primary	-	62.4	69.3	-	67.2	58.4
Vocational	-	64.3	62.6	-	63.8	53.3
Secondary	-	59.8	61.9	-	62.9	49.1
University	-	62.6	61.4	-	55.3	41.1
p for trend	-	0.001	<0.001	-	<0.001	<0.001

7.4.3.2 Hypertension and adult SEC

The odds of men being hypertensive decreased with improving adult SEC: with education and material position in men in Poland, with education, material position and assets in Russian men and with assets in Czech men (table 7.10). After adjustments for childhood SEC and anthropometric measures, the associations observed were unchanged (data not shown).

Higher SEC amongst women was also linked to lower odds of hypertension, although only a few of these relationships were statistically significant (table 7.10). Polish women showed statistically significant associations with education, material position and assets, which were unchanged after further adjustments, whereas there were no significant associations amongst women in Russia or the Czech Republic.

With the use of the higher cut off points for defining hypertension (160/95mmHg or treatment), the odds ratios were similar (table A3.6). Exclusion from the analyses of participants on antihypertensive treatment also had little impact on the effect estimates (tables A3.7 and A3.8).

Table 7.10. OR [95% CI] of hypertension (140/90mmHg) for a one unit increase in adult SEC†

Adult SEC measure	Czech Republic OR [95% CI]	p-value	Russia OR [95% CI]	p-value	Poland OR [95% CI]	p-value
Men						
Education	0.91 [0.82, 1.00]	0.061	0.89 [0.83, 0.95]	0.001	0.89 [0.83, 0.95]	0.001
Material position	0.97 [0.94, 1.01]	0.205	0.97 [0.95, 0.99]	0.001	0.96 [0.94, 0.99]	0.003
Living space	1.11 [0.97, 1.28]	0.131	0.97 [0.82, 1.14]	0.705	1.07 [0.95, 1.21]	0.243
Assets	0.94 [0.90, 0.98]	0.002	0.95 [0.92, 0.98]	0.001	0.99 [0.96, 1.02]	0.353
Women						
Education	0.93 [0.86, 1.01]	0.075	0.96 [0.90, 1.03]	0.305	0.89 [0.83, 0.95]	<0.001
Material position	1.01 [0.98, 1.04]	0.551	0.99 [0.97, 1.01]	0.398	0.97 [0.95, 0.99]	0.015
Living space	0.96 [0.88, 1.06]	0.433	0.89 [0.78, 1.02]	0.096	0.95 [0.86, 1.06]	0.354
Assets	0.97 [0.94, 1.01]	0.112	0.97 [0.94, 1.01]	0.125	0.96 [0.93, 0.99]	0.005

† One higher level of education, one point higher on material position scale, one more room per person in home or one more asset

7.4.3.3 Hypertension and childhood SEC

Men

Amongst men, childhood SEC and anthropometry did not show statistically significant relationships with hypertension, except a positive association with assets in childhood amongst Russian men (table 7.11).

Using the alternate criteria for hypertension did not substantially change these results (table A3.9). Similarly, when subjects on antihypertensive treatment were excluded from the analyses, there were no statistically significant associations between either measure of hypertension and childhood SEC , but there was the suggestion of a positive relationship between hypertension and several anthropometric measures in Czech and Polish men (tables A3.10 and A3.11).

Women

In women, no associations between measures of childhood SEC and hypertension were found, and hypertension was also not consistently linked with anthropometry (table 7.12). Amongst Polish women, in the basic model, there were weak inverse associations between height and leg length and hypertension, but following adjustments for adult SEC these were no longer statistically significant.

In general, there was little change to the odds ratios when the alternate definition of hypertension was used in the analysis (table A3.12) or when those on antihypertensive treatment were excluded (tables A3.13 and A3.14).

Table 7.11. OR [95% CI] for men's hypertension (140/90mmHg) for a one unit increase in direct or indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	0.97 [0.91, 1.04]	0.451	1.06 [1.01, 1.11]	0.010	0.98 [0.95, 1.02]	0.389
	+ adult SEC	1.02 [0.95, 1.10]	0.582	1.07 [1.02, 1.11]	0.005	1.00 [0.96, 1.05]	0.825
	+ anthropometry	0.97 [0.90, 1.04]	0.394	1.06 [1.01, 1.11]	0.009	0.98 [0.94, 1.02]	0.342
	+ adult SEC, anthropometry	1.02 [0.94, 1.10]	0.676	1.07 [1.02, 1.11]	0.005	1.00 [0.96, 1.05]	0.915
Maternal education	Age, BMI and smoking	-	-	0.99 [0.93, 1.05]	0.755	0.98 [0.92, 1.05]	0.624
	+ adult SEC	-	-	1.04 [0.97, 1.10]	0.261	1.02 [0.94, 1.09]	0.677
	+ anthropometry	-	-	0.99[0.93, 1.05]	0.762	0.98 [0.92, 1.05]	0.578
	+ adult SEC, anthropometry	-	-	1.03 [0.97, 1.10]	0.277	1.01 [0.94, 1.09]	0.742
Paternal education	Age, BMI and smoking	-	-	1.00 [0.95, 1.06]	0.892	0.99 [0.93, 1.04]	0.615
	+ adult SEC	-	-	1.05 [0.99, 1.11]	0.143	1.02 [0.96, 1.10]	0.478
	+ anthropometry	-	-	1.00 [0.95, 1.06]	0.908	0.98 [0.93, 1.04]	0.542
	+ adult SEC, anthropometry	-	-	1.04 [0.98, 1.11]	0.155	1.02 [0.95, 1.09]	0.570
Anthropometry							
Height	Age, BMI and smoking	1.01 [1.00, 1.02]	0.107	1.00 [0.99, 1.01]	0.834	1.00 [0.99, 1.01]	0.708
	+ child SEC	1.01 [0.99, 1.02]	0.221	1.00 [0.99, 1.01]	0.877	1.00 [0.99, 1.02]	0.461
	+ adult SEC	1.02 [1.00, 1.03]	0.037	1.00 [0.99, 1.01]	0.700	1.01 [1.00, 1.02]	0.254
	+ child and adult SEC	1.01 [1.00, 1.03]	0.061	1.00 [0.99, 1.01]	0.709	1.01 [1.00, 1.02]	0.236
Leg length	Age, BMI and smoking	1.01 [0.99, 1.03]	0.186	0.99 [0.98, 1.01]	0.479	1.01 [0.99, 1.02]	0.211
	+ child SEC	1.01 [0.99, 1.03]	0.307	0.99 [0.98, 1.01]	0.466	1.01 [1.00, 1.03]	0.098
	+ adult SEC	1.02 [1.00, 1.04]	0.128	1.00 [0.98, 1.01]	0.769	1.01 [1.00, 1.03]	0.071
	+ child and adult SEC	1.01 [0.99, 1.04]	0.176	1.00 [0.98, 1.01]	0.723	1.01 [1.00, 1.03]	0.072
Trunk length	Age, BMI and smoking	1.01 [0.99, 1.04]	0.242	1.01 [0.99, 1.03]	0.596	0.99 [0.97, 1.01]	0.352
	+ child SEC	1.01 [0.99, 1.03]	0.388	1.01 [0.99, 1.03]	0.509	0.99 [0.97, 1.01]	0.425
	+ adult SEC	1.02 [1.00, 1.05]	0.086	1.01 [0.99, 1.03]	0.270	1.00 [0.98, 1.02]	0.772
	+ child and adult SEC	1.02 [0.99, 1.05]	0.121	1.01 [0.99, 1.03]	0.247	1.00 [0.98, 1.02]	0.835

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table 7.12. OR [95% CI] for women's hypertension (140/90mmHg) for a one unit increase in direct or indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	1.01 [0.95, 1.07]	0.850	1.01 [0.97, 1.06]	0.589	1.00 [0.96, 1.04]	0.923
	+ adult SEC	1.01 [0.94, 1.08]	0.782	1.02 [0.98, 1.06]	0.396	1.02 [0.98, 1.06]	0.299
	+ anthropometry	1.01 [0.95, 1.07]	0.755	1.01 [0.97, 1.06]	0.637	1.00 [0.97, 1.04]	0.849
	+ adult SEC, anthropometry	1.01 [0.94, 1.08]	0.764	1.02 [0.97, 1.06]	0.438	1.02 [0.98, 1.07]	0.253
Maternal education	Age, BMI and smoking	-	-	0.99 [0.94, 1.05]	0.806	0.96 [0.90, 1.02]	0.162
	+ adult SEC	-	-	1.00 [0.95, 1.07]	0.878	1.02 [0.95, 1.09]	0.665
	+ anthropometry	-	-	0.99 [0.94, 1.05]	0.772	0.96 [0.91, 1.03]	0.257
	+ adult SEC, anthropometry	-	-	1.00 [0.94, 1.07]	0.919	1.02 [0.95, 1.09]	0.610
Paternal education	Age, BMI and smoking	-	-	1.01 [0.95, 1.07]	0.775	0.96 [0.91, 1.02]	0.185
	+ adult SEC	-	-	1.02 [0.96, 1.08]	0.504	1.01 [0.95, 1.08]	0.706
	+ anthropometry	-	-	1.01 [0.95, 1.06]	0.813	0.97 [0.92, 1.03]	0.308
	+ adult SEC, anthropometry	-	-	1.02 [0.96, 1.08]	0.546	1.02 [0.95, 1.08]	0.638
Anthropometry							
Height	Age, BMI and smoking	0.99 [0.98, 1.00]	0.067	1.00 [0.99, 1.01]	0.964	0.99 [0.97, 1.00]	0.009
	+ child SEC	0.99 [0.98, 1.00]	0.103	1.00 [0.99, 1.01]	0.798	0.99 [0.97, 1.00]	0.012
	+ adult SEC	0.99 [0.97, 1.00]	0.089	1.00 [0.99, 1.01]	0.898	0.99 [0.98, 1.00]	0.110
	+ child and adult SEC	0.99 [0.98, 1.00]	0.114	1.00 [0.99, 1.01]	0.920	0.99 [0.98, 1.00]	0.086
Leg length	Age, BMI and smoking	0.99 [0.97, 1.01]	0.219	0.99 [0.98, 1.01]	0.318	0.98 [0.97, 1.00]	0.031
	+ child SEC	0.99 [0.97, 1.01]	0.359	0.99 [0.97, 1.01]	0.266	0.98 [0.97, 1.00]	0.030
	+ adult SEC	0.99 [0.97, 1.01]	0.427	0.99 [0.98, 1.01]	0.355	0.99 [0.97, 1.00]	0.182
	+ child and adult SEC	0.99 [0.98, 1.01]	0.602	0.99 [0.97, 1.01]	0.301	0.99 [0.97, 1.00]	0.107
Trunk length	Age, BMI and smoking	0.98 [0.96, 1.00]	0.114	1.01 [0.99, 1.03]	0.219	0.98 [0.96, 1.00]	0.075
	+ child SEC	0.98 [0.96, 1.00]	0.106	1.01 [0.99, 1.03]	0.321	0.98 [0.96, 1.00]	0.118
	+ adult SEC	0.98 [0.96, 1.00]	0.057	1.02 [0.99, 1.04]	0.148	0.99 [0.97, 1.01]	0.295
	+ child and adult SEC	0.98 [0.95, 1.00]	0.042	1.01 [0.99, 1.04]	0.242	0.99 [0.97, 1.01]	0.373

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

7.5 Discussion

7.5.1 Summary of results

SBP, DBP and prevalence of hypertension were linked to adult SEC, such that elevated blood pressure was less common amongst those who were more advantaged. These relationships with adult SEC were stronger and more consistent than those with childhood SEC or anthropometry. For instance, a person with university education was estimated to have SBP of 3-9mmHg lower than a person with less than primary education, and to have 0.6-0.8 times the odds of being hypertensive.

None of SBP, DBP or hypertension were consistently linked to the recalled measures of childhood SEC either when only the effects of age, current BMI and smoking, or when other indicators of life course SEC were also taken into account.

There were increases in men's DBP with height and it's components. These associations were not strong, however, and a 10cm increase in height was linked to only around a 1mmHg increase in DBP.

The results of most analyses were not changed substantially when those on antihypertensive medication were excluded, even though those who were treated differed from those who were not in terms of their current SEC.

7.5.2 Limitations

Only those limitations of the study which are specific to this chapter are discussed below. The limitations which are more general are discussed in detail in chapter 12.

There were additional variables, which were of potential importance to the relationships between blood pressure and SEC, which were not collected. For example, there is a large literature on the relationship between birth weight and blood pressure[75;270;271] but birth weight was not collected in the HAPIEE study, so adjustments could not be made. Contemporary birth weight data were not available, and the anticipated inaccuracies in recalled birth weight[272] would be too great for the data to be useful.

Two reviews have shown that there is overwhelming evidence for an inverse association between birth weight and SBP in adulthood,[273;274] and this has been supported by a further meta-analysis of published and unpublished data.[275] There is also a particular effect of low birth weight on SBP amongst people who grow to be tall adults,[276] or who experience fast postnatal catch up growth,[273] suggesting that not reaching full growth potential in utero is the real predictor of future high blood pressure, rather than low birth weight per se.

Various potential mechanisms via which the birth weight-SBP association may operate have been offered, including nutritional insult during fetal development and genetic, epigenetic or endocrine pathways,[277;278] but there has been insufficient investigation of these hypotheses for a conclusion to be reached.

As birth weight is positively associated with parental SEC,[279;280] it may be an unadjusted confounder in the association between childhood SEC and adult blood pressure. However, previous work suggests that this may not be the case. The inverse relationship between birth weight and SBP at age 50 in a cohort of Swedish men was only slightly reduced by adjustment for childhood SEC,[281] and in the 1946 British Birth Cohort the inverse associations between birth weight and SBP and childhood SEC and SBP were independent of each other.[262] Because of the lack of birth weight data for the HAPIEE study participants, however, these relationships could not be investigated here.

Those who reported that they had taken anti-hypertensive medication in the two weeks prior to the questionnaire were excluded from the analyses here, because of the complex relationship between blood pressure and treatment, which made appropriate adjustments to remove the effects of treatment difficult. In the Czech Republic and Poland the questionnaire and the physical examination were completed on different days, and it is possible that participants' status with regard to anti-hypertensive treatment changed in the intervening period. The mean time lapse between the questionnaire and the physical examination was 5.7 days, and 4366 participants (5.3%) had a gap of greater than 14 days. The likelihood of treatment status changing in this period, however, is small, and it is unlikely that this will have introduced a substantial error to the findings relating to blood pressure.

The prevalence of hypertension is very high in these three populations (overall 64%), and with such a common outcome the detection of exposures is more difficult. As with the other outcomes examined in this thesis, the importance of statistical significance should not, therefore, be over-estimated.

7.5.3 Discussion of results

The main finding, namely that childhood SEC are not good predictors of blood pressure in middle age in these three CEE populations, is in contradiction to the literature on the subject, the majority of which found strong relationships between a less advantaged childhood and higher blood pressure in adulthood.[260-263]

The first potential explanation for this disparity between the findings here and those of previous studies relates to study design. Previous studies which found relationships between childhood SEC and blood pressure were longitudinal, whereas the studies which did not find an association were, like the HAPIEE study, cross-sectional.[264;266] It is possible therefore, that limitations inherent to cross-sectional studies, such as errors in the recall of exposure measures, which would attenuate effect estimates, prevented a true difference from being detected.

Alternatively, it is also possible that the results reflect a true lack of association between SEC in childhood and blood pressure in these three CEE populations. In the socialist states of CEE, some efforts were made to reduce the breadth of the socioeconomic distribution, and these were, more so in Czechoslovakia and less so in Poland and the USSR, at least partially successful. The difference between the socioeconomic experience of the best and worst off was smaller than that in most western countries.[40] Previous studies which have found an inverse association between early life SEC and blood pressure were based on data from western countries,[260-263] and the small differences which they detected, of around 3mmHg increase in SBP in the lowest occupational social class compared to the highest, may only have been shown because the socioeconomic spectrum of these populations was sufficiently broad.

An alternative explanation relates to the epidemiologic transition,[58] and the three countries' positions within it. In the post-WWII period, when the HAPIEE study participants were children, Russia, Poland and the Czech Republic may have been making the transition from stage three of the epidemic, when the socioeconomic gradient in blood pressure is positive, so the burden of high blood pressure is disproportionately experienced by more advantaged people, to stage four. However, it is unclear through which mechanism this would impact upon blood pressure regulation.

The positive associations between men's DBP and height and its components are consistent with the limited literature on the topic,[264;276;282] however other relationships which would have been predicted between blood pressure and anthropometry, with DBP amongst women and with SBP in both genders, were not consistently observed. Additionally, the effect estimates suggest only a weak association.

Considering these results in conjunction with others in this chapter, it is unlikely that the observed associations between blood pressure and anthropometry are illustrative of an effect of childhood SEC on blood pressure. The link between men's height and DBP may be due to an effect of the uterine environment, birth weight and subsequent catch-up growth on both height and blood pressure,[276] although, again, owing to the lack of data, this cannot be tested here.

7.5.4 Conclusions

Findings from this chapter suggest that early life SEC has not had an independent impact upon blood pressure, or hypertension, in these middle and older aged people living in the Czech Republic, Russia or Poland. Adult SEC may have some effect, such that individuals living with worse SEC may have increased blood pressure and risk of hypertension, but differences across the socioeconomic spectrum are not substantial.

Chapter 8. Lipids

Continuing on from the previous chapter, which did not find a substantial effect of childhood SEC on either blood pressure or hypertension in middle and older age, this chapter uses similar methods to investigate whether there is an impact of early life SEC on measures of both total and HDL cholesterol.

8.1 Literature review

There are well established relationships between cholesterol, and its fractions, and CVD, and cholesterol is therefore included in all the major CVD risk scores, including the ESC's SCORE[109] and the Framingham Risk Score,[283] and is a component of the metabolic syndrome.[105;284] Higher high density lipoprotein (HDL) cholesterol levels are cardio-protective,[285-287] whilst the opposite is true for low density lipoprotein (LDL)[288] and non-HDL[288] cholesterol. An increase of total cholesterol is also a risk factor for CVD, and there is no evidence for a threshold level.[289;290]

8.1.1 Lipids and adult socioeconomic circumstances

Published reports of relationships between plasma lipid levels and SEC in adulthood are inconsistent. Several studies have shown that total plasma cholesterol decreases with improving SEC, for men[239;244;248;291-293] and women.[244;248;251;291;294-296] However, there are also a substantial number of papers which have shown no relationship for men[250;253;259;297-300] and women,[292;297-299] and which have shown positive associations amongst men[294;296;301-303] and women.[266;302] Overall, the evidence is inconsistent and does not seem to indicate a universal association between cholesterol and adult SEC.

8.1.2 Lipids and childhood socioeconomic circumstances

Several studies have investigated the potential link between SEC in early life and various measures of lipids in later life. The inverse association between CVD risk and childhood SEC which is observed in western populations,[41-43] along with the influence of cholesterol on CVD,[285-288;290] would lead us to predict that, at least in these populations, with improved childhood SEC there would be a more advantageous lipid balance in adulthood. Although all of the studies reviewed here were based on western European populations, this prediction has not consistently been confirmed. Firstly, three studies, the results of which confirmed the hypothesis, will be outlined.

In the 1958 British birth cohort there was a positive link between childhood SEC (paternal occupational social class at birth) and HDL cholesterol at age 45, but not with total cholesterol.[263] The analyses were based on 9377 men and women whose cholesterol data were available, using contemporary measures of childhood SEC and adjusting for sex and adult social class.

The associations between parental occupational social class and total, HDL and LDL cholesterol were investigated amongst 1922 Finnish men and women, aged between 24 and 39 years.[261] In analyses adjusting for age and adult SEC, higher childhood SEC was associated with higher HDL cholesterol and with a reduced likelihood of men having low HDL cholesterol, but there were no statistically significant associations with either LDL or total cholesterol.

In the mid 1970s, in a Norwegian study of over 6000 men and women aged 35-49 years, participants' total cholesterol concentrations were shown to be positively correlated with the rates of infant mortality in the years and municipalities that participants were born.[52] Infant mortality rates were used as a proxy of childhood SEC, so the results suggest an inverse association between early life circumstances and total cholesterol, however, the conclusions which can be drawn from this study are limited, due to the ecological nature of the exposure variables.

There are several other studies which have found contradictory results. For example, HDL cholesterol was not associated with social class at birth amongst men or women in Newcastle.[304] Childhood SEC, which was measured by paternal occupational social class at birth, was collected contemporaneously, and no adjustments were made for current SEC. This apparent lack of association could be due to the small sample size of the study, leaving it underpowered to detect differences in cholesterol between social groups.

There were also several studies which showed associations in the opposite direction to that which would be expected, that is, where improved SEC in childhood was associated with a less favourable lipid balance later in life.

In the British Women's Heart and Health Study, which is a cohort of nearly 4300 women aged 60-79 years, the potential links between childhood SEC (measured by father's RGSC in the longest-held job) and women's LDL and HDL cholesterol were investigated.[305] After adjustments for age and present occupational social class, there was a slight decrease in HDL cholesterol with each increase (improvement) in childhood SEC, but no association with LDL cholesterol.

Amongst the 5645 male participants of the West of Scotland cohort who were aged 30-64 at examination, cholesterol increased as childhood SEC improved, a link which was independent of current SEC.[95] The measure of childhood SEC was retrospectively collected.

The relationships between father's occupational social class and total and HDL cholesterol were also investigated amongst 6980 British civil servants in the Whitehall II study.[96] After adjustment for age and current SEC, neither of the lipid measures were associated with childhood SEC amongst men. Amongst women, there were statistically significant differences between the highest and lowest social groups, such that HDL cholesterol decreased with improved childhood SEC and total serum cholesterol increased.

Finally, a large Norwegian study, which included nearly 15,000 men and women who were aged between 20 and 54 years at baseline showed a positive linear association between total cholesterol and childhood SEC amongst women but not men.[306] The childhood SEC measure was retrospective and subjective.

8.1.3 Lipids and anthropometry

A number of studies have been published on the relationship between blood lipids and height and its components. These have generally observed that, with taller height, there is a healthier lipid balance, including lower total cholesterol,[307-311] lower LDL cholesterol[308] and reduced chance of high cholesterol.[312] Two studies, however, also noted reduced HDL cholesterol with taller height,[308;310] implying a health disadvantage of greater height.

Each of the studies discussed above took place in western countries. However, the observed associations may be universal: a study from Hong Kong not only found the same associations between height and total, HDL and LDL cholesterol, but showed that they were also observed with both trunk and leg length.[267]

Most of these publications did not discuss possible mechanisms for the observed relationship between anthropometry and blood lipid profile. Those which did[267;307;310] invoked, either directly or indirectly, the Barker hypothesis,[79] which suggests that both increased cardiovascular risk and shorter height in adulthood are effects of poor nutrition and growth in utero. Both ‘exposure’ (height) and ‘outcome’ (lipid profile) are therefore hypothesised to be consequences of a non-optimal early life environment, possibly due to disadvantaged maternal SEC.

8.1.4 Lipids and birth weight

In response to Forsdahl’s study of the correlation between infant mortality rates and cholesterol levels in later life,[52] numerous studies went on to investigate the possible relationship between birth weight and cholesterol levels. The 39 such papers which were published in English before 2003 were reviewed by Lauren and colleagues,[313] and showed no consistent relationships between birth weight and total, HDL or LDL cholesterol. Reports published since the review have also had inconsistent results,[311;314;315] suggesting that birth weight is not a confounder of the relationship between childhood SEC and cholesterol.

8.2 Objectives

The objective of this chapter is to investigate the effects of childhood SEC on total and HDL cholesterol in the three populations in the HAPPIEE cohort, and to establish whether the effects of childhood SEC, if any, are independent of later influences.

8.3 Methods

8.3.1 Variables

In the main analyses the continuous measures of total and HDL cholesterol (both measured in mMol/l) were used. Binary measures for each cholesterol measure were also investigated, and the results were discussed in brief and presented in full in the appendix (appendix 4). The cut-offs were >5.0 mMol/l for total cholesterol (from the ESC guidelines)[109] and <1.0 mMol/l for HDL cholesterol (from the ATPIII guidelines).[105]

8.3.2 Analysis

Firstly, mean lipid concentrations and proportions of participants with unfavourable lipid levels were calculated, for age and childhood SEC groups, by country and gender.

Secondly, linear regression was used to investigate age-adjusted associations between blood lipid concentrations and each measure of adult SEC. Similar analyses were then conducted for each recalled and proxy (anthropometric) measure of childhood SEC.

Thirdly, multivariate analyses were performed, in which the relationships between cholesterol concentrations and the recalled and proxy childhood SEC measures were investigated and adjustments were made for adult and childhood SEC measures and anthropometric measures. Additional analyses, not reported in full in the main text, were conducted for binary outcomes using logistic regression.

The relationship between HDL cholesterol and age was linear, so these analyses adjusted for age as a continuous variable. Total cholesterol was not always linearly associated with age, so in these analyses age was adjusted for as a categorical variable in five year age groups. All analyses were performed separately by gender and country, due to interactions (see section 4.4).

Similar analyses were performed with high total cholesterol and low HDL cholesterol. These results are discussed briefly, and tables are provided in appendix 4.

8.4 Results

8.4.1 Total cholesterol

8.4.1.1 Descriptive statistics

Mean total cholesterol was higher amongst women than men in each of the three countries ($p<0.001$) (table 8.1). Amongst both genders Russians had the highest mean total cholesterol and Czechs had the lowest, with statistically significant inter-country variation ($p<0.001$).

The mean total cholesterol did not vary widely between age groups, and the intra-group variation was much wider than the inter-group variation (table 8.1). However, it increased with age in each gender and country group other than Czech and Polish men, where the relationship was reversed.

The differences in mean total cholesterol by measures of childhood SEC were small, and the patterns were inconsistent between genders and countries (table 8.1). Russian men's cholesterol decreased with increasing numbers of assets in childhood, whilst Czech men's did not show any relationship and Polish men's increased. Both Czech and Russian women's mean total cholesterol decreased with increasing numbers of assets, whilst Polish women's did not change. No gender or country group showed a relationship between paternal education and mean total cholesterol, and mean total cholesterol decreased with increasing maternal education only amongst Russian women.

When the binary variable for total cholesterol was investigated, high cholesterol was more common amongst women, and high cholesterol was most common amongst Russians and least amongst Czechs (table A4.1).

The proportion of women, and Russian men, with high total cholesterol increased with age, whilst Polish men showed the opposite and there was not an association amongst Czech men (table A4.1). The proportions of Czech and Russian women and Russian men with high total cholesterol decreased with increasing assets, but there were no associations with parental education.

Table 8.1. Mean [SD] total cholesterol (mMol/l) by age and childhood SEC

	Men			Women		
	Czech Republic	Russia	Poland	Czech Republic	Russia	Poland
Total cholesterol	5.6 [1.0]	6.0 [1.2]	5.7 [1.1]	5.8 [1.0]	6.5 [1.3]	5.9 [1.1]
% high total cholesterol	72.2	80.4	75.8	79.4	90.0	82.4
Age						
45-49	5.7 [1.1]	5.9 [1.1]	5.7 [1.2]	5.5 [1.0]	6.1 [1.3]	5.6 [1.0]
50-54	5.6 [1.0]	6.0 [1.2]	5.9 [1.1]	5.7 [1.1]	6.3 [1.2]	5.9 [1.0]
55-59	5.6 [1.0]	5.9 [1.2]	5.8 [1.1]	5.9 [1.1]	6.7 [1.3]	6.1 [1.1]
60-64	5.6 [1.1]	6.2 [1.3]	5.7 [1.1]	6.0 [1.0]	6.8 [1.3]	6.1 [1.1]
65-69	5.6 [1.0]	6.0 [1.2]	5.6 [1.1]	6.0 [1.0]	6.7 [1.3]	6.0 [1.1]
p for trend	0.019	0.038	<0.001	<0.001	<0.001	<0.001
Assets in childhood						
0	5.7 [1.3]	6.1 [1.2]	5.7 [1.1]	6.4 [0.8]	6.7 [1.3]	6.0 [1.1]
1	5.5 [1.1]	6.1 [1.2]	5.7 [1.1]	5.9 [1.0]	6.7 [1.3]	6.0 [1.1]
2	5.6 [1.0]	6.0 [1.1]	5.7 [1.1]	6.0 [1.1]	6.5 [1.2]	6.0 [1.1]
3	5.6 [1.1]	5.8 [1.1]	5.7 [1.1]	5.9 [1.1]	6.4 [1.3]	5.9 [1.0]
4	5.6 [1.0]	6.1 [1.3]	5.8 [1.1]	5.9 [1.0]	6.4 [1.5]	6.0 [1.1]
5	5.6 [1.0]	5.9 [1.2]	5.7 [1.1]	5.8 [1.0]	6.4 [1.3]	6.0 [1.1]
6	5.7 [1.1]	6.0 [1.2]	5.8 [1.2]	5.7 [1.0]	6.3 [1.2]	5.8 [1.1]
p for trend	0.171	0.013	0.045	<0.001	<0.001	0.065
Paternal education						
< primary	-	6.0 [1.1]	5.7 [1.0]	-	6.6 [1.2]	5.9 [1.1]
Primary	-	6.0 [1.2]	5.7 [1.1]	-	6.5 [1.3]	6.0 [1.1]
Vocational	-	6.1 [1.2]	5.8 [1.1]	-	6.6 [1.3]	5.9 [1.1]
Secondary	-	6.0 [1.2]	5.8 [1.1]	-	6.5 [1.3]	5.9 [1.1]
University	-	6.1 [1.2]	5.7 [1.2]	-	6.6 [1.3]	5.9 [1.1]
p for trend	-	0.163	0.094	-	0.983	0.617
Maternal education						
< primary	-	6.0 [1.1]	5.7 [1.0]	-	6.6 [1.3]	5.9 [1.1]
Primary	-	6.0 [1.2]	5.7 [1.1]	-	6.5 [1.3]	6.0 [1.1]
Vocational	-	6.1 [1.2]	5.8 [1.1]	-	6.5 [1.3]	5.9 [1.1]
Secondary	-	6.0 [1.2]	5.8 [1.2]	-	6.5 [1.3]	5.9 [1.1]
University	-	6.0 [1.2]	5.6 [1.1]	-	6.5 [1.3]	5.9 [1.1]
p for trend	-	0.917	0.056	-	0.041	0.391

8.4.1.2 Adult socioeconomic circumstances

The age-adjusted analyses reveal several statistically significant associations between total cholesterol and adult SEC, however, the majority of the effects are too small to be practically important (table 8.2). They were also inconsistent in the direction of the effects.

Russian men showed positive associations of total cholesterol with education, material position and assets, whilst there was an inverse association with education amongst Czech men, and no associations amongst Polish men (table 8.2).

Amongst Russian women, there was a positive association of total cholesterol with material position, and amongst Polish women an inverse association with living space (table 8.2). There were no associations with adult SEC amongst Czech women.

Table 8.2. Change [95% CI] in total cholesterol (mMol/l) with unit increase in adult SEC[†]

Adult SEC measure	Czech Republic		Russia		Poland	
	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Men						
Education	-0.05 [-0.09, 0.00]	0.032	0.05 [0.01, 0.09]	0.005	-0.01 [-0.04, 0.02]	0.513
Material position	0.00 [-0.02, 0.01]	0.695	0.02 [0.01, 0.03]	<0.001	0.00 [-0.01, 0.01]	0.600
Living space	0.02 [-0.01, 0.06]	0.210	0.02 [-0.06, 0.11]	0.587	0.00 [-0.06, 0.06]	0.947
Assets	0.01 [-0.01, 0.03]	0.324	0.03 [0.01, 0.04]	0.003	0.00 [-0.01, 0.02]	0.680
Women						
Education	-0.01 [-0.05, 0.03]	0.605	0.01 [-0.02, 0.05]	0.442	0.00 [-0.03, 0.03]	0.909
Material position	0.01 [-0.01, 0.02]	0.475	0.02 [0.01, 0.03]	<0.001	0.00 [-0.01, 0.01]	0.518
Living space	0.02 [-0.02, 0.06]	0.388	0.06 [-0.02, 0.13]	0.128	-0.06 [-0.11, -0.01]	0.022
Assets	0.00 [-0.02, 0.02]	0.927	0.01 [-0.01, 0.03]	0.242	0.00 [-0.02, 0.01]	0.831

[†] One higher level of education, one point higher on material position scale, one more room per person in home or one more asset

8.4.1.3 Childhood socioeconomic circumstances

Men

In men, there was no association between any measure of childhood SEC and total cholesterol in the age-adjusted analyses (table 8.3). Further adjustments for measures of current SEC and anthropometry did not alter the results.

Both measured and maximum heights showed a slight inverse association with total cholesterol in the age-adjusted analyses, in each country (table 8.3). These associations were not affected by adjustments for measures of childhood or current SEC. Leg length was similarly associated with total cholesterol amongst Russian and Polish men, and trunk length amongst Polish men, and these associations were also unchanged following further adjustments.

When the dichotomised total cholesterol variable was investigated, there were no associations with either measures of either childhood SEC or anthropometry (table A4.2).

Women

Polish women showed a positive association between assets in childhood and total cholesterol, which slightly increased in strength after adjustments for current SEC and anthropometric measures (table 8.4). In Russian women, there was a positive association between both parents' education and total cholesterol. The association with paternal education remained statistically significant after all adjustments.

Height and leg length were inversely associated with total cholesterol in Czech and Russian women in the age-adjusted analyses, and all remained statistically significant after adjustments for measures of childhood and current SEC (table 8.4). Russian women also showed a similar association with trunk length.

With the dichotomous total cholesterol variable, the only observed relationships were inverse associations with anthropometric measures amongst Russian women (table A4.3).

In both men and women, the observed coefficients, even when statistically significant, were too small to be of clinical or practical importance.

Table 8.3. Change [95% CI] in men's total cholesterol (mMol/l) with unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	0.01 [-0.02, 0.04]	0.699	-0.02 [-0.04, 0.01]	0.207	0.00 [-0.01, 0.02]	0.601
	+ adult SEC	0.00 [-0.03, 0.04]	0.903	-0.02 [-0.04, 0.01]	0.137	0.01 [-0.01, 0.03]	0.485
	+ anthropometry	0.01 [-0.02, 0.04]	0.415	-0.01 [-0.04, 0.01]	0.283	0.01 [-0.01, 0.03]	0.326
	+ adult SEC, anthropometry	0.01 [-0.03, 0.04]	0.667	-0.02 [-0.04, 0.01]	0.209	0.01 [-0.01, 0.03]	0.365
Maternal education	Age	-	-	0.01 [-0.02, 0.05]	0.378	0.02 [-0.01, 0.05]	0.260
	+ adult SEC	-	-	0.00 [-0.04, 0.03]	0.843	0.02 [-0.01, 0.06]	0.175
	+ anthropometry	-	-	0.02 [-0.01, 0.05]	0.281	0.03 [-0.01, 0.06]	0.124
	+ adult SEC, anthropometry	-	-	0.00 [-0.03, 0.03]	0.996	0.03 [-0.01, 0.06]	0.146
Paternal education	Age	-	-	0.03 [0.00, 0.06]	0.031	0.01 [-0.01, 0.04]	0.339
	+ adult SEC	-	-	0.02 [-0.01, 0.05]	0.292	0.02 [-0.01, 0.05]	0.220
	+ anthropometry	-	-	0.04 [0.00, 0.07]	0.023	0.02 [-0.01, 0.05]	0.133
	+ adult SEC, anthropometry	-	-	0.02 [-0.01, 0.05]	0.248	0.02 [-0.01, 0.06]	0.149
Anthropometry							
Height	Age	-0.01 [-0.01, 0.00]	0.018	-0.01 [-0.01, 0.00]	0.043	-0.01 [-0.01, 0.00]	0.002
	+ child SEC	-0.01 [-0.01, 0.00]	0.007	-0.01 [-0.01, 0.00]	0.053	-0.01 [-0.02, 0.00]	0.001
	+ adult SEC	-0.01 [-0.01, 0.00]	0.017	-0.01 [-0.01, 0.00]	0.003	-0.01 [-0.01, 0.00]	0.001
	+ child & adult SEC	-0.01 [-0.02, 0.00]	0.014	-0.01 [-0.01, 0.00]	0.010	-0.01 [-0.02, 0.00]	0.001
Leg length	Age	-0.01 [-0.02, 0.00]	0.088	-0.01 [-0.02, 0.00]	0.012	-0.01 [-0.02, 0.00]	0.013
	+ child SEC	-0.01 [-0.02, 0.00]	0.041	-0.01 [-0.02, 0.00]	0.014	-0.01 [-0.02, 0.00]	0.004
	+ adult SEC	-0.01 [-0.02, 0.00]	0.127	-0.01 [-0.02, -0.01]	0.001	-0.01 [-0.02, 0.00]	0.017
	+ child & adult SEC	-0.01 [-0.02, 0.00]	0.101	-0.01 [-0.02, 0.00]	0.004	-0.01 [-0.02, 0.00]	0.007
Trunk length	Age	-0.01 [-0.02, 0.00]	0.054	0.00 [-0.01, 0.01]	0.621	-0.01 [-0.02, 0.00]	0.018
	+ child SEC	-0.01 [-0.02, 0.00]	0.039	0.00 [-0.01, 0.01]	0.693	-0.01 [-0.02, 0.00]	0.019
	+ adult SEC	-0.01 [-0.02, 0.00]	0.026	-0.01 [-0.02, 0.00]	0.224	-0.01 [-0.02, 0.00]	0.010
	+ child & adult SEC	-0.01 [-0.02, 0.00]	0.028	-0.01 [-0.02, 0.01]	0.347	-0.01 [-0.02, 0.00]	0.015

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table 8.4. Change [95% CI] in women's total cholesterol (mMol/l) with unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	-0.02 [-0.05, 0.01]	0.230	-0.01 [-0.04, 0.01]	0.375	0.02 [0.00, 0.04]	0.013
	+ adult SEC	-0.03 [-0.06, 0.01]	0.099	-0.01 [-0.04, 0.01]	0.292	0.03 [0.01, 0.05]	0.005
	+ anthropometry	-0.02 [-0.04, 0.02]	0.313	-0.01 [-0.03, 0.02]	0.548	0.03 [0.01, 0.04]	0.005
	+ adult SEC, anthropometry	-0.03 [-0.06, 0.01]	0.117	-0.01 [-0.04, 0.01]	0.417	0.03 [0.01, 0.05]	0.003
Maternal education	Age	-	-	0.03 [0.00, 0.07]	0.037	0.02 [-0.01, 0.05]	0.147
	+ adult SEC	-	-	0.03 [-0.01, 0.06]	0.136	0.02 [-0.01, 0.06]	0.155
	+ anthropometry	-	-	0.04 [0.01, 0.07]	0.016	0.03 [-0.00, 0.06]	0.087
	+ adult SEC, anthropometry	-	-	0.03 [0.00, 0.06]	0.089	0.03 [-0.01, 0.06]	0.124
Paternal education	Age	-	-	0.05 [0.02, 0.08]	0.002	0.02 [-0.01, 0.05]	0.135
	+ adult SEC	-	-	0.04 [0.01, 0.07]	0.007	0.03 [0.00, 0.06]	0.067
	+ anthropometry	-	-	0.05 [0.02, 0.08]	0.001	0.02 [0.00, 0.05]	0.076
	+ adult SEC, anthropometry	-	-	0.05 [0.01, 0.08]	0.004	0.03 [0.00, 0.06]	0.055
Anthropometry							
Height	Age	-0.01 [-0.01, 0.00]	0.038	-0.01 [-0.02, -0.01]	<0.001	0.00 [-0.01, 0.00]	0.114
	+ child SEC	-0.01 [-0.01, 0.00]	0.021	-0.01 [-0.02, -0.01]	<0.001	0.00 [-0.01, 0.00]	0.092
	+ adult SEC	-0.01 [-0.01, 0.00]	0.028	-0.01 [-0.02, -0.01]	<0.001	0.00 [-0.01, 0.00]	0.163
	+ child & adult SEC	-0.01 [-0.01, 0.00]	0.016	-0.01 [-0.02, -0.01]	<0.001	0.00 [-0.01, 0.00]	0.160
Leg length	Age	-0.01 [-0.02, 0.00]	0.018	-0.01 [-0.02, 0.00]	0.009	-0.01 [-0.01, 0.00]	0.101
	+ child SEC	-0.01 [-0.02, 0.00]	0.012	-0.01 [-0.02, 0.00]	0.012	-0.01 [-0.01, 0.00]	0.102
	+ adult SEC	-0.01 [-0.02, 0.00]	0.004	-0.01 [-0.02, 0.00]	0.008	-0.01 [-0.01, 0.00]	0.133
	+ child & adult SEC	-0.01 [-0.02, 0.00]	0.004	-0.01 [-0.02, 0.00]	0.015	-0.01 [-0.01, 0.00]	0.145
Trunk length	Age	0.00 [-0.01, 0.01]	0.532	-0.02 [-0.03, -0.01]	0.003	-0.00 [-0.01, 0.01]	0.429
	+ child SEC	0.00 [-0.01, 0.01]	0.400	-0.02 [-0.03, -0.01]	0.003	0.00 [-0.01, 0.01]	0.429
	+ adult SEC	0.00 [-0.01, 0.01]	0.852	-0.02 [-0.03, 0.00]	0.001	0.00 [-0.01, 0.01]	0.652
	+ child & adult SEC	0.00 [-0.01, 0.01]	0.627	-0.02 [-0.03, -0.01]	0.001	0.00 [-0.01, 0.01]	0.600

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

8.4.2 HDL cholesterol

8.4.2.1 Descriptive statistics

Women had higher mean HDL cholesterol than men in each country (table 8.5). Amongst men, Czechs had the lowest HDL cholesterol, whilst Russians had the highest concentrations. Amongst women, there were no differences between Polish and Russian mean HDL cholesterol, whilst Czech women had lower levels.

Amongst men, only Czechs showed a relationship between age and mean HDL cholesterol: mean HDL cholesterol decreased with age (table 8.5). Amongst Russian men HDL decreased with increasing parental education.

Amongst women, there was a positive association between mean HDL cholesterol and age in each country (table 8.5). Czech and Polish women's mean HDL cholesterol increased with number of assets owned in childhood. Amongst Polish women HDL increases with increasing parental education.

When the binary variable for HDL cholesterol was used, higher proportions of women had low HDL cholesterol in each country (table A4.4). With increasing age, the proportions of Czech and Russian women with low HDL cholesterol increased, whilst Russian men showed the opposite trend. Low HDL cholesterol was less common amongst Polish men and women with higher parental education.

Table 8.5. Mean [SD] HDL cholesterol (mMol/l) by age and childhood SEC

	Men			Women		
	Czech Republic	**Russia**	**Poland**	**Czech Republic**	**Russia**	**Poland**
HDL cholesterol	1.3 [0.3]	1.5 [0.5]	1.3 [0.3]	1.5 [0.4]	1.6 [0.5]	1.6 [0.4]
% low HDL cholesterol	23.8	4.1	15.0	33.7	22.7	26.8
Age						
45-49	1.3 [0.4]	1.5 [0.4]	1.3 [0.3]	1.5 [0.4]	1.6 [0.6]	1.6 [0.4]
50-54	1.3 [0.3]	1.5 [0.6]	1.3 [0.3]	1.6 [0.4]	1.6 [0.5]	1.6 [0.4]
55-59	1.2 [0.3]	1.5 [0.5]	1.3 [0.4]	1.5 [0.4]	1.6 [0.4]	1.6 [0.4]
60-64	1.2 [0.3]	1.5 [0.4]	1.3 [0.3]	1.5 [0.4]	1.5 [0.4]	1.6 [0.4]
65-69	1.3 [0.3]	1.5 [0.5]	1.3 [0.3]	1.5 [0.4]	1.5 [0.5]	1.5 [0.4]
p for trend	0.042	0.7807	0.198	<0.001	<0.001	0.004
Assets in childhood						
0	1.2 [0.3]	1.5 [0.4]	1.3 [0.3]	1.5 [0.4]	1.5 [0.3]	1.5 [0.4]
1	1.2 [0.3]	1.5 [0.4]	1.3 [0.3]	1.4 [0.4]	1.6 [0.6]	1.5 [0.4]
2	1.2 [0.3]	1.5 [0.4]	1.3 [0.3]	1.5 [0.4]	1.6 [0.4]	1.5 [0.4]
3	1.2 [0.3]	1.5 [0.8]	1.3 [0.3]	1.5 [0.4]	1.6 [0.4]	1.6 [0.4]
4	1.3 [0.3]	1.5 [0.5]	1.3 [0.3]	1.5 [0.4]	1.5 [0.3]	1.6 [0.4]
5	1.3 [0.3]	1.4 [0.3]	1.3 [0.3]	1.5 [0.4]	1.6 [0.3]	1.6 [0.4]
6	1.3 [0.3]	1.5 [0.9]	1.3 [0.3]	1.5 [0.4]	1.6 [0.3]	1.6 [0.4]
p for trend	0.083	0.940	0.220	0.012	0.989	<0.001
Paternal education						
< primary	-	1.5 [0.5]	1.3 [0.3]	-	1.6 [0.3]	1.5 [0.4]
Primary	-	1.5 [0.6]	1.3 [0.3]	-	1.6 [0.6]	1.5 [0.4]
Vocational	-	1.5 [0.4]	1.3 [0.3]	-	1.6 [0.3]	1.6 [0.4]
Secondary	-	1.5 [0.4]	1.3 [0.3]	-	1.6 [0.6]	1.6 [0.4]
University	-	1.5 [0.4]	1.3 [0.3]	-	1.5 [0.3]	1.6 [0.4]
p for trend	-	0.003	0.231	-	0.705	<0.001
Maternal education						
< primary	-	1.5 [0.5]	1.3 [0.3]	-	1.6 [0.3]	1.5 [0.4]
Primary	-	1.5 [0.5]	1.3 [0.3]	-	1.6 [0.6]	1.6 [0.4]
Vocational	-	1.5 [0.7]	1.3 [0.3]	-	1.6 [0.3]	1.5 [0.4]
Secondary	-	1.5 [0.4]	1.3 [0.3]	-	1.6 [0.5]	1.6 [0.4]
University	-	1.4 [0.4]	1.3 [0.3]	-	1.6 [0.3]	1.6 [0.4]
p for trend	-	0.003	0.102	-	0.195	<0.001

8.4.2.2 Adult socioeconomic circumstances

Men and women showed different patterns in the association between adult SEC and HDL cholesterol, but all effect sizes were consistently small (table 8.6).

The significant associations amongst men tended to be inverse, with HDL cholesterol concentrations decreasing with improving SEC (table 8.6). This was seen with assets in men in each country, and with material position in Russian and Polish men. As one exception, Czech men showed a positive association of education with HDL cholesterol.

By contrast, all the significant associations amongst women were positive, i.e. HDL cholesterol increased with improving SEC (table 8.6). There were associations with each measure of adult SEC amongst Czech and Polish women, whilst amongst Russian women only an effect of material position was observed.

Table 8.6. Change [95% CI] in HDL cholesterol (mMol/l) with unit increase in adult SEC[†]

Adult SEC measure	Czech Republic		Russia		Poland	
	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Men						
Education	0.02 [0.00, 0.03]	0.015	-0.01 [-0.02, 0.01]	0.379	-0.01 [-0.02, 0.00]	0.131
Material position	-0.01 [-002, 0.00]	0.378	-0.01 [-0.01, 0.00]	<0.001	-0.01 [-0.01, 0.00]	<0.001
Living space	0.00 [-0.02, 0.01]	0.556	-0.03 [-0.07, 0.00]	0.078	-0.01 [-0.03, 0.01]	0.275
Assets	-0.01 [-0.01, 0.00]	0.046	-0.02 [-0.02, -0.01]	<0.001	-0.01 [-0.01, -0.01]	<0.001
Women						
Education	0.05 [0.04, 0.06]	<0.001	0.00 [-0.01, 0.01]	0.927	0.04 [0.03, 0.06]	<0.001
Material position	0.01 [0.00, 0.01]	0.031	0.01 [0.00, 0.01]	0.006	0.00 [0.00, 0.01]	0.013
Living space	0.02 [0.01, 0.04]	0.006	0.02 [0.00, 0.05]	0.063	0.02 [0.01, 0.04]	0.006
Assets	0.01 [0.00, 0.01]	0.019	0.00 [-0.01, 0.00]	0.220	0.01 [0.00, 0.01]	0.007

[†] One higher level of education, one point higher on material position scale, one more room per person in home or one more asset

8.4.2.3 Childhood socioeconomic circumstances

Men

The only significant relationships between HDL cholesterol and the recalled measures of childhood SEC were among Russians; men with better educated parents tended to have lower HDL cholesterol (table 8.7). However, the magnitude of the effects was small.

With respect to the anthropometric measures, Russian and Polish men showed slight inverse associations between height and trunk length and HDL cholesterol, and Czech men showed a similar association with trunk length (table 8.6). These associations were unaffected by adjustments for either childhood or current SEC.

The binary variable for HDL cholesterol revealed inverse associations between parental education and low HDL cholesterol amongst Polish men, although these were no longer significant after adjustment for adult SEC (table A4.5). There were positive associations between low HDL cholesterol and height and trunk length amongst Russian and Polish men. Amongst Russians the associations with height were weakened on adjustment for measures of life course SEC.

Women

Amongst women, only Polish women showed any associations between any measure of childhood SEC and HDL cholesterol (table 8.8). In the age-adjusted analyses, there were positive associations of HDL with assets in childhood and both parents’ education. These associations, however, disappeared after adjustment for current SEC.

In Russian and Polish women, HDL cholesterol was inversely associated with trunk length, whilst in Czech women, it was positively associated with leg length (table 8.8). Associations with trunk length were unaffected by adjustments for childhood and current SEC, but that with leg length was no longer statistically significant after adjustment for adult SEC.

Where the dichotomous variable was concerned, Polish women showed inverse associations between each measure of childhood SEC and low HDL cholesterol, but these were removed by adjustment for adult SEC (table A4.6). An inverse association with leg length in Czech women and a positive association with trunk length amongst Russian women were not changed after adjusting for later life measures of SEC.

Table 8.7. Change [95% CI] in men's HDL cholesterol (mMol/l) with unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	0.00 [-0.01, 0.01]	0.588	0.00 [-0.01, 0.01]	0.825	0.00 [0.00, 0.01]	0.378
	+ adult SEC	0.00 [-0.01, 0.01]	0.905	0.00 [-0.01, 0.01]	0.663	0.00 [0.00, 0.01]	0.199
	+ anthropometry	0.00 [-0.01, 0.01]	0.367	0.00 [-0.01, 0.01]	0.585	0.00 [0.00, 0.01]	0.105
	+ adult SEC, anthropometry	0.00 [-0.01, 0.01]	0.784	0.00 [-0.01, 0.01]	0.490	0.00 [0.00, 0.01]	0.130
Maternal education	Age	-	-	-0.02 [-0.03, -0.01]	0.003	0.01 [0.00, 0.02]	0.168
	+ adult SEC	-	-	-0.02 [-0.03, 0.00]	0.029	0.01 [0.00, 0.02]	0.048
	+ anthropometry	-	-	-0.02 [-0.03, 0.00]	0.008	0.01 [0.00, 0.02]	0.040
	+ adult SEC, anthropometry	-	-	-0.01 [-0.03, 0.00]	0.045	0.01 [0.00, 0.02]	0.042
Paternal education	Age	-	-	-0.02 [-0.03, -0.01]	0.003	0.00 [0.00, 0.01]	0.327
	+ adult SEC	-	-	-0.02 [-0.03, 0.00]	0.026	0.01 [0.00, 0.02]	0.076
	+ anthropometry	-	-	-0.02 [-0.03, 0.00]	0.008	0.01 [0.00, 0.02]	0.067
	+ adult SEC, anthropometry	-	-	-0.01 [-0.03, 0.00]	0.041	0.01 [0.00, 0.02]	0.049
Anthropometry							
Height	Age	0.00 [0.00, 0.00]	0.141	0.00 [-0.01, 0.00]	0.002	-0.01 [-0.01, 0.00]	<0.001
	+ child SEC	0.00 [0.00, 0.00]	0.114	0.00 [-001, 0.00]	0.008	-0.01 [-0.01, 0.00]	<0.001
	+ adult SEC	0.00 [0.00, 0.00]	0.232	0.00 [-0.01, 0.00]	0.011	0.00 [-0.01, 0.00]	<0.001
	+ child & adult SEC	0.00 [0.00, 0.00]	0.183	0.00 [-0.01, 0.00]	0.026	0.00 [-0.01, 0.00]	<0.001
Leg length	Age	0.00 [0.00, 0.00]	0.255	0.00 [0.00, 0.00]	0.722	0.00 [0.00, 0.00]	0.388
	+ child SEC	0.00 [0.00, 0.00]	0.276	0.00 [0.00, 0.00]	0.911	0.00 [0.00, 0.00]	0.609
	+ adult SEC	0.00 [0.00, 0.00]	0.316	0.00 [0.00, 0.00]	0.974	0.00 [0.00, 0.00]	0.707
	+ child & adult SEC	0.00 [0.00, 0.00]	0.322	0.00 [0.00, 0.00]	0.913	0.00 [0.00, 0.00]	0.719
Trunk length	Age	-0.01 [-0.01, 0.00]	<0.001	-0.01 [-0.02, -0.01]	<0.001	-0.01 [-0.02, -0.01]	<0.001
	+ child SEC	-0.01 [-0.01, 0.00]	<0.001	-0.01 [-0.02, -0.01]	<0.001	-0.01 [-0.02, -0.01]	<0.001
	+ adult SEC	-0.01 [-0.01, 0.00]	0.001	-0.01 [-0.02, -0.01]	<0.001	-0.01 [-0.02, -0.01]	<0.001
	+ child & adult SEC	-0.01 [-0.01, 0.00]	<0.001	-0.01 [-0.02, -0.01]	<0.001	-0.01 [-0.02, -0.01]	<0.001

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table 8.8. Change [95% CI] in women's HDL cholesterol (mMol/l) with unit increase in childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
		Childhood socioeconomic circumstances					
Assets	Age	0.00 [-0.01, 0.01]	0.665	-0.01 [-0.02, 0.00]	0.063	0.01 [0.00, 0.02]	0.008
	+ adult SEC	-0.01 [-0.02, 0.01]	0.301	-0.01 [-0.02, 0.00]	0.115	0.00 [-0.01, 0.01]	0.989
	+ anthropometry	0.00 [-0.01, 0.01]	0.841	-0.01 [-0.02, 0.00]	0.084	0.01 [0.00, 0.02]	0.006
	+ adult SEC, anthropometry	-0.01 [-0.02, 0.01]	0.240	-0.01 [-0.02, 0.00]	0.140	0.00 [-0.01, 0.01]	0.941
Maternal education	Age	-	-	0.00 [-0.01, 0.01]	0.938	0.02 [0.01, 0.03]	0.002
	+ adult SEC	-	-	0.00 [-0.01, 0.01]	0.985	0.00 [-0.01, 0.01]	0.941
	+ anthropometry	-	-	0.00 [-0.01, 0.01]	0.856	0.02 [0.01, 0.03]	0.001
	+ adult SEC, anthropometry	-	-	0.00 [-0.01, 0.01]	0.940	0.00 [-0.01, 0.01]	0.909
Paternal education	Age	-	-	-0.01 [-0.02, 0.00]	0.200	0.02 [0.01, 0.03]	<0.001
	+ adult SEC	-	-	-0.01 [-0.02, 0.00]	0.187	0.01 [0.00, 0.02]	0.183
	+ anthropometry	-	-	-0.01 [-0.02, 0.00]	0.248	0.02 [0.01, 0.03]	<0.001
	+ adult SEC, anthropometry	-	-	-0.01 [-0.02, 0.00]	0.233	0.01 [0.00, 0.02]	0.149
		Anthropometry					
Height	Age	0.00 [0.00, 0.00]	0.178	0.00 [0.00, 0.00]	0.870	0.00 [0.00, 0.00]	0.278
	+ child SEC	0.00 [0.00, 0.00]	0.198	0.00 [0.00, 0.00]	0.815	0.00 [0.00, 0.00]	0.118
	+ adult SEC	0.00 [0.00, 0.00]	0.754	0.00 [0.00, 0.00]	0.910	0.00 [0.00, 0.00]	0.023
	+ child & adult SEC	0.00 [0.00, 0.00]	0.804	0.00 [0.00, 0.00]	0.788	0.00 [0.00, 0.00]	0.032
Leg length	Age	0.00 [0.00, 0.01]	0.003	0.00 [0.00, 0.01]	0.053	0.00 [0.00, 0.00]	0.211
	+ child SEC	0.00 [0.00, 0.01]	0.004	0.00 [0.00, 0.01]	0.024	0.00 [0.00, 0.00]	0.483
	+ adult SEC	0.00 [0.00, 0.01]	0.054	0.00 [0.00, 0.01]	0.053	0.00 [0.00, 0.00]	0.715
	+ child & adult SEC	0.00 [0.00, 0.01]	0.054	0.00 [0.00, 0.01]	0.024	0.00 [0.00, 0.00]	0.769
Trunk length	Age	0.00 [-0.01, 0.00]	0.178	-0.01 [-0.01, 0.00]	0.004	-0.01 [-0.01, 0.00]	<0.001
	+ child SEC	0.00 [-0.01, 0.00]	0.162	-0.01 [-0.01, 0.00]	0.010	-0.01 [-0.01, 0.00]	<0.001
	+ adult SEC	0.00 [-0.01, 0.00]	0.061	-0.01 [-0.01, 0.00]	0.005	-0.01 [-0.01, 0.00]	<0.001
	+ child & adult SEC	0.00 [-0.01, 0.00]	0.047	-0.01 [-0.01, 0.00]	0.012	-0.01 [-0.01, 0.00]	<0.001

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

8.5 Discussion

8.5.1 Summary of results

Total cholesterol increased and HDL cholesterol decreased with age; however these relationships, particularly those of HDL cholesterol and amongst men, were not consistently statistically significant.

There were very few statistically significant associations between the measures of childhood SEC and lipids, and these were not consistent between gender and country groups. HDL cholesterol amongst men was related to parental education, inversely amongst Russian men and positively amongst Polish men, but the effects were small, with differences in lipid concentrations of less than 0.1mMol/l between participants with parents with the highest and lowest level of education. They were, therefore, unlikely to be practically useful.

As height and its components increased in magnitude, total and HDL cholesterol concentrations decreased. The effect estimates were extremely small, however, such that a 10cm increase in height, leg length or trunk length, might correspond to less than a 0.1mMol/l decrease in lipids.

8.5.2 Limitations

Although standardised protocols were used for their analysis, blood samples from each country were analysed in different laboratories. Strictly speaking, absolute lipid levels may, therefore, not be comparable between countries, although all laboratories used standard and commercial laboratory kits. However, relative levels and trends are certainly reliable, and internationally fully comparable. The results and discussion strongly focus upon those analyses which used the continuous cholesterol variables, which provide the most directly comparable results.

Other limitations which are not specific to this chapter are discussed in the main discussion chapter (section 12.2).

8.5.3 Discussion of results

The observation of very few associations between measures of childhood SEC and measures of blood lipids suggests either that some flaw in the study has resulted in the associations being detected, or that there is little or no independent influence of early life SEC in these populations. Data on childhood SEC were collected retrospectively, and errors in recall, which must be expected, would push effect estimates towards the null value, so that small differences would not be detected.

It remains a possibility that there is no difference in lipid concentrations across the socioeconomic spectrum in these former socialist CEE countries. Efforts to narrow the socioeconomic range were most successful in Czechoslovakia, and least in the USSR.[40] In western countries, where the associations have been observed, the socioeconomic range is broader, and so, in a comparison between the extremes of socioeconomic experience, the detection of a difference is more likely. This may explain why few statistically significant associations were detected, particularly in the Czech Republic. However, even the literature based on studies from western countries is not entirely consistent; it is possible that there is indeed no, or very weak, universal association between childhood SEC and lipids.

As discussed in the previous chapter in relation to blood pressure, it is possible that the lack of observed association between childhood SEC and lipid concentrations relates to the epidemiologic transition.[58] Russia, Poland and the Czech Republic were in stage three of the transition, the age of receding pandemics, when the participants were children, during which there may be a positive social gradient in early life risk factors for elevated cholesterol, including short duration of breastfeeding.[316] The countries have since moved into a stage in which there are inverse social gradients in risk factors for elevated cholesterol, and the opposing effect may have masked that of early life circumstances.

There are several statistically significant, inverse associations between anthropometry and lipids. As discussed previously, anthropometric measures such as height and leg length have been used as proxy measures of childhood SEC.[147-150;152] Here, the lack of consistent association between the direct measures of childhood SEC and lipid concentrations brings the relevance of this into question: either the anthropometric measures, as proxies for childhood SEC, are detecting an association that the recalled measures of SEC are not sufficiently sensitive to detect, or there is another route via which an association between height and lipids may function. Several reports have found associations between body height and other anthropometric measures and lipid concentrations[88;267;307;308;317] but, although several of these reports invoke differences in childhood SEC as an explanation for this association, there is no conclusive evidence that this is the pathway through which the association operates.

One hypothesis relates to post natal diet. Short duration of breast-feeding is associated with higher total cholesterol in adolescence.[89;90] Breast feeding provides a higher cholesterol diet than formula feeding, and it is suggested that this engenders a greater ability to catabolise cholesterols, and therefore to control blood cholesterol levels, later in life.[88] As breast feeding is also linked to improved growth and taller adult height,[148] this might explain the link between height and cholesterol levels.

Benetou and colleagues discuss that associations between cholesterol levels and height are observed less frequently with increasing age, and that this may be related to loss of height in ageing.[88] However, when the analyses were repeated with maximum height (as estimated from calculations in chapter 6), very similar associations were observed to those with measured height (table A4.7).

8.5.4 Conclusions

The results of this chapter have not provided evidence to suggest that there is a link between childhood SEC and lipid concentrations in middle to older age in the three CEE populations taking part in the HAPIEE study. There are some limitations to the study which may mean that a small effect could be obscured and not detected. However, any association which has not been detected in this highly powered study is likely to be so small as to be of little to no importance as regards public health or clinical practice.

Chapter 9. Smoking

The previous two chapters have failed to show substantial evidence of a link between SEC in early life and either blood pressure or lipids in Russia, Poland and the Czech Republic. This chapter investigates patterns of smoking, assesses the impact of childhood SEC on both starting and quitting smoking and determines the position of each country within the smoking epidemic.

9.1 Literature review

Cigarette smoking has been a common habit throughout the twentieth century, and there have been huge, gender specific secular trends. The negative health consequences of smoking were not initially understood but a significant body of evidence has been compiled from the 1940s onwards.[318-322] Causal associations between smoking cigarettes and numerous health outcomes have been established, most notably lung cancer,[321] multiple other cancers[323] and cardiovascular disease.[324] The habit has been shown to eventually kill about half of persistent smokers,[324] to reduce their life expectancy by about ten years compared to lifelong non-smokers,[325] and to triple age-specific mortality rates.[325]

9.1.1 The tobacco epidemic

The tobacco epidemic theory was developed by Lopez and colleagues, who collated data from countries with long histories of tobacco use, and summarised patterns of tobacco use over time by sex, age and socioeconomic circumstance (see Figure 6.1). They posit that all countries where cigarettes are smoked can be placed at some point in this epidemic, although the exact nature of the epidemic will be population-specific.[326] Since this model is based on past history of smoking, it is highly relevant for a study such as this which attempts to identify life course determinants of smoking, which date back as far as the 1930s.

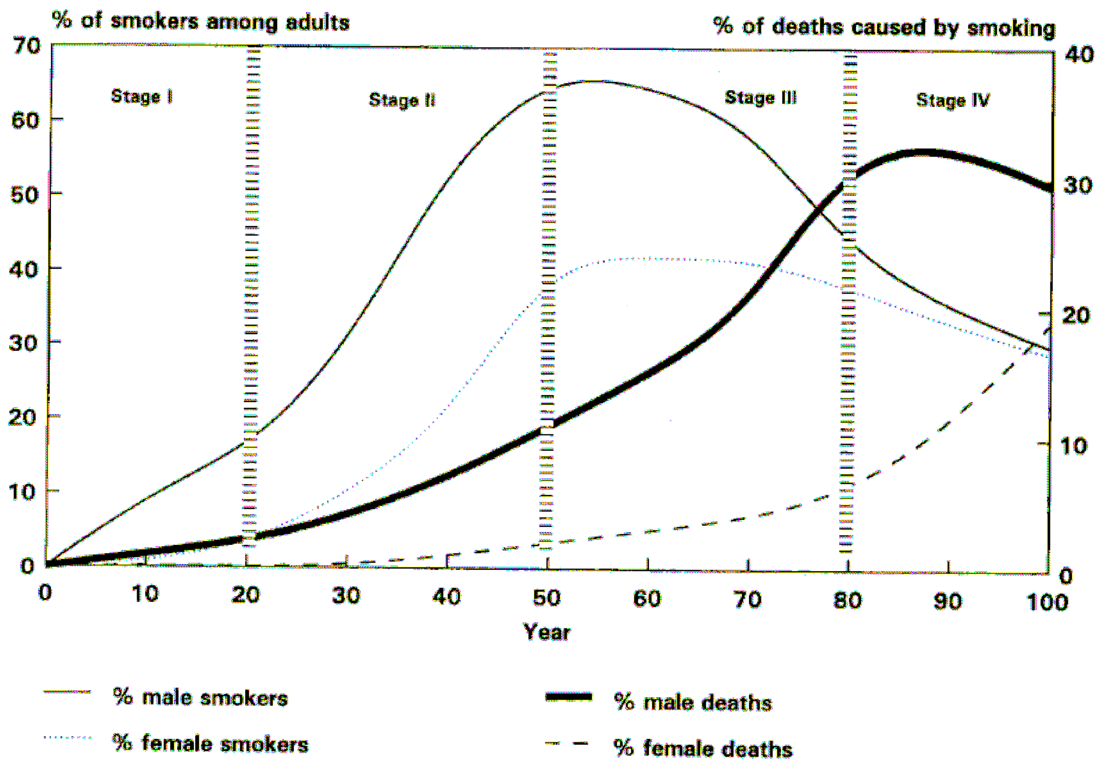

Figure 9.1. A model of the tobacco epidemic, from Lopez et al.[326]

The epidemic, as observed so far, has four main stages, each characterised by the prevalence of smoking, the rates of starting and quitting and the proportion of smoking-related deaths.[326] In stage one, cigarette smoking is introduced, and rates increase in men, and more slowly in women. The prevalence of smoking in both genders is low, and deaths and disease due to smoking are extremely rare.

In stage two, rates of smoking continue to rise, again with male rates increasing much faster. Men's smoking peaks at the end of this stage, between 50 and 80% and tobacco related deaths begin to have an impact among males. Smoking may be similarly common amongst all socioeconomic groups or slightly more common among people of higher social status.

During stage three, male rates of smoking begin to decrease, whilst women's plateau and begin to decrease towards the end of the stage. The peak prevalence amongst women is much lower than amongst men. Men at older ages and of higher SEC begin to quit smoking and deaths amongst both men and women from smoking-related causes increase. Smoking, which has previously been a socially normal behaviour, becomes socially abnormal and the socioeconomic gradient changes, such that smoking is more common amongst people of lower SEC.

In stage four the prevalence of smoking declines at a similar rate in men and women. Male mortality from smoking related causes peaks and begins to decline, Women’s mortality continues to rise for a further 20-30 years. The inverse socioeconomic gradient becomes more pronounced, as those quitting smoking are disproportionately of higher SEC.

Lopez and colleagues’ theory is based exclusively on data from western countries. Habits of tobacco use are culturally specific, so it cannot be assumed that the tobacco epidemic will develop in the same way in other settings. The historical and social context of the countries of Central and Eastern Europe may result in different patterns or the tobacco epidemic may be followed simply at a different time and/or tempo from western countries.

The tobacco epidemic theory suggests the prevalence of smoking in different socioeconomic sectors of a population varies over time. At the beginning of the epidemic smoking is most common among those of higher SEC but as the detrimental health effects of smoking become understood middle and upper class men begin to quit smoking, whilst women in these social strata do not start smoking. In the latter stages of the epidemic the association between SEC and smoking is reversed.[326]

Since socioeconomic patterns of smoking habits change over time and because parental smoking influences smoking habits of their children,[327;328] SEC at different stages of the life course may have different effects on adult smoking habits, which may interact.

9.1.2 Smoking and adult socioeconomic circumstances

The relationship between adult SEC and smoking has been investigated in many western European and North American populations which are towards the end of the tobacco epidemic (stages three and four). The majority of these studies have shown higher SEC to be linked to lower rates of smoking.[94-98] This includes one international study, which showed that adults of manual SEC in five Northern European countries and the US had increased odds of both current and ever smoking, when compared to those of non-manual SEC.[93] A further European study investigated the association between smoking and educational level in 12 western European countries and showed an inverse association in most countries.[329] There was, however, a north-south divide, with weaker or reversed social gradients in smoking in Southern European countries (Italy, Spain, Portugal etc.), particularly amongst women, as compared to Northern European countries (Great Britain, Sweden, Germany etc.).

9.1.3 Smoking and childhood socioeconomic circumstances

When the impact of SEC on adolescent uptake of smoking is investigated, there are inverse associations, such that those children whose families are of lower SEC are more likely to take up smoking.[330;331] Additionally, having parents who smoke is associated with an increased likelihood of adolescents taking up smoking,[330;332] creating another, albeit indirect, link between family SEC and smoking uptake, due to the presumed link between and parental smoking status and SEC.

Whilst the relationships between adult SEC and adult smoking, and between childhood SEC and childhood smoking, are well-established, the evidence regarding the impact of childhood SEC on adult smoking is less clear.

A study of nearly 7000 UK civil servants found an inverse association between father’s social class and smoking status, which was independent of that with adult SEC,[96] although in the 1958 British Birth Cohort, the same was only observed in women.[333] Amongst men, only adult SEC had an independent effect on smoking habits.[333]

Another British study, which only included women, found independent, inverse effects on smoking prevalence of father’s social class, own education and own social class. Women of higher SEC were also more likely to quit smoking.[98]

Amongst a cohort of working men in the west of Scotland in the early 1970s, adult SEC was inversely associated with smoking status, but there was no association with father’s social class.[95]

These gender difference in the effects of childhood SEC on smoking[95;96;98;333] are reinforced by those of other studies, from the UK[334] and Finland,[335] in which adult SEC is the most important SEC determinant of smoking status amongst men, whilst amongst women child and adult SEC have additive effects.

An international study discussed in section 9.1.2.1, which investigated starting and quitting smoking in five Northern European countries and the US, found that women smokers with manual childhood SEC in each of the European cohorts (Finland, Sweden, Denmark, Britain, Netherlands) were less likely to quit than their counterparts with non-manual childhood SEC.[93] The same was true for men in Britain, Denmark and the US, but the effects of childhood SEC on starting smoking were inconsistent.

These studies reviewed above are all from countries in the final stages of the tobacco epidemic. Since studies in the west tend to show a weaker, if not non-existent, relationship between child SEC and smoking amongst men than women, and men's smoking habits tend to be more mature than women's at any one stage of the epidemic, it might be hypothesised that childhood SEC may have large effects on adult smoking in countries in earlier stages of the tobacco epidemic.

9.1.4 Smoking in Russia

9.1.4.1 Trends in smoking

Smoking has been very common in Russia, at least amongst men, throughout the second half of the twentieth century. Cigarette consumption increased further after the collapse of the USSR, when tobacco markets were liberalised and tobacco control policies were poorly enforced or insufficiently stringent to curb usage.[336;337]

Data from the WHO MONICA (Multinational Monitoring of Trends and Determinants in Cardiovascular Disease) project from the mid 1980s to the mid 1990s showed little change in the prevalence of daily smoking amongst men and women in Moscow.[338] In Novosibirsk, men showed a slight increase whilst the prevalence amongst women more than doubled from 3 to 8% in a decade.[338]

In 1996, the New Russia Barometer (NRB) surveyed more than 1500 men and women from across Russia. The prevalence of current smoking was more than five times higher amongst women aged 18-34 than women older than 55, of whom only 5% were smokers, and two to three times higher amongst women aged 35-54.[339] The men in the same survey, however, showed less variation in smoking prevalence with age. The highest rates were observed in those aged 25 to 44 (>70%) and the lowest in those aged over 65 (41%). These data suggest that Russia is between stages two and three of the tobacco epidemic.[326]

The Russia Longitudinal Monitoring Study (RLMS) showed that the prevalence of smoking increased linearly in men and women and in most age groups between 1992 and 2003.[340] Young men (18-34 years) and older women (65+ years) were the exceptions where no trends were observed. These patterns suggest that the prevalence of smoking is likely to flatten off amongst men and to increase rapidly amongst women in the coming years.

9.1.4.2 Socioeconomic circumstances and smoking

Data on the socioeconomic gradient in smoking in Russia are less consistent than findings from the west, and a linear gradient was found only exceptionally. A survey in 1992 of 380 men and 455 women aged 25-64 living in the Republic of Karelia also found inverse educational gradients in smoking prevalence in both men and women, although the differences were not statistically significant.[341]

The 1996 NRB showed that the prevalence of smoking varied by educational category, with the highest rates observed amongst those with secondary or less education (38%). Those with higher, secondary or vocational level education all showed relatively low rates of smoking (10-16%), whilst those with technical education (intermediate between secondary and higher education) had a rate of 22%.[339]

More recent rounds of NRB showed that the trend to increasing rates of smoking with decreasing levels of education was strengthened by 2004.[342] There was a similar trend by material position level in 1996, with more deprived men being more likely to smoke, which had flattened off by 2004 such that the most deprived were the only ones with an increased prevalence.[342] Amongst women the trends were less clear. In 2004 there was no trend in prevalence of smoking by educational level. In 1996, more deprived women were more likely to smoke, but by 2004 this trend appeared to be in reverse, although this was not statistically significant.[342]

RLMS data from 1992 to 2003 showed an approximately constant educational gap in smoking prevalence amongst men, with around 1.4 times as many men with less than complete secondary education smoking as men with higher education. Amongst women, an initially negligible gap grew until, in 2003, 1.7 times as many women with less than complete secondary education smoked as women with higher education.[340]

9.1.5 Smoking in Poland

9.1.5.1 Trends in smoking

Data on annual per capita cigarette consumption in Poland showed a steady increase in consumption from about 500 in 1935 to 2700 in the late 1970s, after which point consumption fluctuated between 2300 and 2600 until 1992.[220] Part of this five-fold increase in per capita consumption may be explained by an increase in the number of cigarettes consumed by existing smokers, however an increase in the prevalence of smoking over this period is also likely.

Polish national data show that from the mid 1970s the prevalence of male and female smoking was, respectively, decreasing and increasing slightly. In the early 1980s, government use of tobacco coupons as payment lead to a sudden increase in the proportions of smokers of both genders. Since 1982 the proportions of both male and female smokers have dropped, with some minor fluctuations.[220]

The Warsaw centre of the MONICA project found less substantial changes in smoking habits between 1984 and 1993. The proportion of smokers amongst 35 to 64 year-old men fell from 59 to 52%, whilst amongst the equivalent female population the proportion of smokers remained steady at 34%.[343] These figures, however, are based on relatively small samples (<800 for each gender in 1993) from the capital city, so may not be representative for all of Poland.

A further survey showed that the prevalence of smoking amongst men decreased from at least 1974, when more than 60% of the adult male population were regular smokers, to around 40% in 1998. At the peak prevalence of women’s smoking in the mid 1980s the survey reports that around 35% of women were smokers and this fell to around 20% in 1998.[32]

9.1.5.2 Socioeconomic circumstances and smoking

There are few reports of socioeconomic differentials in smoking in Poland, but data published in 1996 showed that the prevalence of smoking amongst unskilled workers was 2.1 times higher than that of white collar workers.[344]

MONICA data from 1989 suggest that relationships between smoking and SEC vary by age, gender and location. Men and younger women (35-44 years) in urban areas who were more highly educated had a lower prevalence of smoking, whilst amongst older women in urban areas, smoking was most common amongst those with secondary education, and less common amongst those with primary or university education.[344]

9.1.6 Smoking in the Czech Republic

9.1.6.1 Trends in smoking

MONICA data show that the prevalence of smoking amongst men in the Czech Republic fell from 44% in 1985 to 39% in 1992, whilst proportions of female smokers increased slightly from 21 to 23% in the same period.[338]

Between 1985 and 1997 older Czechs had lower rates of smoking than younger people.[33] By the 1990s, however, the prevalence of smoking was slightly lower amongst the youngest groups of men and women. These cohort effects suggest a secular trend towards increasing uptake during the 1980s with a slowing, and possibly reversal, of this trend in the early 1990s.

9.1.6.2 Socioeconomic circumstances and smoking

As with Poland, there are not many published reports of socioeconomic differentials in smoking habits in the Czech Republic. In the 1980s and 1990s people in Czechoslovakia of higher SEC had a higher prevalence of smoking.[344] MONICA data from 1989, however, show that for men aged 35 to 54 and women aged 35 to 44 the rates of smoking decreased with increasing education. For women aged 45 to 54 the opposite was true.[344]

9.2 Objectives

The first objective of this chapter is to establish the distribution of current smoking in each of the three HAPIEE cohorts, by various sociodemographic factors.

Current smoking is a function of uptake and quitting smoking, and the SEC influences on these are different, so this chapter will address the predictors of these factors separately. The second and third objectives are to investigate the relationships of i) uptake of smoking and ii) quitting smoking with childhood SEC.

9.3 Methods

9.3.1 Variables

As noted in the objectives above, there are three outcomes in this chapter: current smoking, starting smoking and quitting smoking. The outcomes were all derived from the question ‘Do you smoke cigarettes?’ as outlined in the methods chapter (section 4.2.1.4).

The main exposure variables were recalled measures of childhood SEC (assets at age 10, paternal education, maternal education), all of which were coded such that a higher score indicated higher SEC, and proxy, anthropometric measures (height, leg length, trunk length), details of which are given in the methods chapter. Covariates are year of birth and measures of adult SEC (education, material position, living space and assets), also detailed in the methods chapter.

9.3.2 Statistical analysis

All analyses were conducted separately by sex and country, because of well recognised gender differences in smoking habits, and because smoking habits are context specific. Although this stratification was hypothesis driven, there were also interactions between

SEC and both country and gender (section 4.4). To allow for secular trends in smoking, age was included as a covariate in all multivariate analyses, and because the relationship between age and smoking is non-linear, age was adjusted for in five year age bands, and this variable was treated as categorical.

The populations were described in terms of the proportions of current smoking and ever smoking and, of these, the proportions who had quit smoking. Prevalence of current smoking, ever smoking and quitting smoking was shown by year of birth, in five year groups, and by measures of childhood SEC.

Since current smoking is a product of starting and quitting smoking, full analyses were only done for ever smoking and quitting, and not for current smoking.

Age-adjusted associations of each of the measures of childhood SEC and anthropometry with smoking uptake were established using logistic regression. Multivariate logistic regression was used to determine whether relationships between smoking uptake and childhood SEC/anthropometry remained after further adjustment for measures of adult SEC and anthropometry/childhood SEC. In adjustments for adult and childhood SEC, all measures were included. Adjustments for anthropometric measures included only leg length and trunk length. Similar analyses were used to investigate the relationships between life course measures of SEC and quitting smoking. Tests for trend were obtained using a continuous, rather than categorical, version of the exposure variable where possible.

9.4 Results

9.4.1 Current smoking

Prevalence of smoking was higher amongst men than women, and highest amongst Russian men and lowest amongst Russian women. The gender difference in smoking prevalence in Russia was five times as great as in Poland, and six times as great as in the Czech Republic (table 9.1). Prevalence of smoking decreased with increasing age and increased with increasing number of childhood assets. The relationship with parental education was less clear. Amongst women, increasing parental education was associated with increasing prevalence of smoking, but amongst men this relationship was only observed in Poland (table 9.1).

Table 9.1. Prevalence (%) of current smoking by age and childhood SEC measures

	Men			Women		
	Czech Republic	**Russia**	**Poland**	**Czech Republic**	**Russia**	**Poland**
Current smokers (%)	1177 (29.4)	2035 (49.2)	1876 (36.0)	1079 (23.6)	494 (10.0)	1557 (28.4)
Never smokers (%)	1270 (31.7)	1071 (25.9)	1453 (27.9)	2505 (54.7)	4227 (85.7)	2785 (50.8)
Former smokers (%)	1558 (38.9)	1034 (25.0)	1884 (36.1)	995 (21.7)	212 (4.3)	1142 (20.8)
Age						
45-49	38.2	62.8	48.6	33.4	19.7	40.9
50-54	38.4	55.2	41.8	30.1	16.5	36.9
55-59	32.1	52.5	39.0	26.9	12.0	29.1
60-64	25.6	44.9	29.6	17.7	3.2	20.0
65-69	18.7	37.2	23.5	12.6	2.2	14.0
p for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Childhood assets						
0	17.8	40.2	30.2	11.5	4.6	22.8
1	17.2	46.4	30.5	10.7	6.7	20.9
2	24.2	51.1	33.3	18.2	9.3	22.7
3	23.9	52.0	35.0	18.1	13.9	27.1
4	29.3	53.4	35.0	22.8	14.3	31.0
5	30.5	52.5	40.0	25.9	16.4	31.8
6	36.5	56.7	42.9	30.7	19.2	35.6
p for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Paternal education						
< primary	-	51.2	32.6	-	6.8	21.4
Primary	-	47.2	33.7	-	9.8	24.6
Vocational	-	53.2	41.1	-	12.2	33.1
Secondary	-	46.8	35.8	-	11.4	32.6
University	-	46.2	38.3	-	11.5	33.0
p for trend	-	0.196	0.008	-	<0.001	<0.001
Maternal education						
< primary	-	47.1	34.0	-	6.7	22.3
Primary	-	49.9	33.6	-	10.2	26.4
Vocational	-	52.3	42.8	-	12.2	33.0
Secondary	-	49.4	38.5	-	11.6	31.6
University	-	43.1	37.9	-	14.9	37.3
p for trend	-	0.886	0.001	-	<0.001	<0.001

9.4.2 Starting smoking

9.4.2.1 Descriptive analysis

Starting (‘ever’) smoking was more common amongst men, and prevalence was highest amongst Russian men and lowest amongst Russian women. The gender difference in starting smoking was almost three times as great in Russia as in Poland or the Czech Republic (table 9.2).

There was a positive trend in starting smoking with year of birth in each gender and country group, other than Czech men, amongst whom starting smoking was less common in the youngest men. The trends were steeper amongst women, and in particular Russian women, the youngest group of whom had a uptake prevalence ten times that of the oldest group (table 9.2).

Amongst women, smoking uptake increased with childhood assets and parental education, whilst amongst men these were either much weaker or not apparent (table 9.2).

Table 9.2. Distribution (%) of ever smoking by age and childhood SEC measures

	Men			Women		
	Czech Republic	Russia	Poland	Czech Republic	Russia	Poland
N	4005	4140	5213	4579	4933	5484
Ever smokers (%)	68.3	74.1	72.1	45.3	14.3	49.2
Age						
45-49	66.1	79.6	75.9	55.3	28.4	61.7
50-54	71.6	76.1	73.3	51.7	22.2	56.9
55-59	70.5	76.9	72.4	50.6	17.8	52.2
60-64	68.9	70.7	71.2	39.0	4.8	39.7
65-69	64.7	70.1	68.2	33.3	3.2	34.2
p for trend	0.114	<0.001	<0.001	<0.001	<0.001	<0.001
Childhood assets						
0	64.4	72.2	73.0	38.5	7.0	37.7
1	62.7	73.8	71.2	24.3	9.5	39.7
2	70.2	74.4	70.9	39.7	13.8	42.9
3	68.7	75.3	70.7	41.0	19.6	47.8
4	68.9	77.9	72.5	43.3	20.4	54.5
5	64.6	73.5	73.8	47.9	22.3	53.7
6	69.9	73.1	73.3	54.4	27.2	57.2
p for trend	0.690	0.604	0.200	<0.001	<0.001	<0.001
Paternal education						
< primary	-	76.2	72.4	-	9.2	39.6
Primary	-	73.1	71.0	-	13.2	43.8
Vocational	-	75.6	75.2	-	17.8	54.0
Secondary	-	73.6	72.3	-	16.6	56.4
University	-	69.2	69.8	-	19.9	55.8
p for trend	-	0.073	0.910	-	<0.001	<0.001
Maternal education						
< primary	-	74.2	72.5	-	9.4	41.1
Primary	-	75.3	71.5	-	13.7	46.0
Vocational	-	76.4	74.9	-	17.7	54.4
Secondary	-	72.8	72.3	-	17.9	56.0
University	-	63.7	70.6	-	21.6	55.7
p for trend	-	0.024	0.773	-	<0.001	<0.001

9.4.2.2 Adult socioeconomic circumstances

Men showed approximately linear inverse associations between adult SEC and starting smoking, although amongst Russian men there were no associations with either material position or living space (table 9.3). These associations were not substantially altered after adjustments, other than that between education and smoking in Polish men, which was strengthened on adjustment for childhood SEC (results not shown in table).

Amongst women, the associations between measures of adult SEC and starting smoking were less consistent (table 9.3). Women in the Czech Republic and Poland showed inverse associations with material position and Russian women showed inverse associations with assets. The associations showed little change after adjustment for childhood SEC and anthropometric measures (not shown).

Table 9.3. OR [95% CI] for starting smoking for a one unit increase in adult SEC†

Adult SEC measure	**Czech Republic**		**Russia**		**Poland**	
	OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
			Men			
Education	0.67 [0.62, 0.73]	<0.001	0.73 [0.68, 0.79]	<0.001	0.72 [0.67, 0.77]	<0.001
Material position	0.92 [0.89, 0.95]	<0.001	0.98 [0.97, 1.01]	0.148	0.92 [0.90, 0.94]	<0.001
Living space	0.88 [0.80, 0.97]	0.011	0.89 [0.75, 1.04]	0.150	0.83 [0.75, 0.92]	<0.001
Assets	0.91 [0.88, 0.94]	<0.001	0.92 [0.89, 0.95]	<0.001	0.94 [0.92, 0.97]	<0.001
			Women			
Education	0.94 [0.88, 1.01]	0.091	1.05 [0.96, 1.16]	0.260	1.05 [0.99, 1.11]	0.124
Material position	0.94 [0.92, 0.96]	<0.001	0.99 [0.97, 1.02]	0.602	0.94 [0.92, 0.96]	<0.001
Living space	1.04 [0.97, 1.12]	0.249	0.91 [0.76, 1.10]	0.337	0.97 [0.89, 1.06]	0.519
Assets	0.98 [0.96, 1.01]	0.259	0.93 [0.89, 0.97]	<0.001	1.01 [0.98, 1.04]	0.488

† One higher level of education, one point higher on material position scale, one more room per person in home or one more asset

9.4.2.3 Childhood socioeconomic circumstances

Men

There were no associations between starting smoking and childhood assets, although amongst Polish men adjustments for adult SEC resulted in a positive association (table 9.4).

Amongst Russian men, age-adjusted analyses showed inverse associations between parental education and starting smoking, whilst Polish men showed no associations (table 9.4). After adjustment for adult SEC the associations amongst Russian men were weakened, and Polish men showed positive associations.

There were no associations between starting smoking and height or leg length (table 9.4). Age-adjusted analyses showed an inverse association between trunk length and starting smoking in Russian men, but this relationship was no longer statistically significant after adjustment for adult SEC.

Women

Women showed positive associations between starting smoking and childhood assets (table 9.5).

Russian women showed non-significant increases in the odds of starting smoking with increasing parental education (table 9.5). Adjustments for adult SEC strengthened the association, such that that with paternal education was borderline statistically significant. In Polish women there were increasing odds of starting smoking with increases in parental education.

Relationships between starting smoking and anthropometric measures were weak (table 9.5). Amongst Czech women there were no statistically significant relationships. Russian and Polish women showed slight increases in the odds of starting smoking with increases in height and leg length.

Table 9.4. OR [95% CI] for men starting smoking for a one unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	0.98 [0.93, 1.04]	0.582	0.96 [0.91, 1.00]	0.053	0.99 [0.96, 1.03]	0.708
	+ adult SEC	1.04 [0.98, 1.10]	0.245	0.97 [0.93, 1.02]	0.260	1.06 [1.02, 1.11]	0.002
	+ anthropometry	1.02 [0.96, 1.08]	0.600	0.96 [0.91, 1.00]	0.073	1.00 [0.97, 1.04]	0.870
	+ adult SEC, anthropometry	1.08 [1.01, 1.15]	0.035	0.97 [0.93, 1.02]	0.284	1.07 [1.03, 1.12]	0.002
Maternal education	Age	-	-	0.88 [0.83, 0.93]	<0.001	0.98 [0.93, 1.04]	0.570
	+ adult SEC	-	-	0.93 [0.87, 0.99]	0.026	1.14 [1.06, 1.22]	<0.001
	+ anthropometry	-	-	0.88 [0.83, 0.93]	<0.001	0.97 [0.91, 1.04]	0.432
	+ adult SEC, anthropometry	-	-	0.93 [0.87, 0.99]	0.026	1.12 [1.04, 1.20]	0.003
Paternal education	Age	-	-	0.91 [0.86, 0.97]	0.002	0.98 [0.93, 1.03]	0.392
	+ adult SEC	-	-	0.97 [0.92, 1.03]	0.385	1.12 [1.06, 1.20]	<0.001
	+ anthropometry	-	-	0.91 [0.86, 0.97]	0.003	0.97 [0.92, 1.03]	0.385
	+ adult SEC, anthropometry	-	-	0.97 [0.92, 1.04]	0.412	1.11 [1.04, 1.18]	0.003
Anthropometry							
Measured height	Age	1.00 [0.99, 1.01]	0.665	0.99 [0.98, 1.00]	0.209	1.00 [0.99, 1.01]	0.649
	+ child SEC	1.00 [0.98, 1.01]	0.587	0.99 [0.98, 1.01]	0.270	1.00 [0.99, 1.01]	0.714
	+ adult SEC	1.01 [1.00, 1.02]	0.222	1.00 [0.99, 1.01]	0.944	1.01 [0.99, 1.02]	0.305
	+ child & adult SEC	1.01 [0.99, 1.02]	0.316	1.00 [0.99, 1.01]	0.776	1.00 [0.99, 1.01]	0.620
Leg length	Age	1.00 [0.98, 1.01]	0.771	1.00 [0.99, 1.02]	0.869	1.00 [0.99, 1.01]	0.975
	+ child SEC	1.00 [0.98, 1.01]	0.730	1.00 [0.99, 1.02]	0.833	1.00 [0.99, 1.02]	0.792
	+ adult SEC	1.01 [0.99, 1.02]	0.493	1.01 [0.99, 1.03]	0.279	1.01 [0.99, 1.02]	0.309
	+ child & adult SEC	1.01 [0.99, 1.02]	0.577	1.01 [0.99, 1.02]	0.429	1.01 [0.99, 1.02]	0.535
Trunk length	Age	1.00 [0.98, 1.02]	0.723	0.97 [0.95, 0.99]	0.013	0.99 [0.97, 1.01]	0.400
	+ child SEC	1.00 [0.97, 1.02]	0.635	0.98 [0.95, 1.00]	0.023	0.99 [0.97, 1.01]	0.329
	+ adult SEC	1.01 [0.99, 1.04]	0.217	0.98 [0.96, 1.00]	0.129	1.01 [0.99, 1.03]	0.620
	+ child & adult SEC	1.01 [0.99, 1.04]	0.309	0.98 [0.96, 1.00]	0.125	1.00 [0.98, 1.02]	0.941

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table 9.5. OR [95% CI] for women starting smoking for a one unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
		Childhood socioeconomic circumstances					
Assets	Age	1.08 [1.02, 1.13]	0.004	1.06 [1.01, 1.12]	0.018	1.07 [1.04, 1.11]	<0.001
	+ adult SEC	1.08 [1.02, 1.14]	0.013	1.08 [1.02, 1.13]	0.004	1.07 [1.03, 1.10]	<0.001
	+ anthropometry	1.08 [1.02, 1.15]	0.005	1.06 [1.01, 1.12]	0.020	1.08 [1.05, 1.12]	<0.001
	+ adult SEC, anthropometry	1.09 [1.02, 1.16]	0.011	1.07 [1.02, 1.13]	0.008	1.08 [1.04, 1.12]	<0.001
Maternal education	Age	-	-	1.02 [0.95, 1.10]	0.520	1.12 [1.07, 1.18]	<0.001
	+ adult SEC	-	-	1.04 [0.97, 1.12]	0.289	1.11 [1.04, 1.18]	0.001
	+ anthropometry	-	-	1.02 [0.95, 1.10]	0.534	1.11 [1.05, 1.18]	<0.001
	+ adult SEC, anthropometry	-	-	1.04 [0.96, 1.12]	0.311	1.11 [1.03, 1.18]	0.003
Paternal education	Age	-	-	1.06 [0.98, 1.13]	0.130	1.15 [1.10, 1.21]	<0.001
	+ adult SEC	-	-	1.07 [1.00, 1.15]	0.059	1.16 [1.09, 1.23]	<0.001
	+ anthropometry	-	-	1.06 [0.99, 1.14]	0.110	1.15 [1.09, 1.21]	<0.001
	+ adult SEC, anthropometry	-	-	1.08 [1.00, 1.16]	0.046	1.16 [1.09, 1.24]	<0.001
		Anthropometry					
Measured height	Age	1.01 [1.00, 1.02]	0.149	1.02 [1.00, 1.03]	0.010	1.02 [1.01, 1.03]	0.002
	+ child SEC	1.01 [1.00, 1.02]	0.169	1.02 [1.00, 1.04]	0.011	1.01 [1.00, 1.02]	0.033
	+ adult SEC	1.01 [0.99, 1.02]	0.277	1.02 [1.01, 1.04]	0.007	1.01 [1.00, 1.03]	0.008
	+ child & adult SEC	1.01 [1.00, 1.02]	0.231	1.02 [1.00, 1.04]	0.010	1.01 [1.00, 1.02]	0.029
Leg length	Age	1.01 [1.00, 1.03]	0.073	1.04 [1.02, 1.06]	<0.001	1.02 [1.01, 1.04]	0.002
	+ child SEC	1.01 [1.00, 1.03]	0.098	1.04 [1.02, 1.06]	0.001	1.02 [1.00, 1.03]	0.021
	+ adult SEC	1.01 [0.99, 1.03]	0.345	1.04 [1.02, 1.06]	<0.001	1.02 [1.00, 1.03]	0.010
	+ child & adult SEC	1.01 [0.99, 1.03]	0.327	1.04 [1.02, 1.06]	0.001	1.02 [1.00, 1.03]	0.030
Trunk length	Age	1.00 [0.98, 1.02]	0.814	1.00 [0.97, 1.02]	0.831	1.01 [0.99, 1.03]	0.165
	+ child SEC	1.00 [0.98, 1.02]	0.775	1.00 [0.97, 1.03]	0.953	1.01 [0.99, 1.03]	0.494
	+ adult SEC	1.01 [0.99, 1.03]	0.504	1.00 [0.97, 1.03]	0.967	1.01 [0.99, 1.03]	0.228
	+ child & adult SEC	1.01 [0.99, 1.03]	0.420	1.00 [0.98, 1.03]	0.821	1.01 [0.99, 1.03]	0.357

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

9.4.3 Quitting smoking

9.4.3.1 Descriptive analysis

These descriptive analyses show that Russian smokers were the least likely to have quit (table 9.6). Quitting was more common amongst younger age groups, other than amongst Russian women.

Other than Russian women, in each gender and country group those who had fewer assets in childhood were more likely to have quit (table 9.6). Associations between parental education and quitting smoking were inconsistent between groups. Polish men showed inverse associations with both parent’s education whilst Russian women showed a positive relationship with paternal education, but no relationship with maternal education and no associations were observed amongst Russian men or Polish women.

Table 9.6. Distribution (%) of quitting smoking by age and childhood SEC measures

	Men			Women		
	Czech Republic	Russia	Poland	Czech Republic	Russia	Poland
Ever smokers (N)	2735	3069	3760	2074	706	2699
Former smokers (%)	57.0	33.7	50.1	48.0	30.0	42.3
Age						
45-49	57.7	78.9	64.0	60.4	69.3	66.3
50-54	53.6	72.6	57.0	58.3	74.1	64.8
55-59	45.5	68.3	53.8	53.3	67.4	55.8
60-64	37.1	63.5	41.5	45.4	67.4	50.4
65-69	28.9	53.1	34.4	37.9	66.7	41.0
p for trend	<0.001	<0.001	<0.001	<0.001	0.563	<0.001
Childhood assets						
0	72.4	44.3	58.6	70.0	35.3	39.6
1	72.6	37.1	57.1	56.0	29.4	47.4
2	65.6	31.2	53.1	54.1	32.2	47.2
3	65.2	30.9	50.6	55.9	29.1	43.4
4	57.6	31.5	51.7	47.3	29.9	43.2
5	52.8	28.7	45.8	45.9	26.4	40.8
6	47.8	22.4	41.5	43.6	29.3	37.7
p for trend	<0.001	<0.001	<0.001	<0.001	0.521	0.002
Paternal education						
< primary	-	32.8	55.0	-	26.3	45.9
Primary	-	35.4	52.5	-	25.7	43.8
Vocational	-	29.6	45.4	-	31.3	38.8
Secondary	-	36.4	50.4	-	31.3	42.3
University	-	33.3	45.2	-	42.3	40.9
p for trend	-	0.758	0.002	-	0.013	0.204
Maternal education						
< primary	-	36.6	53.1	-	29.2	45.7
Primary	-	33.7	53.0	-	25.5	42.7
Vocational	-	31.6	42.9	-	31.3	39.4
Secondary	-	32.2	46.8	-	35.1	43.5
University	-	32.4	46.3	-	31.1	33.1
p for trend	-	0.069	<0.001	-	0.151	0.152

* % of ever smokers who have quit

9.4.3.2 Adult socioeconomic circumstances

People of higher adult SEC tended to be more likely to quit smoking (table 9.7). Amongst women the associations were less consistent: there were no associations with living space and amongst Russian women only an association with assets. The associations were not affected by adjustment for childhood SEC or anthropometric measures (results not shown in table).

Table 9.7. OR [95% CI] for quitting smoking for a one unit increase in adult SEC†

Adult SEC measure	Czech Republic		Russia		Poland	
	OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Men						
Education	1.25 [1.14, 1.38]	<0.001	1.22 [1.13, 1.32]	<0.001	1.22 [1.14, 1.31]	<0.001
Material position	1.10 [1.06, 1.13]	<0.001	1.06 [1.03, 1.08]	<0.001	1.10 [1.08, 1.13]	<0.001
Living space	1.09 [0.97, 1.23]	0.159	1.46 [1.22, 1.74]	<0.001	1.24 [1.10, 1.40]	<0.001
Assets	1.10 [1.06, 1.14]	<0.001	1.20 [1.16, 1.25]	<0.001	1.17 [1.13, 1.21]	<0.001
Women						
Education	1.15 [1.04, 1.27]	0.005	1.07 [0.89, 1.28]	0.471	1.23 [1.13, 1.33]	<0.001
Material position	1.08 [1.04, 1.12]	<0.001	1.02 [0.98, 1.07]	0.358	1.07 [1.05, 1.10]	<0.001
Living space	0.94 [0.84, 1.05]	0.253	1.23 [0.87, 1.72]	0.239	1.02 [0.90, 1.16]	0.704
Assets	1.07 [1.02, 1.11]	0.003	1.08 [1.01, 1.16]	0.036	1.12 [1.08, 1.16]	<0.001

† One higher level of education, one point higher on material position scale, one more room per person in home or one more asset

9.4.3.3 Childhood socioeconomic circumstances

Men

There were few statistically significant associations between childhood SEC and quitting smoking (table 9.8). Amongst Czech men, an inverse association with assets was slightly strengthened on adjustment for adult SEC. Russian men showed a positive association between paternal education and quitting which was not significant after adjustment for adult SEC measures.

Associations between quitting smoking and anthropometric measures were inconsistent (table 9.8). Amongst Czech and Russian men there were slight positive associations between height and quitting smoking, although after adjustment for adult SEC they were no longer statistically significant amongst Czech men. There were no associations with leg length but slight positive associations with trunk length. In Polish men this association was not significant after adjustment for adult SEC.

Women

There was a positive association between paternal education and quitting amongst Russian women, which was weakened after adjustment for adult SEC (table 9.9).

There were no statistically significant associations with height or leg length, but positive associations with trunk length in Czech and Polish women (table 9.9). These associations were weak, and no longer significant after adjustment for measures of adult SEC.

Table 9.8. OR [95% CI] for men quitting smoking for a one unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
		Childhood socioeconomic circumstances					
Assets	Age	0.93 [0.88, 1.00]	0.035	0.96 [0.91, 1.01]	0.098	0.98 [0.94, 1.01]	0.221
	+ adult SEC	0.89 [0.83, 0.95]	0.001	0.94 [0.89, 0.99]	0.015	0.90 [0.87, 0.94]	<0.001
	+ anthropometry	0.92 [0.85, 0.99]	0.025	0.94 [0.89, 0.99]	0.030	0.97 [0.93, 1.01]	0.184
	+ adult SEC, anthropometry	0.89 [0.82, 0.96]	0.004	0.93 [0.88, 0.98]	0.005	0.90 [0.86, 0.95]	<0.001
Maternal education	Age	-	-	1.06 [0.99, 1.14]	0.081	0.97 [0.91, 1.003]	0.318
	+ adult SEC	-	-	0.98 [0.91, 1.05]	0.512	0.83 [0.77, 0.89]	<0.001
	+ anthropometry	-	-	1.04 [0.97, 1.11]	0.269	0.97 [0.91, 1.04]	0.441
	+ adult SEC, anthropometry	-	-	0.96 [0.90, 1.04]	0.339	0.85 [0.78, 0.92]	<0.001
Paternal education	Age	-	-	1.10 [1.04, 1.18]	0.003	0.97 [0.92, 1.03]	0.349
	+ adult SEC	-	-	1.02 [0.95, 1.10]	0.533	0.85 [0.79, 0.91]	<0.001
	+ anthropometry	-	-	1.09 [1.02, 1.16]	0.014	0.97 [0.91, 1.03]	0.365
	+ adult SEC, anthropometry	-	-	1.01 [0.94, 1.09]	0.712	0.86 [0.80, 0.93]	<0.001
		Anthropometry					
Measured height	Age	1.01 [1.00, 1.03]	0.050	1.03 [1.02, 1.05]	<0.001	1.01 [1.00, 1.02]	0.233
	+ child SEC	1.02 [1.00, 1.03]	0.026	1.03 [1.02, 1.04]	<0.001	1.01 [1.00, 1.02]	0.211
	+ adult SEC	1.00 [0.99, 1.02]	0.608	1.02 [1.01, 1.04]	<0.001	1.00 [0.98, 1.01]	0.504
	+ child & adult SEC	1.00 [0.99, 1.02]	0.584	1.02 [1.01, 1.04]	0.001	1.00 [0.99, 1.01]	0.810
Leg length	Age	0.99 [0.97, 1.01]	0.424	1.02 [1.00, 1.04]	0.053	0.99 [0.98, 1.01]	0.305
	+ child SEC	0.99 [0.97, 1.01]	0.609	1.01 [1.00, 1.03]	0.142	0.99 [0.98, 1.01]	0.350
	+ adult SEC	0.98 [0.95, 1.00]	0.027	1.01 [0.99, 1.03]	0.408	0.98 [0.97, 1.00]	0.066
	+ child & adult SEC	0.98 [0.95, 1.00]	0.031	1.01 [0.99, 1.03]	0.511	0.99 [0.97, 1.01]	0.165
Trunk length	Age	1.05 [1.03, 1.08]	<0.001	1.08 [1.06, 1.11]	<0.001	1.04 [1.02, 1.06]	0.001
	+ child SEC	1.06 [1.03, 1.08]	<0.001	1.08 [1.06, 1.11]	<0.001	1.04 [1.02, 1.06]	0.001
	+ adult SEC	1.05 [1.02, 1.08]	<0.001	1.07 [1.04, 1.09]	<0.001	1.01 [0.99, 1.04]	0.231
	+ child & adult SEC	1.05 [1.02, 1.08]	<0.001	1.07 [1.04, 1.10]	<0.001	1.02 [0.99, 1.04]	0.167

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table 9.9. OR [95% CI] for women quitting smoking for a one unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
		Childhood socioeconomic circumstances					
Assets	Age	0.98 [0.90, 1.05]	0.514	0.98 [0.89, 1.08]	0.652	1.00 [0.96, 1.05]	0.891
	+ adult SEC	0.93 [0.86, 1.02]	0.122	0.97 [0.88, 1.07]	0.523	0.96 [0.91, 1.01]	0.086
	+ anthropometry	0.98 [0.90, 1.07]	0.659	0.98 [0.89, 1.08]	0.678	0.99 [0.94, 1.04]	0.619
	+ adult SEC, anthropometry	0.94 [0.85, 1.03]	0.182	0.97 [0.88, 1.07]	0.539	0.95 [0.90, 1.00]	0.044
Maternal education	Age	-	-	1.12 [0.98, 1.29]	0.107	0.99 [0.92, 1.07]	0.891
	+ adult SEC	-	-	1.09 [0.94, 1.26]	0.273	0.90 [0.83, 0.98]	0.017
	+ anthropometry	-	-	1.13 [0.98, 1.30]	0.094	1.00 [0.93, 1.09]	0.917
	+ adult SEC, anthropometry	-	-	1.09 [0.94, 1.27]	0.240	0.92 [0.84, 1.01]	0.069
Paternal education	Age	-	-	1.20 [1.05, 1.37]	0.009	0.99 [0.93, 1.06]	0.819
	+ adult SEC	-	-	1.16 [1.01, 1.34]	0.038	0.90 [0.83, 0.97]	0.009
	+ anthropometry	-	-	1.20 [1.05, 1.37]	0.009	1.01 [0.94, 1.09]	0.818
	+ adult SEC, anthropometry	-	-	1.16 [1.01, 1.34]	0.040	0.93 [0.85, 1.01]	0.082
		Anthropometry					
Measured height	Age	1.01 [0.99, 1.03]	0.273	1.00 [0.97, 1.02]	0.797	1.00 [0.99, 1.01]	0.997
	+ child SEC	1.01 [1.00, 1.03]	0.108	0.99 [0.96, 1.02]	0.583	1.00 [0.98, 1.01]	0.755
	+ adult SEC	1.00 [0.98, 1.02]	0.797	0.99 [0.96, 1.02]	0.537	0.99 [0.98, 1.01]	0.381
	+ child & adult SEC	1.01 [0.99, 1.03]	0.415	0.99 [0.96, 1.02]	0.411	0.99 [0.98, 1.01]	0.374
Leg length	Age	1.00 [0.97, 1.02]	0.776	1.00 [0.96, 1.03]	0.825	0.98 [0.96, 1.00]	0.090
	+ child SEC	1.00 [0.98, 1.02]	0.957	0.99 [0.95, 1.03]	0.619	0.98 [0.96, 1.00]	0.093
	+ adult SEC	0.99 [0.97, 1.02]	0.536	0.99 [0.95, 1.03]	0.611	0.98 [0.96, 1.00]	0.030
	+ child & adult SEC	1.00 [0.97, 1.02]	0.872	0.99 [0.95, 1.03]	0.470	0.98 [0.96, 1.00]	0.044
Trunk length	Age	1.03 [1.00, 1.06]	0.028	1.00 [0.95, 1.05]	0.876	1.03 [1.00, 1.06]	0.023
	+ child SEC	1.04 [1.01, 1.07]	0.009	0.99 [0.94, 1.04]	0.715	1.02 [1.00, 1.05]	0.088
	+ adult SEC	1.02 [0.99, 1.05]	0.223	0.99 [0.94, 1.04]	0.626	1.02 [0.99, 1.05]	0.177
	+ child & adult SEC	1.03 [0.99, 1.06]	0.113	0.98 [0.93, 1.04]	0.565	1.02 [0.99, 1.05]	0.266

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

9.5 Discussion

9.5.1 Summary of results

With increasing age there was a decrease in prevalence of both current smoking and ever smoking (other than Czech men), and an increase in quitting smoking (other than Russian women). Women were less likely to be current smokers, to have started or to have quit smoking than men.

Although associations were not consistent across all measures, higher childhood SEC were linked to increased likelihood of women starting smoking, but a reduced likelihood of Russian men starting. Amongst all groups other than Russian men, participants who had the maximum number of assets in childhood had around 1.5-1.7 times the odds of starting smoking of persons with no assets, after the effects of age, anthropometry and adult SEC were taken into account. Effects of childhood SEC on quitting behaviour were less common, and the direction of the effects was inconsistent. However, men who had no assets in childhood had 1.5-2 times the odds of quitting smoking of those who had the maximum number of assets.

Men's anthropometry was not related to starting smoking, but was positively associated with quitting, whilst women's anthropometry was positively associated with starting but not quitting. Relationships varied between countries, with Czech women and Polish men not showing any associations. Amongst both men and women, height was associated with smoking, but when height was broken into its constituent parts, trunk length was more important amongst men, where a ten centimetre increase in trunk length was associated with 1.6-2.0 times the odds of quitting smoking, and leg length was more important amongst women, where a ten centimetre increase was linked to 1.2-1.5 times the odds of starting.

Measures of adult SEC had more consistent and substantial effects on men's starting and quitting smoking and women's quitting. In the reverse to the associations observed with childhood SEC, those of higher adult SEC were less likely to have started smoking, and more likely to quit.

9.5.2 Limitations

In addition to the general limitations of the study (particularly the retrospectively reported childhood SEC measures), several other features may affect the interpretation of results.

Firstly, parental smoking habits, which are an important determinant of an individual's smoking habits,[327;328] were not collected. Odds ratios for associations between childhood SEC and smoking may therefore be overestimated, because parental smoking is a potential confounder.

Another important consideration is the potential effect on the accuracy of self-reported smoking of social desirability bias. A striking feature of Russian smoking is the gender difference in reporting. In 1985, twenty times as many men enrolled in MONICA in Novosibirsk reported smoking as women (59% compared to less than 3%),[338] in a 1992 survey in the Republic of Karelia 64% of men and 10% of women reported regular smoking[341] and RLMS data from the same year suggested eight times as many men as women smoked.[340]

Thirdly, gender differences in smoking prevalence in Russia may be overestimated, due to underreporting by women. The Republic of Karelia survey compared serum cotinine measurements to reported smoking, and although 82% of women reported non-smoker status, 13% of these had cotinine levels which suggested that they were regular smokers.[341] This finding suggests that almost half of Russian women smokers do not report their habit, and was replicated in a study of women in Novosibirsk,[345] suggesting that smoking is less socially acceptable amongst Russian women. These studies have not investigated whether this underreporting is differential by age or SEC, but older women, amongst whom smoking may be less common, may also be less likely to report a smoking habit. Although a similar proportion of Russian male self-reported non-smokers have been shown to be smokers, self-reported non-smoking is less common (19% versus 82% of women), so the absolute number of men affected is far fewer.[341] In a Czech study, self-reported active smoking correlated closely with blood thiocyanate (a metabolite of nicotine) concentrations in men and women, suggesting that self-reported smoking is an accurate measure in the Czech Republic.[346] To my knowledge, the reliability of self-reported smoking has not been investigated in Poland.

Fourthly, smoking habits tend to vary by urban or rural location,[344] and the HAPIEE study populations are exclusively urban. A Russian study, using RLMS data, however, showed that the prevalence of men's smoking did not differ between urban and rural populations, and women's was similar in all urban populations, but lower in rural populations,[340] suggesting that the Novosibirsk sample may be representative, at least, of the smoking habits of urban-dwelling Russians. Again, similar studies have not investigated these issues in the Czech Republic or Poland.

Finally, because of the large study population some odds ratios which vary very slightly from the null, so have little practical relevance, are highly significant. The opposite issue applies to the predictors of Russian women quitting smoking. Only small numbers of Russian women reported smoking, so the group in which determinants of quitting smoking can be investigated is accordingly even smaller. As a consequence very few statistically significant associations were found in this group, even where effect estimates were relatively large, due to the lack of power. In both cases there must not be an overemphasis on the importance of statistical significance when interpreting the results.

9.5.3 Discussion of results

Childhood SEC influenced adult smoking behaviour in Russia, Poland and the Czech Republic: people who experienced improved SEC in childhood were more likely to start, and less likely to quit, smoking. The exception was Russian participants, amongst whom higher parental education was associated with increased likelihood of quitting smoking, but in all other cases the relationships were similar whether recalled or anthropometric measures of childhood SEC were used.

Adjusting for adult SEC frequently substantially strengthened the observed associations. Adult and childhood SEC had opposite effects: with improving adult SEC, starting smoking was less likely whilst quitting was more likely. Although there were positive associations between childhood and adult SEC, correlations were not sufficiently high for colinearity to be a consideration (see chapter 5), so negative confounding by adult SEC was more probable.

Those who experienced higher SEC in childhood were more likely to have taken up smoking, other than amongst Russian men, where the inverse was observed. These results appear to be in contrast with results from previous studies in western countries, which showed that whilst childhood SEC was inversely associated with women's smoking, there was no effect on men's.[95;96;98;333-335] Although participants of these previous studies were not necessarily born more recently than the HAPIEE participants, they lived in Western Europe, and therefore lived through later stages of the tobacco epidemic. As the relationship of smoking with adult SEC varies throughout the epidemic,[326] it stands to reason that the relationship with childhood SEC would also vary, therefore the disparity between the results here and previous findings may be attributable to these CEE countries having been at earlier stages of the tobacco epidemic. In order to confirm this, further investigation needs to be undertaken into the links between childhood SEC and smoking in various countries.

With regard to quitting smoking, the results were mixed. There has been little previous research into the early life predictors of quitting smoking, and the rationale for an association is weak, with the temporality of the exposure (childhood SEC) and outcome (quitting smoking) usually being distant. The potential for a far greater impact of later life SEC on quitting smoking to eclipse a weaker effect of childhood SEC is great, and indeed this is shown here: when associations between childhood SEC and quitting are adjusted for adult SEC, the effects are weakened substantially, whereas in the reverse situation, adjusting for childhood SEC does not alter the odds ratios.

The use of these data to place the three countries on the tobacco epidemic is limited because it is not known when study participants took up and/or gave up smoking, so the secular trends in smoking prevalence cannot be investigated. Additionally, the age range of the study populations is limited to people over 45 years. However, the current prevalence and the gender, age and socioeconomic distributions of smoking can give some indication of the status of the countries with regard to the tobacco epidemic.

The small gender difference and low prevalence of current smoking in the Czech Republic, the lack of association between age and ever smoking amongst men, and the inverse associations between adult SEC and current smoking, suggest that this population is at stage four of the tobacco epidemic. The inverse association between age and ever smoking amongst women suggests that smoking may be becoming more common amongst women, however a lower prevalence in the young women not included in this study would fulfil the requirements of stage four of the epidemic.

The patterns observed suggest that Russia is at stage two of the epidemic. Inverse associations between age and current and ever smoking, which are particularly strong amongst women, suggest increasing prevalence in both sexes, as previous reports have suggested.[338;340] Inverse associations between adult SEC and ever smoking here are less consistent than in the other countries, which reinforces the observation in the literature that there is no clear relationship between SEC and smoking.[339;341;342] The very large gender difference in both current and ever smoking prevalence is also most consistent with the early stages of the epidemic.

It is not clear which stage of the tobacco epidemic Poland is at. The small gender difference in current smoking prevalence and relatively low prevalence of current smoking in both genders, and the inverse associations of ever and current smoking with both age and adult SEC in both genders suggest that Poland is at stage four of the epidemic. However, inverse associations between age and quitting smoking show that, at least in this age range (45-69 years), the prevalence of smoking is increasing. Again, however, the prevalence of smoking may be lower amongst young adults, so that overall prevalence may not be increasing, as the literature suggests.[32;220;343]

9.5.4 Conclusions

In these CEE populations, who were born between 1933 and 1957, men and women who experienced higher childhood SEC were more likely to take up smoking, suggesting that the influence of childhood SEC on smoking uptake is dependent upon the stage of the tobacco epidemic the country is in at the time. Male smokers who experienced higher SEC in childhood were less likely to quit, even after taking into account the effects of adult SEC.

The findings from this chapter suggest that Poland and the Czech Republic are at stage four of the tobacco epidemic, when rates smoking are declining, whilst Russia is at stage two, when rates are increasing.

Chapter 10. Adiposity

The previous chapters have shown that smoking in Russia, Poland and the Czech Republic is socially patterned according to childhood experiences, whilst blood pressure and lipids are not. This chapter establishes the relationship between SEC in early life and total and abdominal adiposity in middle and older age in the three CEE populations. It compares the patterns of adiposity between genders and across countries.

10.1 Literature review

There is an extensive literature on the relationship between adiposity and morbidity and mortality from a number of health outcomes. Although the evidence on all-cause mortality is inconsistent, with studies showing no association,[347-350] inverse,[351] positive,[347;350-352] U-shaped[350;353-359] and J-shaped associations,[348;360] obesity is consistently associated with increased risk of CVD.[361-363]

The relationship between SEC and adiposity is dependent upon the stage of the nutritional transition a society is in (see section 2.2.2.2). For instance obesity is initially most common in more wealthy and educated people, because they are the first to adopt new lifestyles[64] and technologies,[364] and because diets high in animal fat are more expensive. However, as observed in high income countries, and more recently in many middle income countries,[67;70;365] the social gradient in adiposity reverses, so that in time obesity is associated with poverty. The large body of evidence in support of a link between SEC in adulthood and childhood and adiposity is briefly summarised below.

10.1.1 Adiposity and adult socioeconomic circumstances

There are four major reviews on the association between adult SEC and adiposity. The first, from 1989[101] and an update in 2007[366] included studies which used both objective and self-reported measures of adiposity (body mass index (BMI) and other weight/height ratios, skin fold thicknesses and waist to hip ratio (WHR)). Two further reviews summarised the evidence from low and middle income countries published between 1989 and 2004[367] and the relationship of adult SEC with weight change published between 1980 and 2002.[368] Associations throughout are characterised as positive (high SEC-obesity), inverse (low SEC-obesity) or non-significant or curvilinear.

Men

The relationship between SEC and adiposity in men is not clear-cut. In high income countries, of the 66 studies published prior to 1989, 52% found an inverse association and 30%, a positive association, and those studies which did not find an association were often of a smaller size.[101] Among papers published after 1989, 37% of studies in high income countries showed inverse relationships and 9% showed positive relationships.[366] Comparing the results of the two reviews suggests that a shift may be occurring towards an inverse association between men's SEC and adiposity, at least in high income countries.

14 studies published prior to 1989 investigated men in low and middle income countries, and 86% of these found positive associations whilst none found inverse associations.[101] The 2007 update covered 128 studies of men in medium income countries, 39% of which found positive associations, and 6% of which found inverse associations. It also included three studies in low income countries, all of which showed positive associations.[366] Between 1989 and 2004, 14 studies were published from low- and middle-income countries, half of which found positive associations whilst the remainder found no association.[367] Overall, 45% of the studies in low- and middle-income countries found a positive association and 5% found an inverse association, and studies in which inverse associations were observed were of populations in middle-income countries.

Women

Overall, both reviews of the literature on the relationship between SEC and adiposity in high income countries[101;366] suggested that for women in high income countries, improved SEC was associated with lower adiposity. Of 54 studies published before 1989, 85% found inverse associations and 13% found no association, whilst the study population of the single study which showed a positive association were immigrants from a low income country.[101] Of 731 studies from high income countries published since 1989, 63% found inverse associations and only 3% found positive associations.[366]

The opposite association has been shown more frequently in low and middle income countries. Ten of eleven studies published prior to 1989 found positive associations between adiposity and SEC, whilst the final study showed no association.[101] Of 173 more recent studies from medium income countries and 35 from low income countries, 43% and 94% showed positive associations.[366] At least amongst women, there may be a relationship between the wealth of a country and the association between obesity and SEC. However, of 14 studies of low and middle income populations published between 1989 and 2003, 10 (71%) found inverse associations, whilst two found positive associations.[367]

10.1.2 Adiposity and childhood socioeconomic circumstances

The vast majority of studies investigating the relationship between SEC and adiposity have concentrated on adult exposures and outcomes, but a smaller number of studies have taken a life course approach and investigated the possible effects of childhood SEC on adult adiposity. A review summarised those studies published prior to 1999: four of five of women, eight of nine of men and three of four which pooled the sexes found inverse associations between childhood SEC and adiposity, whilst the remaining studies showed no association.[369] Several studies did not adjust for adult SEC,[306;370;371] and as there are often strong associations between adult SEC and obesity there is a possibility of confounding or mediation.

Since this review, several further studies on the association between childhood SEC and adiposity in adulthood have been published. These studies are summarised below. There were several weaknesses afflicting these studies, including the use of self-reported height or weight,[372-374] which tend to over- and underestimate, respectively,[120-122;375] and of retrospectively recalled measures of childhood SEC.[93;96;372;374;376;377] Despite these problems, all the studies found that childhood SEC were inversely associated with adiposity in adulthood. There was, however, variation in the size of the effects, gender differences, and the mediating role of adult SEC.

In 8756 women aged 22-27 living in Australia, maternal, paternal and own SEC were all independently and inversely associated with BMI.[372] However, both height and weight were self-reported, childhood SEC was recalled and there was a low response rate of 41%.

In 1044 Swedish men and women, overweight (BMI ≥ 25 kg/m^2) at age 30 was more common amongst those who had fewer than 12 years of schooling, but was not associated with parental social class or own current social class.[373] Although this study had an extremely high response rate (96.4%), it's relatively small size may have left it underpowered to detect associations.

There were no social class differences in overweight or mean BMI amongst 15322 Glasgow University alumni in their late teens and early twenties.[377] By their late thirties the men's BMI and overweight showed inverse associations with paternal social class, but a similar association in women did not reach statistical significance, possibly due to the relatively small number of women in the study. Adjustments were not made for social class in adulthood, but the researchers argued that, due to their similar educational background, the study population were likely to be fairly homogenous in this regard.

A study of 5464 Swedish women aged 45 to 73 showed that body fat, waist size, WHR and change in BMI since age 20 were each inversely associated with both parental and own occupational social class, and the two social class measures had similar sized effects.[374]

The effects on obesity of manual and non-manual social class in childhood and adulthood were investigated in seven population based surveys from Western Europe and the USA.[93] Overall, effects were weaker amongst men, and in most studies adult social class was a stronger determinant of obesity than childhood social class. The opposite was true, however, in studies which prospectively collected childhood social class, suggesting that inaccurate recall in the other studies may have lead to underestimation of the effects of childhood social class.

Both paternal and own occupational social class were inversely correlated with measures of adiposity in the Whitehall II cohort.[96] Women's current and childhood SEC were both associated with BMI and waist circumference, whilst only current SEC showed an association with WHR. Amongst men, effects were smaller, and only BMI was associated with childhood SEC.

In 11,115 men and women aged 20 to 61 in Tromso, Norway adult SEC (educational level) and childhood SEC (family economy) both had inverse effects on women's BMI, whilst amongst men only current SEC had an independent effect and this was approximately half the size of the effect in women.[376]

The 1958 British birth cohort data were used to investigate the relative importance of social class at birth and at ages 7, 11, 16, 23 and 33 in predicting obesity (BMI ≥ 30 kg/m^2) at age 33.[100] Women's obesity was predicted by lower social class at age 7, and men's was predicted by lower social class at birth, whist social class in adolescence and adulthood did not affect adult obesity, in either gender.

The evidence overwhelmingly points to inverse associations between childhood SEC and adiposity and obesity in adulthood, although effects may be less strong amongst men. All of the studies discussed above took place in western countries which have been in the final stage of the nutritional transition for some time and similar relationships have not been explored in CEE countries.

10.1.3 Adiposity and anthropometry

In this thesis, height and its components (leg and trunk length) are being investigated as proxy measures of SEC in early life. In this chapter, however, where the outcomes under investigation are three anthropometric measures of adiposity, there is potential for positive associations to be observed due to the adiposity measures not being independent of height.

BMI was specifically developed as a measure of adiposity which would not be dependent on height,[378] however there is a debate in the literature as to whether it achieves this independence. Amongst members of the 1958 British birth cohort there was an inverse linear association of adult height and BMI,[379] whilst another study showed that tall and short people with the same BMI had very similar body compositions,[380] so the evidence is not conclusive.

Although waist circumference is not adjusted for height in any way, and it may therefore have been predicted to be dependent upon height, this has been shown not to be the case amongst white British and Dutch adults.[381] As a ratio of two horizontal measures, WHR is unlikely to be dependent upon height.

The implication from the literature is that, in the following analyses as in previous chapters, height may be treated as a proxy measure for childhood SEC. If waist circumference, WHR or, possibly, BMI were found to be associated with height in the following analyses this may be interpreted as evidence in support of an effect of early life circumstances on adiposity in adulthood. Regarding waist circumference and WHR, the same approach may be taken with leg and trunk length as with height, however, as the trunk is heavier than the legs, BMI might be predicted to be positively related to the former, and inversely to the latter, and this may not be interpreted as implying a relationship with childhood SEC.

10.2 Objectives

The overall aim of this chapter is to investigate the association of childhood SEC with adiposity in the three populations in the HAPIEE cohort. The specific objectives are to assess the relationships between both the recalled and the proxy (anthropometric) indicators of childhood SEC and three measures of adiposity.

10.3 Methods

10.3.1 Variables

Three measures of adiposity, all widely used in epidemiological research, were selected as outcome variables in this chapter: BMI, which indicates overall adiposity, and waist circumference and WHR, which both indicate abdominal adiposity. For full details of measurement and calculation, see the methods chapter (Chapter 4).

The main exposure variables were measures of childhood SEC (assets at age 10, paternal education, maternal education) and anthropometric measures (height, leg length, trunk length), details of the measurement of which are provided in Chapter 4. Covariates included adult SEC (education, material position, living space and assets) and age, as a continuous variable other than for the purposes of the descriptive analysis, where five year age groups were used.

10.3.2 Statistical analysis

The stages of the analysis are described below. Similar analyses were performed for each of the three measures of adiposity (BMI, waist circumference, waist to hip ratio).

1. The mean of the adiposity measure and the prevalence of obesity were calculated. The distribution of adiposity by age and by each of the three measures of childhood SEC were described and tests for trend were used to determine whether there were linear trends in adiposity.

2. Linear regression assessed the age-adjusted associations between adult SEC and adiposity.

3. Linear regression was used to investigate the associations between childhood SEC (maternal and paternal education and assets) and adiposity. Initial analyses were age-adjusted, and further analyses also adjusted for adult SEC (education, material position, living space and assets) and leg and trunk length.

4. Linear regression was used to investigate the associations between adult anthropometric measures (height, leg length and trunk length) and adiposity. Initial analyses were age-adjusted, and further analyses also adjusted for adult SEC (education, material position, living space and assets) and childhood SEC (maternal and paternal education and assets).

All analyses were conducted separately for men and women, due to gender differences in patterns of adiposity, and analyses were stratified by country to enable examination of inter-country differences. Likelihood ratio tests showed that there were interactions between each exposure and both gender and country (see section 4.4). Age was included as a covariate in all multivariate analyses, because adiposity tends to increase with age.[374]

10.4 Results

10.4.1 Descriptive analyses

10.4.1.1 BMI

Although mean BMI in the country and gender groups only varied between 27 and 30kg/m^2, the prevalence of obesity (BMI ≥ 30kg/m^2) varied substantially by gender and country (table 10.1). In each country, obesity was more frequently observed in women: it was more than twice as common amongst Russian women as men (47% compared to 21%), whilst in the Czech Republic the gender gap was only 2%. The overall prevalence of overweight (BMI ≥ 25) was twice that of obesity and Russian men and women were the extreme low and high prevalence groups. In the Czech Republic and Poland overweight was more common amongst men than women.

BMI increased with age, assets in childhood and maternal education (other than Russian men) and paternal education (other than Polish men) (table 10.1).

Table 10.1. Mean [SD] BMI (kg/m^2) by age and childhood SEC measures

	Men			Women		
	Czech Republic	Russia	Poland	Czech Republic	Russia	Poland
N	3266	4133	4500	3858	4917	4751
BMI	28.3 [3.9]	26.6 [4.4]	28.0 [4.0]	28.2 [5.0]	30.2 [5.7]	28.3 [5.1]
% overweight*	81.3	61.3	77.5	71.5	82.3	71.9
% obese†	29.8	20.8	27.5	31.9	47.1	34.3
Age						
45-49	27.3 [3.7]	26.2 [4.5]	27.5 [4.0]	26.2 [4.7]	28.9 [5.9]	26.7 [4.8]
50-54	28.1 [3.9]	26.8 [4.5]	27.9 [4.3]	27.3 [5.0]	29.9 [5.8]	27.6 [5.1]
55-59	28.5 [3.9]	26.9 [4.5]	27.9 [4.0]	28.7 [5.1]	30.5 [5.7]	28.8 [4.9]
60-64	28.7 [4.0]	26.4 [4.2]	28.4 [3.9]	29.2 [5.0]	30.5 [5.6]	29.1 [4.9]
65-69	28.7 [4.0]	26.7 [4.4]	28.0 [3.9]	29.1 [4.7]	30.7 [5.4]	29.6 [5.2]
p for trend	<0.001	0.970	0.001	<0.001	<0.001	<0.001
Assets in childhood						
0	30.0 [4.6]	26.5 [4.3]	28.3 [4.5]	30.4 [3.7]	30.7 [5.4]	29.7 [5.2]
1	28.6 [4.0]	26.6 [4.5]	28.0 [3.8]	29.6 [4.9]	30.6 [5.8]	29.5 [5.1]
2	28.7 [3.8]	26.6 [4.4]	28.0 [4.1]	29.1 [4.8]	30.2 [5.6]	29.3 [4.9]
3	28.9 [4.1]	26.5 [4.4]	28.0 [4.2]	29.0 [4.9]	30.1 [6.0]	28.1 [4.9]
4	28.2 [3.7]	26.6 [4.3]	28.0 [4.2]	28.3 [5.1]	29.7 [5.8]	28.1 [5.3]
5	28.2 [3.9]	27.0 [4.5]	27.7 [3.9]	27.7 [5.0]	29.3 [5.2]	27.8 [5.0]
6	27.8 [4.0]	26.6 [4.5]	27.7 [4.1]	27.1 [5.0]	28.9 [5.7]	27.2 [4.9]
p for trend	<0.001	0.361	0.012	<0.001	<0.001	<0.001
Paternal education						
< primary	-	26.2 [4.4]	27.7 [4.1]	-	30.8 [5.7]	29.6 [5.1]
Primary	-	26.7 [4.5]	28.1 [4.1]	-	30.1 [5.5]	28.9 [4.9]
Vocational	-	26.6 [4.4]	28.0 [4.0]	-	30.0 [6.0]	28.1 [5.3]
Secondary	-	26.9 [4.4]	27.9 [3.8]	-	29.9 [5.6]	27.5 [4.8]
University	-	26.7 [4.6]	27.7 [4.2]	-	29.4 [5.4]	26.8 [5.0]
p for trend	-	0.010	0.146	-	<0.001	<0.001
Maternal education						
< primary	-	26.6 [4.5]	28.0 [4.2]	-	30.9 [5.7]	29.6 [5.3]
Primary	-	26.7 [4.5]	28.1 [4.1]	-	30.2 [5.7]	28.7 [5.0]
Vocational	-	26.7 [4.4]	27.7 [3.8]	-	29.8 [5.4]	28.0 [5.0]
Secondary	-	26.6 [4.4]	27.8 [3.9]	-	29.9 [5.8]	27.3 [4.9]
University	-	26.3 [4.4]	27.0 [4.2]	-	28.7 [5.9]	26.4 [5.0]
p for trend	-	0.846	0.001	-	<0.001	<0.001

* BMI ≥ 25; † BMI ≥ 30

10.4.1.2 Waist circumference

Abdominal obesity, assessed by waist circumference, was more prevalent amongst women, and was most common amongst Russian women and least amongst Russian men (table 10.2). Waist circumference increased with age and decreased with improving childhood SEC: amongst women this was irrespective of the SEC measure used but amongst men the trends were less consistent. Assets were linked to Czech and Polish men's waist circumference, and maternal education to Polish and Russian men's waist circumference.

Table 10.2. Mean [SD] waist circumference (cm) by age and childhood SEC measures

	Men			Women		
	Czech Republic	**Russia**	**Poland**	**Czech Republic**	**Russia**	**Poland**
N	3273	4137	4518	3865	4933	4765
WC	98.7 [10.5]	94.1 [12.2]	97.7 [10.5]	89.1 [12.9]	91.9 [13.2]	87.8 [12.1]
% obese*	32.5	23.8	30.6	48.4	58.8	46.0
Age						
45-49	94.9 [9.5]	92.0 [12.0]	95.8 [10.7]	83.1 [12.3]	87.7 [13.2]	83.2 [11.4]
50-54	97.2 [10.0]	94.0 [12.2]	97.0 [10.9]	86.5 [12.6]	90.3 [13.0]	85.7 [12.3]
55-59	99.0 [10.1]	94.4 [12.3]	97.4 [10.2]	89.9 [12.7]	92.4 [13.0]	89.0 [11.9]
60-64	100.4 [10.7]	93.7 [11.9]	99.1 [10.4]	92.1 [12.7]	93.4 [13.0]	89.8 [11.5]
65-69	100.4 [10.7]	95.6 [12.4]	91.9 [11.9]	91.9 [11.9]	94.3 [13.0]	91.8 [11.8]
p for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Assets in childhood						
0	103.5 [10.6]	94.6 [11.9]	98.9 [11.3]	94.1 [11.1]	94.5 [13.0]	90.1 [12.5]
1	99.5 [10.0]	94.3 [12.3]	98.1 [9.9]	92.4 [12.1]	93.2 [13.3]	90.6 [11.9]
2	99.7 [10.0]	93.9 [12.3]	97.9 [10.4]	91.5 [11.9]	91.6 [13.1]	89.9 [11.7]
3	99.9 [10.8]	93.3 [12.2]	97.9 [10.5]	91.2 [12.4]	91.4 [13.1]	87.6 [11.7]
4	98.4 [10.2]	94.0 [11.9]	98.0 [10.8]	89.4 [13.1]	90.3 [13.4]	87.8 [13.0]
5	98.4 [10.7]	95.1 [11.6]	97.1 [10.1]	87.8 [13.0]	89.6 [12.6]	86.3 [11.8]
6	97.2 [10.0]	93.7 [12.6]	96.9 [10.7]	86.1 [13.0]	87.7 [12.5]	84.9 [11.8]
p for trend	<0.001	0.494	0.001	<0.001	<0.001	<0.001
Paternal education						
< primary	-	94.0 [12.2]	97.6 [10.7]	-	94.1 [13.3]	91.1 [11.9]
Primary	-	94.3 [12.5]	98.1 [10.5]	-	92.1 [12.9]	89.1 [11.8]
Vocational	-	93.8 [11.9]	97.5 [10.5]	-	91.0 [13.5]	87.4 [12.5]
Secondary	-	94.7 [12.0]	97.3 [10.0]	-	90.6 [12.9]	85.8 [11.8]
University	-	93.9 [12.8]	97.6 [11.2]	-	89.6 [12.8]	84.7 [12.5]
p for trend	-	0.721	0.195	-	<0.001	<0.001
Maternal education						
< primary	-	94.7 [12.5]	98.5 [10.9]	-	94.3 [13.2]	91.1 [12.4]
Primary	-	94.0 [12.4]	98.0 [10.5]	-	91.9 [13.2]	88.7 [11.9]
Vocational	-	94.2 [12.3]	97.0 [9.8]	-	90.5 [12.6]	86.8 [12.2]
Secondary	-	93.7 [11.8]	97.3 [10.6]	-	90.5 [13.1]	85.6 [11.9]
University	-	93.1 [12.4]	96.1 [11.1]	-	87.5 [13.2]	84.1 [13.1]
p for trend	-	0.048	0.001	-	<0.001	<0.001

* waist circumference >102cm for men and >88cm for women

10.4.1.3 Waist to hip ratio

Abdominal obesity, as measured by waist to hip ratio (WHR) was almost twice as common in men (74%) as in women (39%) (table 10.3). This may, however, reflect the cut-off points, which are >0.90 and >0.85 for men and women, respectively. WHR increased with age and decreased with improving childhood SEC (other than with paternal education in Polish men).

Table 10.3. Mean [SD] waist to hip ratio by age and childhood SEC measures

	Men			**Women**		
	Czech Republic	**Russia**	**Poland**	**Czech Republic**	**Russia**	**Poland**
N	3270	4137	4516	3860	4933	4763
WHR	0.95 [0.06]	0.94 [0.07]	0.94 [0.06]	0.83 [0.07]	0.84 [0.07]	0.83 [0.06]
% obese*	78.5	70.6	74.1	38.9	45.0	32.4
Age						
45-49	0.92 [0.05]	0.92 [0.07]	0.93 [0.06]	0.81 [0.07]	0.81 [0.07]	0.81 [0.06]
50-54	0.94 [0.06]	0.93 [0.07]	0.93 [0.06]	0.83 [0.07]	0.83 [0.07]	0.81 [0.06]
55-59	0.95 [0.06]	0.93 [0.07]	0.94 [0.06]	0.84 [0.07]	0.84 [0.07]	0.83 [0.06]
60-64	0.95 [0.06]	0.94 [0.07]	0.95 [0.06]	0.85 [0.07]	0.86 [0.07]	0.04 [0.06]
65-69	0.96 [0.06]	0.96 [0.07]	0.95 [0.06]	0.85 [0.07]	0.86 [0.07]	0.84 [0.06]
p for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Assets in childhood						
0	0.97 [0.06]	0.95 [0.07]	0.94 [0.06]	0.85 [0.05]	0.87 [0.07]	0.84 [0.06]
1	0.96 [0.06]	0.94 [0.07]	0.94 [0.06]	0.85 [0.07]	0.85 [0.07]	0.84 [0.06]
2	0.95 [0.06]	0.94 [0.07]	0.94 [0.06]	0.84 [0.07]	0.84 [0.07]	0.83 [0.06]
3	0.95 [0.06]	0.93 [0.07]	0.94 [0.06]	0.84 [0.07]	0.83 [0.07]	0.83 [0.06]
4	0.95 [0.06]	0.93 [0.07]	0.94 [0.06]	0.84 [0.07]	0.83 [0.06]	0.83 [0.06]
5	0.94 [0.06]	0.93 [0.06]	0.93 [0.06]	0.83 [0.07]	0.83 [0.07]	0.82 [0.06]
6	0.94 [0.05]	0.93 [0.07]	0.93 [0.06]	0.82 [0.07]	0.81 [0.07]	0.81 [0.06]
p for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Paternal education						
< primary	-	0.95 [0.07]	0.94 [0.06]	-	0.85 [0.07]	0.84 [0.06]
Primary	-	0.94 [0.07]	0.94 [0.06]	-	0.85 [0.07]	0.83 [0.06]
Vocational	-	0.93 [0.07]	0.94 [0.06]	-	0.84 [0.07]	0.82 [0.06]
Secondary	-	0.94 [0.07]	0.93 [0.06]	-	0.83 [0.07]	0.82 [0.06]
University	-	0.93 [0.08]	0.93 [0.06]	-	0.83 [0.07]	0.81 [0.07]
p for trend	-	0.006	0.071	-	<0.001	<0.001
Maternal education						
< primary	-	0.95 [0.07]	0.94 [0.06]	-	0.86 [0.07]	0.84 [0.06]
Primary	-	0.94 [0.07]	0.94 [0.06]	-	0.84 [0.07]	0.83 [0.06]
Vocational	-	0.94 [0.07]	0.94 [0.06]	-	0.83 [0.07]	0.82 [0.06]
Secondary	-	0.93 [0.07]	0.93 0.06]	-	0.83 [0.07]	0.82 [0.06]
University	-	0.92 [0.07]	0.92 [0.06]	-	0.81 [0.07]	0.81 [0.07]
p for trend	-	<0.001	0.002	-	<0.001	<0.001

* WHR >0.90 (men), >0.85 (women)

10.4.2 Adiposity and adult socioeconomic circumstances

10.4.2.1 BMI

Age-adjusted analyses showed that amongst Russian and Polish men, BMI increased with improving adult SEC (table 10.4). Amongst Czech men, a statistically significant association was only seen with education, where BMI decreased with increasing educational attainment. There were not statistically significant associations between education and BMI in Russian or Polish men.

Women's BMI decreased as adult SEC improved (table 10.4). Education was the only measure where an association was seen in all countries.

10.4.2.2 Waist circumference

Associations of adult SEC with waist circumference differed depending on the measure of adult SEC, country and gender (table 10.4). The majority of statistically significant relationships observed were in the expected direction: improved SEC in adulthood was associated with smaller waist circumference. The exceptions to this pattern were seen amongst Russian and Polish men, and larger waist circumference was linked to decreased material position and living space.

10.4.2.3 Waist to hip ratio

Where associations between measures of adult SEC and WHR were statistically significant, WHR tended to decrease as SEC improved (table 10.4). There were exceptions, however, where improved SEC was associated with increased WHR: material position and assets in Russians, and assets in Polish men. The effects were more consistent amongst women than men, and, overall, education appeared to have the greatest influence.

Table 10.4. Age-adjusted change [95% CI] in adiposity for a one unit increase in measures of adult SEC†

	Czech Republic		Russia		Poland	
	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
BMI (kg/m^2)						
Men						
Education	-0.56 [-0.72, -0.40]	<0.001	0.14 [0.01, 0.28]	0.035	-0.07 [-0.19, 0.06]	0.281
Material position	-0.01 [-0.07, 0.05]	0.829	0.09 [0.05, 0.13]	<0.001	0.10 [0.06, 0.15]	<0.001
Living space	0.04 [-0.10, 0.17]	0.583	0.56 [0.24, 0.88]	0.001	0.09 [-0.12, 0.30]	0.411
Assets	0.04 [-0.02, 0.11]	0.186	0.31 [0.25, 0.38]	<0.001	0.23 [0.18, 0.28]	<0.001
Women						
Education	-1.08 [-1.25, -0.91]	<0.001	-0.63 [-0.79, -0.47]	<0.001	-1.02 [-1.17, -0.88]	<0.001
Material position	-0.22 [-0.28, -0.15]	<0.001	-0.04 [-0.09, 0.01]	0.085	-0.07 [-0.12, -0.02]	0.003
Living space	-0.33 [-0.53, -0.12]	0.002	-0.12 [-0.44, 0.19]	0.445	-0.56 [-0.79, -0.33]	<0.001
Assets	-0.13 [-0.21, -0.05]	0.001	0.03 [-0.05, 0.11]	0.523	-0.09 [-0.16, -0.03]	0.011
Waist circumference (cm)						
Men						
Education	-1.55 [-1.96, -1.13]	<0.001	0.14 [-0.23, 0.51]	0.449	-0.33 [-0.65, -0.02]	0.040
Material position	-0.21 [-0.38, -0.05]	0.010	0.17 [0.07, 0.28]	0.002	0.20 [0.09, 0.31]	<0.001
Living space	0.22 [-0.14, 0.58]	0.231	1.27 [0.38, 2.15]	0.005	0.06 [-0.48, 0.60]	0.831
Assets	-0.07 [-0.23, 0.10]	0.434	0.67 [0.49, 0.85]	<0.001	0.50 [0.36, 0.64]	<0.001
Women						
Education	-2.91 [-3.34, -2.48]	<0.001	-1.51 [-1.88, -1.13]	<0.001	-2.50 [-2.83, -2.16]	<0.001
Material position	-0.58 [-0.75, -0.42]	<0.001	-0.13 [-0.24, -0.03]	0.014	-0.25 [-0.35, -0.14]	<0.001
Living space	-0.67 [-1.18, -0.15]	0.011	-0.48 [-1.21, 0.25]	0.195	-1.34 [-1.88, -0.80]	<0.001
Assets	-0.44 [-0.63, -0.24]	<0.001	-0.07 [-0.26, 0.11]	0.437	-0.32 [-0.48, -0.16]	<0.001
Waist to hip ratio (x1000)						
Men						
Education	-10.89 [-13.21, -8.58]	<0.001	-1.10 [-3.27, -1.07]	0.322	-3.94 [-5.73, -2.15]	<0.001
Material position	-2.18 [-3.08, -1.28]	<0.001	1.09 [0.45, 1.73]	0.001	-0.25 [-0.87, 0.38]	0.438
Living space	0.48 [-1.52, 2.47]	0.638	5.12 [-0.14, 10.38]	0.056	1.18 [-1.89, 4.26]	0.450
Assets	-1.19 [-2.12, -0.26]	0.012	2.80 [1.74, 3.85]	<0.001	1.01 [0.21, 1.81]	0.014
Women						
Education	-13.88 [-16.23, -11.52]	<0.001	-4.30 [-6.30, -2.31]	<0.001	-11.64 [-13.41, -9.88]	<0.001
Material position	-2.91 [-3.81, -2.01]	<0.001	0.31 [-0.25, 0.87]	0.284	-1.61 [-2.17, -1.05]	<0.001
Living space	-3.46 [-6.25, -0.67]	0.015	-2.35 [-6.21, 1.51]	0.233	-5.94 [-8.73, -3.14]	<0.001
Assets	-2.68 [-3.73, -1.62]	<0.001	0.88 [-0.10, 1.85]	0.077	-1.85 [-2.68, -1.01]	<0.001

† One higher level of education, one point higher on material position scale, one more room per person in home or one more asset

10.4.3 Adiposity and childhood socioeconomic circumstances

10.4.3.1 BMI

Men

The age adjusted analyses showed a negative association between BMI and assets in childhood amongst Czech, but not Russian or Polish, men (table 10.5). This association was of only borderline statistical significance following further adjustments.

The inverse association between BMI and maternal education amongst Polish men was unaffected by adjustments for adult SEC and anthropometric measures (table 10.5). No association was observed amongst Russian men in the age adjusted analysis, but in the fully adjusted analysis there was a similar relationship to that amongst Polish men.

No relationship between paternal education and BMI was observed amongst Polish men, whilst amongst Russian men, age adjusted analysis showed a positive association which was not significant in the fully adjusted analysis (table 10.5).

Leg length and trunk length showed, respectively, inverse and positive age adjusted associations with BMI in all countries, and these relationships were unaffected by adjustments for SEC (table 10.5). Amongst Russian men there was a positive association between BMI and height which was similarly unaltered by adjustments for child and adult SEC. There were no such relationships amongst Czech or Polish men.

Women

In women, there were inverse associations between each measure of childhood SEC and BMI, which tended to be weakened after adjustment for adult SEC but were unaffected by adjustment for anthropometric measures (table 10.6). After complete adjustment, several associations remained statistically significant; between BMI and assets in childhood (Russian women), maternal education (Russian and Polish women) and paternal education (Polish women).

Women showed inverse associations of height and leg length with BMI, which were weakened slightly on adjustment for childhood and adult SEC (table 10.6). Russian and Polish women showed positive associations between trunk length and BMI, whilst although there was no association amongst Czech women in the age adjusted analysis, a small positive association was apparent on adjustment for adult SEC.

Table 10.5. Age-adjusted change [95% CI] in men's BMI (kg/m^2) for a one unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	-0.16 [-0.27, -0.05]	0.004	0.04 [-0.05, 0.13]	0.358	-0.04 [-0.11, 0.03]	0.219
	+ adult SEC	-0.12 [-0.24, 0.00]	0.043	0.02 [-0.07, 0.11]	0.714	-0.06 [-0.13, 0.02]	0.122
	+ anthropometry	-0.16 [-0.27, -0.05]	0.004	0.02 [-0.06, 0.11]	0.595	-0.03 [-0.10, 0.03]	0.318
	+ adult SEC, anthropometry	-0.11 [-0.23, 0.01]	0.061	0.00 [-0.08, 0.09]	0.969	-0.04 [-0.12, 0.03]	0.240
Maternal education	Age	-	-	-0.03 [-0.15, 0.09]	0.648	-0.15 [-0.26, -0.03]	0.013
	+ adult SEC	-	-	-0.13 [-0.25, 0.00]	0.045	-0.17 [-0.30, -0.04]	0.013
	+ anthropometry	-	-	-0.06 [-0.17, 0.06]	0.329	-0.13 [-0.25, -0.02]	0.022
	+ adult SEC, anthropometry	-	-	-0.14 [-0.26, -0.02]	0.025	-0.14 [-0.27, -0.01]	0.034
Paternal education	Age	-	-	0.14 [0.02, 0.25]	0.017	-0.04 [-0.14, 0.07]	0.485
	+ adult SEC	-	-	0.06 [-0.05, 0.18]	0.289	-0.03 [-0.15, 0.09]	0.590
	+ anthropometry	-	-	0.10 [-0.01, 0.21]	0.078	-0.02 [-0.13, 0.08]	0.684
	+ adult SEC, anthropometry	-	-	0.04 [-0.07, 0.16]	0.492	0.00 [-0.12, 0.11]	0.955
Anthropometry							
Height	Age	-0.02 [-0.04, 0.00]	0.047	0.03 [0.01, 0.05]	0.005	-0.01 [-0.03, 0.01]	0.333
	+ child SEC	-0.02 [-0.04, 0.01]	0.130	0.03 [0.01, 0.06]	0.004	-0.01 [-0.03, 0.01]	0.411
	+ adult SEC	-0.02 [-0.04, 0.01]	0.185	0.02 [0.00, 0.04]	0.083	-0.02 [-0.04, 0.00]	0.097
	+ child & adult SEC	-0.01 [-0.04, 0.01]	0.253	0.02 [0.00, 0.05]	0.046	-0.02 [-0.04, 0.00]	0.107
Leg length	Age	-0.11 [-0.14, -0.08]	<0.001	-0.10 [-0.13, -0.07]	<0.001	-0.12 [-0.14, -0.09]	<0.001
	+ child SEC	-0.11 [-0.14, -0.08]	<0.001	-0.10 [-0.13, -0.07]	<0.001	-0.12 [-0.14, -0.09]	<0.001
	+ adult SEC	-0.10 [-0.13, -0.07]	<0.001	-0.11 [-0.14, -0.08]	<0.001	-0.12 [-0.15, -0.09]	<0.001
	+ child & adult SEC	-0.10 [-0.13, -0.07]	<0.001	-0.11 [-0.14, -0.08]	<0.001	-0.12 [-0.15, -0.09]	<0.001
Trunk length	Age	0.10 [0.07, 0.14]	<0.001	0.27 [0.23, 0.30]	<0.001	0.16 [0.13, 0.19]	<0.001
	+ child SEC	0.11 [0.07, 0.15]	<0.001	0.28 [0.23, 0.32]	<0.001	0.16 [0.13, 0.20]	<0.001
	+ adult SEC	0.11 [0.07, 0.15]	<0.001	0.25 [0.21, 0.29]	<0.001	0.14 [0.11, 0.18]	<0.001
	+ child & adult SEC	0.11 [0.07, 0.15]	<0.001	0.26 [0.22, 0.30]	<0.001	0.15 [0.11, 0.18]	<0.001

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table 10.6. Age-adjusted change [95% CI] in women's BMI (kg/m^2) for a one unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	-0.22 [-0.35, -0.09]	0.001	-0.20 [-0.31, -0.09]	<0.001	-0.29 [-0.37, -0.21]	<0.001
	+ adult SEC	-0.05 [-0.20, 0.10]	0.484	-0.19 [-0.30, -0.08]	<0.001	-0.10 [-0.19, -0.01]	0.037
	+ anthropometry	-0.18 [-0.31, -0.05]	0.007	-0.20 [-0.31, -0.10]	<0.001	-0.26 [-0.34, -0.18]	<0.001
	+ adult SEC, anthropometry	-0.03 [-0.17, 0.12]	0.714	-0.20 [-0.31, -0.09]	<0.001	-0.07 [-0.16, 0.01]	0.098
Maternal education	Age	-	-	-0.29 [-0.43, -0.15]	<0.001	-0.57 [-0.71, -0.44]	<0.001
	+ adult SEC	-	-	-0.19 [-0.34, -0.05]	0.010	-0.20 [-0.36, -0.04]	0.012
	+ anthropometry	-	-	-0.28 [-0.42, -0.14]	<0.001	-0.53 [-0.67, -0.40]	<0.001
	+ adult SEC, anthropometry	-	-	-0.20 [-0.34, -0.05]	0.007	-0.17 [-0.33, -0.02]	0.028
Paternal education	Age	-	-	-0.20 [-0.33, -0.06]	0.004	-0.56 [-0.68, -0.44]	<0.001
	+ adult SEC	-	-	-0.10 [-0.24, -0.04]	0.162	-0.19 [-0.33, -0.04]	0.012
	+ anthropometry	-	-	-0.19 [-0.33, -0.06]	0.004	-0.53 [-0.65, -0.41]	<0.001
	+ adult SEC, anthropometry	-	-	-0.11 [-0.25, 0.02]	0.105	-0.17 [-0.31, -0.02]	0.022
Anthropometry							
Height	Age	-0.09 [-0.11, -0.06]	<0.001	-0.09 [-0.12, -0.06]	<0.001	-0.08 [-0.10, -0.05]	<0.001
	+ child SEC	-0.08 [-0.11, -0.06]	<0.001	-0.09 [-0.12, -0.06]	<0.001	-0.06 [-0.08, -0.03]	<0.001
	+ adult SEC	-0.05 [-0.08, -0.02]	0.001	-0.08 [-0.11, -0.05]	<0.001	-0.05 [-0.08, -0.03]	<0.001
	+ child & adult SEC	-0.05 [-0.08, -0.02]	0.001	-0.08 [-0.11, -0.05]	<0.001	-0.05 [-0.08, -0.02]	<0.001
Leg length	Age	-0.16 [-0.20, -0.13]	<0.001	-0.24 [-0.28, -0.20]	<0.001	-0.18 [-0.21, -0.15]	<0.001
	+ child SEC	-0.16 [-0.20, -0.12]	<0.001	-0.23 [-0.27, -0.19]	<0.001	-0.16 [-0.19, -0.13]	<0.001
	+ adult SEC	-0.14 [-0.18, -0.10]	<0.001	-0.23 [-0.27, -0.19]	<0.001	-0.16 [-0.19, -0.13]	<0.001
	+ child & adult SEC	-0.14 [-0.18, -0.10]	<0.001	-0.22 [-0.26, -0.18]	<0.001	-0.16 [-0.19, -0.12]	<0.001
Trunk length	Age	0.00 [-0.04, 0.05]	0.959	0.13 [0.08, 0.18]	<0.001	0.09 [0.04, 0.13]	<0.001
	+ child SEC	0.00 [-0.04, 0.05]	0.940	0.13 [0.07, 0.18]	<0.001	0.11 [0.07, 0.15]	<0.001
	+ adult SEC	0.06 [0.02, 0.11]	0.011	0.13 [0.08, 0.18]	<0.001	0.12 [0.08, 0.17]	<0.001
	+ child & adult SEC	0.07 [0.02, 0.12]	0.005	0.13 [0.07, 0.18]	<0.001	0.12 [0.08, 0.17]	<0.001

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

10.4.3.2 Waist circumference

Men

In men, there were no consistent and/or significant associations between measures of childhood SEC and waist circumference (table 10.7). The adjustments which were made did not have an effect, other than when the relationship between Russian men's mothers' education and waist circumference was adjusted for anthropometry, an inverse association was observed.

There were positive associations between all anthropometric measures and waist circumference, which were generally unchanged after adjustments for SEC in childhood and adulthood (table 10.7).

Women

In women, waist circumference decreased as SEC improved, whichever measure of SEC was investigated (table 10.8). Adjusting for anthropometric measures slightly strengthened these associations, but after further adjustment for adult SEC, the associations were no longer statistically significant amongst Czech and Polish women.

There were positive age adjusted associations between all anthropometric measures and waist circumference, other than leg length in Russian women and trunk length in Czech women (table 10.8). After adjustments for child and adult SEC only Russian women's leg length did not show a positive association with waist circumference.

Table 10.7. Age-adjusted change [95% CI] in men's waist circumference (cm) for a one unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	-0.17 [-0.45, 0.12]	0.260	0.17 [-0.08, 0.41]	0.180	-0.04 [-0.22, 0.13]	0.637
	+ adult SEC	0.02 [-0.29, 0.33]	0.905	0.12 [-0.13, 0.37]	0.338	-0.04 [-0.24, 0.15]	0.650
	+ anthropometry	-0.31 [-0.59, -0.03]	0.033	0.01 [-0.23, 0.25]	0.927	-0.20 [-0.37, -0.02]	0.027
	+ adult SEC, anthropometry	-0.10 [-0.40, 0.21]	0.540	-0.01 [-0.25, 0.23]	0.917	-0.12 [-0.31, 0.07]	0.221
Maternal education	Age	-	-	-0.12 [-0.45, 0.20]	0.466	-0.25 [-0.54, 0.05]	0.108
	+ adult SEC	-	-	-0.30 [-064, 0.04]	0.082	-0.20 [-0.54, 0.14]	0.244
	+ anthropometry	-	-	-0.39 [-0.70, -0.07]	0.016	-0.52 [-0.82, -0.23]	0.001
	+ adult SEC, anthropometry	-	-	-0.47 [-0.80, -0.14]	0.005	-0.31 [-0.65, 0.02]	0.064
Paternal education	Age	-	-	0.20 [-0.11, 0.52]	0.201	0.03 [-0.24, 0.30]	0.829
	+ adult SEC	-	-	0.08 [-0.25, 0.41]	0.639	0.14 [-0.17, 0.45]	0.380
	+ anthropometry	-	-	-0.02 [-0.33, 0.28]	0.888	-0.25 [-0.52, 0.02]	0.069
	+ adult SEC, anthropometry	-	-	-0.05 [-0.37, 0.27]	0.766	0.02 [-0.29, 0.32]	0.919
Anthropometry							
Height	Age	0.28 [0.23, 0.34]	<0.001	0.39 [0.34, 0.45]	<0.001	0.31 [0.27, 0.36]	<0.001
	+ child SEC	0.29 [0.24, 0.35]	<0.001	0.40 [0.34, 0.47]	<0.001	0.32 [0.27, 0.37]	<0.001
	+ adult SEC	0.32 [0.26, 0.38]	<0.001	0.38 [0.32, 0.44]	<0.001	0.32 [0.27, 0.37]	<0.001
	+ child & adult SEC	0.32 [0.26, 0.38]	<0.001	0.39 [0.33, 0.45]	<0.001	0.32 [0.26, 0.37]	<0.001
Leg length	Age	0.23 [0.15, 0.31]	<0.001	0.23 [0.15, 0.32]	<0.001	0.24 [0.17, 0.31]	<0.001
	+ child SEC	0.24 [0.16, 0.32]	<0.001	0.23 [0.14, 0.32]	<0.001	0.24 [0.17, 0.31]	<0.001
	+ adult SEC	0.27 [0.19, 0.36]	<0.001	0.21 [0.13, 0.30]	<0.001	0.25 [0.18, 0.32]	<0.001
	+ child & adult SEC	0.27 [0.18, 0.35]	<0.001	0.21 [0.12, 0.30]	<0.001	0.24 [0.17, 0.32]	<0.001
Trunk length	Age	0.49 [0.39, 0.58]	<0.001	0.93 [0.83, 1.04]	<0.001	0.59 [0.51, 0.68]	<0.001
	+ child SEC	0.49 [0.40, 0.59]	<0.001	0.96 [0.85, 1.07]	<0.001	0.60 [0.51, 0.69]	<0.001
	+ adult SEC	0.52 [0.42, 0.62]	<0.001	0.92 [0.81, 1.03]	<0.001	0.58 [0.49, 0.67]	<0.001
	+ child & adult SEC	0.52 [0.42, 0.63]	<0.001	0.94 [0.83, 1.06]	<0.001	0.57 [0.48, 0.66]	<0.001

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table 10.8. Age-adjusted change [95% CI] in women's waist circumference (cm) for a one unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	-0.37 [-0.71, -0.04]	0.029	-0.55 [-0.79, -0.30]	<0.001	-0.55 [-0.74, -0.35]	<0.001
	+ adult SEC	0.13 [-0.24, 0.51]	0.493	-0.50 [-0.75, -0.25]	<0.001	-0.04 [-0.26, 0.17]	0.684
	+ anthropometry	-0.41 [-0.75, -0.07]	0.018	-0.62 [-0.86, -0.37]	<0.001	-0.63 [-0.83, -0.44]	<0.001
	+ adult SEC, anthropometry	0.09 [-0.28, 0.47]	0.628	-0.56 [-0.81, -0.32]	<0.001	-0.10 [-0.31, 0.11]	0.369
Maternal education	Age	-	-	-0.88 [-1.20, -0.56]	<0.001	-1.12 [-1.45, -0.79]	<0.001
	+ adult SEC	-	-	-0.63 [-0.97, -0.30]	<0.001	-0.17 [-0.53, 0.20]	0.372
	+ anthropometry	-	-	-0.95 [-1.27, -0.63]	<0.001	-1.24 [-1.57, -0.91]	<0.001
	+ adult SEC, anthropometry	-	-	-0.69 [-1.02, -0.35]	<0.001	-0.23 [-0.59, 0.14]	0.226
Paternal education	Age	-	-	-0.70 [-1.00, -0.39]	<0.001	-1.14 [-1.43, -0.84]	<0.001
	+ adult SEC	-	-	-0.46 [-0.78, -0.14]	0.005	-0.17 [-0.51, 0.17]	0.330
	+ anthropometry	-	-	-0.76 [-1.06, -0.45]	<0.001	-1.28 [-1.58, -0.99]	<0.001
	+ adult SEC, anthropometry	-	-	-0.51 [-0.83, -0.19]	0.002	-0.26 [-0.60, 0.08]	0.141
Anthropometry							
Height	Age	0.11 [0.04, 0.18]	0.001	0.14 [0.08, 0.21]	<0.001	0.18 [0.12, 0.24]	<0.001
	+ child SEC	0.12 [0.05, 0.19]	0.001	0.15 [0.09, 0.22]	<0.001	0.24 [0.18, 0.30]	<0.001
	+ adult SEC	0.22 [0.15, 0.30]	<0.001	0.17 [0.11, 0.24]	<0.001	0.26 [0.20, 0.32]	<0.001
	+ child & adult SEC	0.23 [0.16, 0.31]	<0.001	0.18 [0.11, 0.24]	<0.001	0.27 [0.21, 0.33]	<0.001
Leg length	Age	0.14 [0.04, 0.23]	0.004	0.03 [-0.06, 0.11]	0.545	0.12 [0.04, 0.20]	0.003
	+ child SEC	0.14 [0.05, 0.24]	0.003	0.05 [-0.04, 0.14]	0.322	0.18 [0.10, 0.26]	<0.001
	+ adult SEC	0.24 [0.14, 0.34]	<0.001	0.07 [-0.02, 0.16]	0.125	0.19 [0.11, 0.27]	<0.001
	+ child & adult SEC	0.23 [0.12, 0.33]	<0.001	0.08 [-0.01, 0.17]	0.088	0.20 [0.12, 0.28]	<0.001
Trunk length	Age	0.11 [0.00, 0.22]	0.055	0.43 [0.31, 0.55]	<0.001	0.36 [0.25, 0.46]	<0.001
	+ child SEC	0.13 [0.01, 0.24]	0.036	0.44 [0.32, 0.56]	<0.001	0.42 [0.31, 0.52]	<0.001
	+ adult SEC	0.28 [0.16, 0.41]	<0.001	0.46 [0.34, 0.57]	<0.001	0.45 [0.35, 0.56]	<0.001
	+ child & adult SEC	0.31 [0.18, 0.44]	<0.001	0.45 [0.33, 0.57]	<0.001	0.47 [0.36, 0.57]	<0.001

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

10.4.3.3 Waist to hip ratio

Men

In age-adjusted models, there were no significant associations between measures of childhood SEC and WHR in men (table 10.9). Further adjustments for adult SEC and anthropometric measures most often did not change the results. The exception was with maternal education amongst Russian men, where an inverse association was observed.

Age adjusted analyses did not reveal any associations between height or leg length and WHR (table 10.9). Adjusting for child and adult SEC did not affect this, other than with leg length in Czech men, where a positive association was observed after adjusting for adult SEC. In both Czech and Russian men there were age adjusted associations between trunk length and WHR, although in the former this was inverse, and in the latter it was positive. These associations persisted after adjustment for child and adult SEC.

Women

Amongst women in Russia and Poland there were inverse associations between each measure of childhood SEC and WHR in the age adjusted analyses (table 10.10). Adjusting for adult SEC virtually removed the association amongst Polish women, but it persisted in Russian women after this and adjustment for anthropometric measures. Czech women showed no association between assets in childhood and WHR, either in the age adjusted analysis or after further adjustments.

Inverse age adjusted associations were observed between height and WHR in Czech and Russian, but not Polish, women (table 10.10). This relationship disappeared in Czech women after adjustment for adult SEC, but remained significant in Russian women after full adjustment. Leg length did not show an association with WHR in age adjusted analyses, but after adjusting for adult SEC there was a positive association amongst Polish women. With trunk length inverse age adjusted associations were seen in all three countries, and amongst Polish women this was weakened on adjustment for adult SEC.

Table 10.9. Age-adjusted change [95% CI] in men's waist to hip ratio* for a one unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	-0.07 [-1.68, 1.54]	0.936	-1.16 [-2.61, 0.29]	0.118	-0.37 [-1.38, 0.63]	0.467
	+ adult SEC	1.29 [-0.46, 3.04]	0.148	-1.35 [-2.81, 0.11]	0.071	0.04 [-1.05, 1.14]	0.937
	+ anthropometry	0.13 [-1.49, 1.74]	0.879	-1.20 [-2.66, 0.26]	0.106	-0.43 [-1.45, 0.59]	0.409
	+ adult SEC, anthropometry	1.27 [-0.48, 3.02]	0.154	-1.35 [-2.81, 0.12]	0.072	0.01 [-1.09, 1.11]	0.990
Maternal education	Age	-	-	-1.56 [-3.48, 0.36]	0.111	-0.83 [-2.53, 0.86]	0.335
	+ adult SEC	-	-	-2.24 [-4.25, -0.24]	0.028	0.42 [-1.49, 2.33]	0.667
	+ anthropometry	-	-	-1.66 [-3.60, 0.27]	0.092	-0.93 [-2.65, 0.78]	0.287
	+ adult SEC, anthropometry	-	-	-2.29 [-4.30, -0.27]	0.026	0.34 [-1.58, 2.27]	0.727
Paternal education	Age	-	-	-0.25 [-2.10, 1.59]	0.786	0.10 [-1.43, 1.63]	0.899
	+ adult SEC	-	-	-0.62 [-2.56, 1.33]	0.534	1.60 [-0.15, 3.35]	0.074
	+ anthropometry	-	-	-0.35 [-2.20, 1.50]	0.713	0.14 [-1.42, 1.69]	0.864
	+ adult SEC, anthropometry	-	-	-0.68 [-2.63, 1.26]	0.492	1.65 [-0.11, 3.42]	0.066
Anthropometry							
Height	Age	-0.28 [-0.60, 0.03]	0.081	-0.01 [-0.36, 0.35]	0.977	0.07 [-0.21, 0.36]	0.608
	+ child SEC	-0.29 [-0.61, 0.04]	0.081	0.05 [-0.32, 0.42]	0.789	0.04 [-0.25, 0.34]	0.773
	+ adult SEC	-0.06 [-0.40, 0.28]	0.737	-0.08 [-0.44, 0.28]	0.667	0.10 [-0.19, 0.40]	0.499
	+ child & adult SEC	-0.07 [-0.41, 0.28]	0.698	-0.01 [-0.39, 0.37]	0.957	0.05 [-0.25, 0.35]	0.758
Leg length	Age	0.34 [-0.10, 0.78]	0.131	-0.42 [-0.93, 0.09]	0.109	0.25 [-0.14, 0.64]	0.206
	+ child SEC	0.32 [-0.12, 0.77]	0.157	-0.38 [-0.91, 0.15]	0.155	0.23 [-0.17, 0.63]	0.261
	+ adult SEC	0.65 [0.18, 1.12]	0.007	-0.52 [-1.03, 0.00]	0.050	0.33 [-0.07, 0.74]	0.107
	+ child & adult SEC	0.60 [0.13, 1.08]	0.013	-0.45 [-0.99, 0.08]	0.094	0.27 [-0.14, 0.69]	0.192
Trunk length	Age	-1.31 [-1.84, -0.77]	<0.001	0.66 [0.01, 1.32]	0.046	-0.18 [-0.68, 0.32]	0.477
	+ child SEC	-1.30 [-1.85, -0.76]	<0.001	0.79 [0.12, 1.46]	0.022	-0.24 [-0.76, 0.27]	0.355
	+ adult SEC	-1.17 [-1.76, -0.59]	<0.001	0.59 [-0.08, 1.25]	0.082	-0.24 [-0.76, 0.29]	0.375
	+ child & adult SEC	-1.12 [-1.71, -0.53]	<0.001	0.72 [0.03, 1.40]	0.040	-0.31 [-0.84, 0.22]	0.255

* WHR is multiplied by 1000; † One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table 10.10. Age-adjusted change [95% CI] in women's waist to hip ratio* for a one unit increase in direct and indirect measures of childhood SEC†

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	-0.76 [-2.60, 1.08]	0.417	-4.54 [-5.84, -3.23]	<0.001	-2.65 [-3.66, -1.65]	<0.001
	+ adult SEC	1.57 [-0.49, 3.62]	0.134	-4.62 [-5.94, -3.30]	<0.001	-0.36 [-1.47, 0.75]	0.523
	+ anthropometry	-0.51 [-2.36, 1.34]	0.591	-4.39 [-5.70, -3.08]	<0.001	-2.60 [-3.62, -1.59]	<0.001
	+ adult SEC, anthropometry	1.49 [-0.57, 3.54]	0.156	-4.46 [-5.78, -3.14]	<0.001	-0.40 [-1.50, 0.71]	0.484
Maternal education	Age	-	-	-4.15 [-5.85, -2.44]	<0.001	-4.08 [-5.77, -2.39]	<0.001
	+ adult SEC	-	-	-4.03 [-5.81, -2.25]	<0.001	0.47 [-1.45, 2.38]	0.632
	+ anthropometry	-	-	-3.82 [-5.52, -2.11]	<0.001	-3.95 [-5.65, -2.24]	<0.001
	+ adult SEC, anthropometry	-	-	-3.77 [-5.56, -1.99]	<0.001	0.42 [-1.50, 2.34]	0.668
Paternal education	Age	-	-	-3.84 [-5.47, -2.21]	<0.001	-4.94 [-6.47, -3.41]	<0.001
	+ adult SEC	-	-	-3.89 [-5.59, -2.19]	<0.001	-0.49 [-2.27, 1.29]	0.589
	+ anthropometry	-	-	-3.53 [-5.17, -1.90]	<0.001	-4.80 [-6.35, -3.26]	<0.001
	+ adult SEC, anthropometry	-	-	-3.65 [-5.36, -1.95]	<0.001	-0.53 [-2.31, 1.26]	0.562
Anthropometry							
Height	Age	-0.76 [-1.13, -0.39]	<0.001	-0.67 [-1.01, -0.34]	<0.001	-0.24 [-0.54, 0.07]	0.129
	+ child SEC	-0.70 [-1.08, -0.32]	<0.001	-0.62 [-0.97, -0.27]	<0.001	-0.01 [-0.33, 0.30]	0.927
	+ adult SEC	-0.24 [-0.64, 0.17]	0.247	-0.60 [-0.94, -0.26]	0.001	0.13 [-0.19, 0.44]	0.431
	+ child & adult SEC	-0.23 [-0.64, 0.18]	0.278	-0.60 [-0.95, -0.24]	0.001	0.18 [-0.14, 0.50]	0.273
Leg length	Age	0.08 [-0.43, 0.58]	0.764	-0.29 [-0.76, 0.17]	0.219	0.13 [-0.27, 0.54]	0.516
	+ child SEC	0.13 [-0.40, 0.65]	0.639	-0.25 [-0.73, 0.23]	0.309	0.38 [-0.03, 0.79]	0.071
	+ adult SEC	0.60 [0.05, 1.15]	0.033	-0.15 [-0.62, 0.32]	0.520	0.51 [0.09, 0.92]	0.017
	+ child & adult SEC	0.52 [-0.04, 1.09]	0.068	-0.16 [-0.64, 0.32]	0.510	0.57 [0.14, 0.99]	0.009
Trunk length	Age	-2.27 [-2.88, -1.66]	<0.001	-1.74 [-2.37, -1.12]	<0.001	-0.98 [-1.52, -0.44]	<0.001
	+ child SEC	-2.15 [-2.79, -1.51]	<0.001	-1.65 [-2.29, -1.01]	<0.001	-0.73 [-1.28, -0.17]	0.010
	+ adult SEC	-1.62 [-2.30, -0.93]	<0.001	-1.73 [-2.35, -1.10]	<0.001	-0.51 [-1.07, 0.04]	0.069
	+ child & adult SEC	-1.47 [-2.16, -0.77]	<0.001	-1.69 [-2.33, -1.05]	<0.001	-0.46 [-1.02, 0.11]	0.112

* WHR is multiplied by 1000; † One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

10.5 Discussion

10.5.1 Summary of results

Adiposity, irrespective of the measure used, increased with age in all countries and both genders, with the exception of BMI amongst Russian men, which remained stable in these 45-69 year olds.

When the effects of adult SEC and leg and trunk length were removed, adiposity tended to decrease as childhood SEC improved, although the associations varied between countries. Amongst Poles, childhood SEC did not influence abdominal adiposity (WHR or waist circumference), but overall adiposity (BMI) decreased with improving parental education. In Russia, there were decreases in both abdominal and total adiposity with improving childhood SEC, although amongst men, of the SEC measures, only maternal education had an influence. Czech adiposity, whether abdominal or overall, was not related to childhood assets, the only direct measure of childhood SEC available here.

A Polish or Russian person whose mother had university education would have a BMI of around 0.6kg/m^2 lower than one whose mother has less than primary education. This difference is of a similar magnitude to that seen with the recently discovered FTO gene variant.[382] A Russian man's waist circumference would be 2cm smaller, and a Russian woman's 3cm smaller, and their WHR would be around 1% lower.

The relationships between anthropometry and adiposity were more consistently observed across countries. Waist circumference tended to increase with height and leg and trunk length, and BMI increased with height (other than amongst Czech and Polish men) and trunk length, but decreased with leg length. WHR was not consistently associated with anthropometry between gender and country groups; however it decreased with height and trunk length, and increased with leg length.

10.5.2 Limitations

The major potential limitation of this chapter is the high proportion of missing data in the adiposity measures, each of which had 11% missing data. This is discussed in detail in the discussion chapter (chapter 12); however some further investigation has been undertaken here, as self-reported height and weight were available for the majority of those with missing measured values. The age-adjusted associations of childhood SEC with BMI calculated from self-reported anthropometry were similar to those with measured BMI (see table A5.1). Mean self-reported BMI is 0.68kg/m^2 lower than measured BMI (SD=1.49) due to the overestimation of height and underestimation of weight which is commonly observed in the literature,[120-122] but the correlation between the two measures was high (correlation coefficient 0.95). This would suggest that, although the prevalence of obesity may be underestimated, the associations between SEC and adiposity estimated in this thesis are not biased.

There are concerns relating to the relationships between height and its components and the measures of adiposity. The consistently observed strong associations of waist circumference with height and its components may be a direct effect of the association between taller height and larger frames, and therefore greater waist measurements, although waist circumference has been previously shown to be independent of height.[381] These associations, for example the 0.9cm increase in waist circumference with a 1cm increase in Russian men's trunk length, were not repeated when other measures of adiposity, which take body size into account, were investigated. They may, therefore, not be an indication of a strong relationship between childhood SEC and adiposity.

BMI is a measure of weight in proportion to height squared, and this calculation should account for the inevitable association between weight and height. However, there is an unresolved debate as to whether the two measures are independent of one another. [378-380] The results here showed BMI to be related to height; inversely in women and positively in Russian men, suggesting over-adjustment for the association between weight and height amongst women, and inadequate adjustment amongst Russian men. BMI was inversely associated with leg, and positively with trunk, length. This is illustrated by the strong inverse association between BMI and leg to trunk ratio (table A5.2). The trunk is heavier than the legs, so a person with greater than usual trunk length for their height will have a higher BMI that expected as the calculation of BMI does not take into account the effect of body proportions.

WHR, as a ratio, does not depend directly on height or any other anthropometric measure. Although some relationships have been observed between various anthropometric measures and WHR these are weak (10cm increase in an anthropometric measure ~ 0.02

change in WHR) and do not show consistent patterns between countries, genders or anthropometric measures.

10.5.3 Discussion of results

There were inverse associations of men's adiposity with maternal education, but not with other direct measures of childhood SEC, whilst women's adiposity was inversely related to all childhood SEC measures. These findings reflect the results of previous studies, which have found that obesity is more common amongst those who experienced a more disadvantaged childhood,[93;96;100;369;372-374;376;377] but that the association may be weaker amongst men[93;96;376] and that observing it may be dependent upon the SEC[373] or adiposity measure[96] chosen.

Very few men were underweight (3%, compared to 73% overweight or obese, as measured by BMI, see figure A5.1), so the reduced adiposity amongst men with more highly educated mothers may indicate a beneficial effect of increased maternal education.

Maternal education may impact upon adult obesity via several pathways. Recent studies from the United States have shown that children and adolescents with lower SEC are more likely to have unhealthy diets,[144;145] and that more highly educated mothers are more likely to recognise that their children are obese.[383] Although these studies were conducted on populations in which overweight was common and there was an inverse association between SEC and adiposity, which contrast with the situation when the members of the HAPIEE cohorts were children, the recent studies may still be relevant. They suggest that more highly educated mothers make more informed choices about healthy ways to feed their children, and that their children grow up with more healthy eating habits.

The results for women suggest a more complex relationship between childhood SEC and adiposity in adulthood. Russian and Polish women showed similar associations with maternal education to men. However, in Polish women there was also an inverse association with paternal education, and in Russian women there were inverse associations with both paternal education and assets in childhood. These results suggest that, amongst Polish and Russian women at least, the financial aspect of childhood SEC may have had an influence on adiposity, in addition to the influence of maternal education.

The lack of observed effect of childhood SEC on adiposity amongst Czechs is likely to be due to data on parental education not being available, and does not exclude the possibility of a relationship similar to those observed amongst the Polish and Russian cohorts.

Overall obesity was more consistently related to childhood SEC than abdominal obesity: in Russia improved childhood SEC was linked to a reduction in each measure of adiposity, whilst in Poland it only appeared to affect BMI. These findings suggest a stronger influence of childhood SEC on adiposity in Russia than in Poland, which may be a reflection of the greater differentiation in socioeconomic experience between the social classes in the USSR than in Poland, and particularly than in Czechoslovakia, in the period following WWII.[40]

10.5.4 Conclusions

Childhood SEC are inversely associated with adiposity in these three CEE populations in middle and older age, even after adjusting for age, adult SEC and leg and trunk length. These relationships are similar to those observed in western populations, particularly in that they are stronger amongst women than men. The relationships are most consistent in Russia, possibly due to a steeper socioeconomic gradient in the USSR than Poland and Czechoslovakia when these cohorts were children, in the years following WWII.

Chapter 11. Cardiovascular disease risk

The previous four chapters have explored the impact of childhood SEC on four classical CVD risk factors. They have shown that starting smoking is increasingly common with improving childhood SEC, whilst adiposity decreases. Blood pressure and cholesterol levels do not appear to be influenced by childhood SEC. This chapter seeks to investigate overall CVD risk, as measured by a CVD risk score (SCORE) which takes three of these classical risk factors (systolic blood pressure, total cholesterol and smoking) into account.

11.1 Literature review

11.1.1 CVD risk scores

Multiple methods have been developed for the assessment of CVD risk using the classical risk factors. The two most commonly used risk scores are the Framingham Risk Score (FRS)[384] and the European Society of Cardiology's Systematic Coronary Risk Evaluation (SCORE).[109]

The FRS was developed in 1971[384] and updated in 1991,[283] using data from the Massachusetts-based Framingham Heart and Offspring studies. 5573 participants were included, who were aged 30-74 years and free from CVD at baseline. They were followed up for 12 years, and 11% had incident CHD during follow-up. The score was designed to predict 10 year risk of CHD incidence using gender, age, blood pressure and cholesterol.

SCORE was developed by the European Society of Cardiology in 2003, and is based on data from 12 cohorts across Europe to estimate 10 year risk of CVD mortality. The cohorts comprised more than 200,000 people (57% male) who were followed up for a total of 2.7 million person years, during which time there was 4% CVD mortality.[109] SCORE uses gender, age, smoking habits, systolic blood pressure and total cholesterol (or the ratio of total to HDL cholesterol) to calculate a percentage ten-year risk of fatal CVD.

SCORE was chosen for use in this thesis because it is based on data from European populations, and is the most widely used risk score in Europe, both in clinical practice and in epidemiological research. SCORE's predictive power has been tested in other European populations, and although it may over estimate CVD risk, it has been found to be clinically useful.[385-387]

To my knowledge, there are no studies which have investigated the relationship between height or SEC, either in childhood or adulthood, and SCORE. There is, however, a large body of evidence regarding the associations with CVD outcomes, and this is reviewed below.

11.1.2 Cardiovascular disease and adult socioeconomic circumstances

An inverse association between CVD and adult SEC is well established in western countries. For instance, studies have tended to find higher rates of CVD or CHD amongst those with lower levels of education,[22;255;388-392] lower status jobs[60;127;258;296;388;393-398] and lower incomes.[254;388;399] There are, of course, some exceptions to this generalisation, firstly a Finnish study which showed women's occupational social class to be related to CVD but not men's,[397] and secondly a US study which did not find an association with income.[398] The majority of the studies which found inverse associations are of Western European populations, but they also include one based in the Czech Republic[389] and three in Russia.[22;390;391]

11.1.3 Cardiovascular disease and childhood socioeconomic circumstances

The first review of the literature on the impact of childhood SEC on CVD risk was published in 1991 and discussed the results of 15 longitudinal studies of the relationship between early life SEC and CVD: ten studies took CVD morbidity or mortality as their outcome, whilst the remaining five used CVD risk factors.[41] Of those studies which used a CVD outcome, six had direct measures of childhood SEC as the exposure, whilst the remaining four used height as an indirect measure. Those which used direct measures variously showed them to be inversely related to CHD incidence, coronary, IHD and COLD (chronic obstructive lung disease) mortality and prevalence of ischaemia. Studies using adult height consistently showed inverse relationships with CHD incidence and mortality. All these studies were based in western Europe or the USA.

The literature on childhood SEC and CVD had broadened substantially by the time of the publication of the second review in 2006, which included 40 studies, all of which were of European and North American populations, other than one which was based in Hong Kong.[43] 31 of these studies found that CVD and its subtypes were more common amongst those who had been less advantaged in childhood. Of the two studies which found a positive association, one was of former university students in Pennsylvania and used number of siblings to indicate SEC.[400] The socioeconomic distribution of the participants may have been narrow, and number of siblings may not have been an accurate measure of early life SEC. The other study, from the Czech Republic, had a case-control design, and the results suggested that mothers of cases (people who had had a myocardial infarction) were more highly educated, however the relationship was not statistically significant.[401]

A further review, which was published in 2004, was of the literature on the relationship of early life SEC with mortality from CVD, CHD and stroke.[42] Of ten studies which investigated the association with CHD mortality, seven showed an inverse association, and of the six studies looking at stroke mortality, four found an inverse association.[42] Five of the nine studies concerned with CVD mortality showed an inverse relationship with childhood SEC, whilst the rest found no association. These four studies are discussed in detail below:

In 958 working women in the west of Scotland, there was no significant difference between the risk of CVD mortality over 25 years of follow up in those whose fathers were of manual and non-manual social class.[266] This result remained unchanged after adjustment for a number of classical cardiovascular risk factors. The relatively small sample size may have left this study underpowered to detect a difference between the social groups, and in dichotomising the social class variable detail may have been lost.

There was not a significant difference in CVD mortality amongst almost 7500 Danish men, who were followed up between 15 and 49 years, between those whose fathers' occupations were classified as high and middle class, and working class.[402] When men whose father's social class was not known were compared to men with high and middle class fathers, there was an increased risk of CVD risk (HR: 3.84, 95% CI: 1.75, 7.53).

There was no change, amongst 1162 men and women, in the risk of CVD mortality with increasing numbers of siblings.[403] Participants in this cohort were originally selected as school children on the basis of being identified as 'gifted' by their teachers, and were followed up for 70 years. An association may not have been found here because number of siblings was not an accurate measure of SEC, and, additionally, the SEC distribution of the cohort will have been narrowed due to the selection criteria.

In the Nurses' Health Study, no difference in risk of CVD mortality was detected between women whose father's occupational social class was 'white collar' or 'blue collar'.[404] There was, however, a slight increase in risk of both total and non-fatal CVD amongst daughters of blue collar workers. There were 117,006 women in the cohort, who were aged 30-55 years at recruitment and were followed up for 14 years.

11.1.3 CVD risk and anthropometry

The majority of the evidence relating to body height and CVD risk suggests that, as height increases, risk decreases. Thirteen of sixteen studies which looked at the association amongst men,[405-416] and five of nine which looked at women[405;408;410;416;417] found inverse associations which remained after age-adjustment. Only one paper did not find a crude association between height and CVD, and this was the only one which investigated the components of adult height.[418] It compared the predictive power of height, leg length, trunk length and leg to trunk ratio on CHD incidence over 15 years amongst 2512 middle-aged men living in South Wales, and found that only leg length was associated with CHD incidence.

As discussed previously, there has been a debate in the literature as to whether overall height or some component, such as leg length, has the strongest link with early life SEC.[158;307;418;419] Some commentators have suggested that leg and trunk length grow during different critical periods of childhood, and that leg length is more vulnerable to material position in early childhood.[139;156] This period of vulnerability may coincide with a critical period for CVD risk, either by a direct effect on CVD risk, or through learned behaviours. If this were the case, leg length would act as a relatively specific indicator of childhood socioeconomic conditions and as an indicator of CVD risk.

11.2 Objectives

The overall aim of this chapter is to investigate how CVD risk in CEE, as measured by SCORE, is predicted by SEC in childhood. The specific objectives are to assess the relationship of three recalled measures of childhood SEC (asset score and maternal and paternal education) and four anthropometric measures, used as proxy childhood SEC measures (maximum height, measured height, leg length and trunk length) with SCORE.

This chapter will determine which dimension of SEC in early life has the most important influence on CVD risk in later life, and whether education and knowledge of parents is more or less important than economic resources. It will also establish whether leg or trunk length or overall height is a better predictor of CVD risk.

11.3 Methods

11.3.1 Variables

The European Society of Cardiology's (ESC) SCORE for risk of cardiovascular mortality has been used as the main outcome of interest. SCORE was calculated using the ESC tables for European populations at high risk of CVD.[420] A score from zero to 47, which indicates percentage risk of CVD mortality over ten years, is determined using gender, age, smoking status, total cholesterol and systolic blood pressure (see appendix 6 for tables). Higher scores are attributed for male gender, smoking, older age, higher systolic blood pressure and higher total cholesterol.

Dichotomous variables were calculated, to separate those at high and low risk of CVD mortality. For men, the cut off was 10%, and for women it was 5%, as the risk across the population was insufficiently high for the 10% cut off to be useful.

11.3.2 Analysis

All analyses were performed separately for each country and gender, to enable comparisons of the relationships between life course SEC and cardiovascular risk.

SCORE was described in terms of the mean percentage risk and proportions of the populations at high risk. Risk was described by age and each of the three direct measures of childhood SEC (assets, maternal and paternal education).

Logistic regression was used to investigate the effect of adult SEC and direct and indirect (anthropometric) measures of childhood SEC on high CVD risk (i.e. ≥ 10% in men and ≥ 5% in women). Initial analyses were age-adjusted, and further adjustments were made for anthropometry, childhood and adult SEC.

11.4 Results

11.4.1 Descriptive analysis

Table 11.1 shows the proportions of people at high risk of CVD, and the mean percentage risk of CVD mortality in the next ten years. Both these measures were higher amongst men and Russians, increased with age and decreased with improving childhood SEC.

Table 11.1. Prevalence (%) of high CVD risk* and mean [SD] percentage 10 year risk of CVD mortality, measured by SCORE, by age and measures of childhood SEC

	Men						Women					
	Czech Republic		Russia		Poland		Czech Republic		Russia		Poland	
	% high risk	Mean [SD]	% high risk	Mean [SD]	% high risk	Mean [SD]	% high risk	Mean [SD]	% high risk	Mean [SD]	% high risk	Mean [SD]
	12.6	5.5 [4.8]	18.3	6.6 [6.0]	11.4	5.2 [4.7]	8.1	1.8 [1.9]	14.4	2.2 [2.4]	8.3	1.7 [2.0]
Age												
45-49	0.0	1.0 [0.2]	0.0	1.1 [0.3]	0.0	1.1 [0.3]	0.0	0.1 [0.3]	0.0	0.0 [0.0]	0.0	0.1 [0.3]
50-54	0.5	2.6 [1.5]	1.3	3.0 [1.8]	0.7	2.7 [1.6]	0.0	0.7 [0.5]	0.0	0.8 [0.5]	0.0	0.7 [0.5]
55-59	3.5	4.2 [2.3]	7.4	5.3 [3.0]	4.7	4.5 [2.5]	0.5	1.6 [1.1]	0.5	1.4 [0.8]	1.0	1.6 [1.0]
60-64	19.2	6.8 [4.2]	33.1	8.5 [4.7]	18.2	6.6 [3.8]	7.2	2.3 [1.4]	14.2	2.8 [1.6]	7.1	2.4 [1.5]
65-69	38.9	10.0 [5.5]	56.3	12.4 [7.2]	41.0	10.2 [5.9]	34.3	4.1 [2.3]	48.8	5.1 [2.6]	38.1	4.3 [2.5]
p for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Childhood assets												
0	26.5	8.7 [4.8]	39.2	9.6 [6.6]	25.2	7.2 [5.5]	20.0	3.5 [2.5]	28.4	3.7 [2.6]	16.0	2.5 [2.2]
1	22.1	7.4 [4.3]	27.4	7.6 [6.3]	23.8	7.0 [5.2]	21.0	2.9 [2.3]	20.0	2.8 [2.5]	15.8	2.5 [2.2]
2	21.9	7.1 [5.0]	23.0	6.8 [6.1]	15.6	5.8 [5.1]	18.7	2.8 [2.1]	13.8	2.3 [2.4]	9.8	2.0 [2.1]
3	21.5	6.7 [5.2]	15.7	5.3 [4.7]	14.5	5.5 [4.7]	12.3	2.3 [2.1]	6.8	1.4 [1.8]	9.8	1.9 [1.9]
4	17.7	6.1 [5.1]	10.7	4.8 [4.7]	12.0	5.1 [4.4]	7.8	2.0 [1.8]	5.2	1.3 [1.7]	9.1	1.7 [1.9]
5	7.7	4.3 [4.1]	5.9	3.9 [3.6]	9.1	4.5 [4.1]	4.2	1.3 [1.6]	2.9	1.1 [1.5]	5.1	1.5 [1.8]
6	6.1	3.2 [3.2]	4.7	3.0 [3.1]	4.5	3.1 [3.1]	2.4	0.9 [1.3]	0.8	0.7 [0.9]	2.0	0.9 [1.5]
p for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Paternal education												
< primary	-	-	37.2	9.1 [6.9]	21.3	6.7 [5.1]	-	-	24.6	3.2 [2.6]	15.3	2.4 [2.2]
Primary	-	-	21.1	6.5 [5.6]	16.9	5.7 [4.8]	-	-	12.5	2.1 [2.3]	9.3	1.9 [2.0]
Vocational	-	-	18.9	6.1 [5.9]	9.8	4.7 [4.7]	-	-	12.4	2.0 [2.2]	7.2	1.5 [1.8]
Secondary	-	-	14.3	5.4 [5.4]	9.2	4.5 [4.3]	-	-	9.0	1.6 [2.1]	5.9	1.5 [1.7]
University	-	-	15.5	5.5 [5.0]	8.7	4.3 [4.3]	-	-	8.4	1.7 [1.9]	4.7	1.4 [2.1]
p for trend	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001
Maternal education												
< primary	-	-	37.6	9.0 [6.5]	19.7	6.5 [4.9]	-	-	24.6	3.2 [2.6]	14.2	2.3 [2.2]
Primary	-	-	21.7	6.6 [5.9]	15.5	5.6 [4.8]	-	-	12.4	2.1 [2.3]	9.1	1.9 [2.0]
Vocational	-	-	14.5	5.5 [5.5]	11.2	4.6 [5.0]	-	-	10.0	1.8 [2.1]	7.0	1.4 [1.7]
Secondary	-	-	13.0	5.1 [5.2]	8.4	4.3 [4.2]	-	-	7.2	1.5 [1.9]	5.4	1.4 [1.8]
University	-	-	9.5	4.5 [4.2]	6.5	3.8 [3.8]	-	-	6.3	1.4 [1.7]	4.2	1.3 [2.2]
p for trend	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001

* Risk ≥ 10% in men and ≥ 5% in women

11.4.2 Adult socioeconomic circumstances

Age adjusted analyses revealed inverse associations between adult SEC and the likelihood of being at high risk of CVD mortality (table 11.2).

Amongst men, higher education and assets, and lower material position, were associated with reduced likelihood of being at high risk in all three countries, whilst the association with living space was only significant amongst Poles (table 11.2).

Amongst women, significant relationships were only observed amongst Poles, where there were inverse associations with education, material position and assets (table 11.2).

Table 11.2. OR [95% CI] for high CVD mortality risk*, as measured by SCORE, by adult SEC

Adult SEC measure	Czech Republic		Russia		Poland	
	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Men						
Education	0.73 [0.64, 0.84]	<0.001	0.84 [0.78, 0.91]	<0.001	0.76 [0.69, 0.84]	<0.001
Material position	0.91 [0.87, 0.96]	0.001	0.95 [0.92, 0.97]	<0.001	0.95 [0.91, 0.99]	0.006
Living space	0.91 [0.76, 1.10]	0.319	0.91 [0.75, 1.11]	0.349	0.82 [0.69, 0.97]	0.023
Assets	0.93 [0.88, 0.98]	0.009	0.88 [0.84, 0.92]	<0.001	0.90 [0.86, 0.94]	<0.001
Women						
Education	0.90 [0.78, 1.04]	0.146	0.93 [0.85, 1.02]	0.128	0.86 [0.77, 0.96]	0.008
Material position	0.98 [0.92, 1.04]	0.452	1.01 [0.99, 1.04]	0.310	0.96 [0.92, 0.99]	0.027
Living space	0.89 [0.74, 1.06]	0.190	0.84 [0.70, 1.01]	0.070	0.88 [0.74, 1.05]	0.149
Assets	0.96 [0.90, 1.02]	0.207	0.97 [0.92, 1.03]	0.310	0.92 [0.86, 0.98]	0.009

* Risk ≥ 10% in men and ≥ 5% in women

11.4.3 Childhood socioeconomic circumstances

Men

In the age-adjusted analyses, there was an increased likelihood of high CVD risk amongst Russian men of lower SEC background, as measured by parental education (table 11.3). Neither of these associations remained significant, however, after adjustment for measures of adult SEC. A similar relationship with parental education amongst Polish men in the age-adjusted analysis was also weakened and not statistically significant after adjustment for adult SEC. The association of Czech men's childhood assets and CVD risk was not statistically significant in the age-adjusted analysis, but following adjustment for adult SEC a strong positive association was observed.

Amongst Russian, but not Czech or Polish, men there were slight inverse associations between high CVD risk and height, leg length and trunk length (table 11.3). The association with leg length was no longer statistically significant after adjustment for adult SEC, but the others remained so, but the magnitudes of the effects were small.

Women

There were no statistically significant relationships between high CVD risk and the recalled measures of childhood SEC, or anthropometric measures, although most of the age-adjusted estimates suggested inverse relationships (table 11.4).

Table 11.3. OR [95% CI] for men's high CVD mortality risk*, as measured by SCORE, by direct and indirect measures of childhood SEC

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	1.07 [0.98, 1.17]	0.117	0.99 [0.92, 1.06]	0.707	0.95 [0.90, 1.01]	0.094
	+ adult SEC	1.14 [1.03, 1.26]	0.010	0.98 [0.92, 1.06]	0.675	1.01 [0.95, 1.08]	0.761
	+ anthropometry	1.08 [0.99, 1.18]	0.094	1.00 [0.93, 1.07]	0.958	0.96 [0.90, 1.01]	0.010
	+ adult SEC, anthropometry	1.14 [1.03, 1.26]	0.010	0.99 [0.92, 1.07]	0.842	1.01 [0.95, 1.08]	0.684
Maternal education	Age	-	-	0.88 [0.81, 0.95]	0.001	0.92 [0.84, 1.02]	0.118
	+ adult SEC	-	-	0.94 [0.86, 1.02]	0.110	1.08 [0.97, 1.22]	0.170
	+ anthropometry	-	-	0.89 [0.82, 0.97]	0.004	0.91 [0.83, 1.01]	0.083
	+ adult SEC, anthropometry	-	-	0.94 [0.87, 1.02]	0.159	1.07 [0.95, 1.20]	0.269
Paternal education	Age	-	-	0.92 [0.86, 0.99]	0.032	0.88 [0.81, 0.96]	0.005
	+ adult SEC	-	-	0.99 [0.91, 1.07]	0.744	1.01 [0.91, 1.12]	0.831
	+ anthropometry	-	-	0.93 [0.87, 1.01]	0.072	0.88 [0.80, 0.96]	0.004
	+ adult SEC, anthropometry	-	-	0.99 [0.92, 1.07]	0.841	1.00 [0.90, 1.11]	0.950
Anthropometry							
Height	Age	0.99 [0.98, 1.01]	0.396	0.97 [0.96, 0.99]	<0.001	0.99 [0.98, 1.01]	0.456
	+ child SEC	0.99 [0.97, 1.01]	0.258	0.98 [0.96, 0.99]	0.001	1.00 [0.98, 1.02]	0.975
	+ adult SEC	1.00 [0.98, 1.02]	0.771	0.98 [0.97, 0.99]	0.008	1.00 [0.98, 1.02]	0.930
	+ child & adult SEC	1.00 [0.98, 1.02]	0.825	0.98 [0.97, 1.00]	0.022	1.00 [0.98, 1.02]	0.862
Leg length	Age	0.99 [0.97, 1.02]	0.556	0.97 [0.95, 0.99]	0.014	1.00 [0.98, 1.02]	0.855
	+ child SEC	0.99 [0.96, 1.01]	0.367	0.98 [0.96, 1.00]	0.037	1.01 [0.98, 1.03]	0.638
	+ adult SEC	1.00 [0.97, 1.03]	0.959	0.98 [0.96, 1.00]	0.075	1.00 [0.98, 1.03]	0.870
	+ child & adult SEC	1.00 [0.97, 1.03]	0.906	0.98 [0.96, 1.00]	0.124	1.00 [0.98, 1.03]	0.797
Trunk length	Age	0.99 [0.96, 1.02]	0.441	0.95 [0.93, 0.98]	<0.001	0.99 [0.96, 1.01]	0.291
	+ child SEC	0.99 [0.96, 1.02]	0.389	0.96 [0.93, 0.98]	0.001	0.99 [0.96, 1.02]	0.516
	+ adult SEC	1.01 [0.98, 1.04]	0.575	0.97 [0.94, 0.99]	0.012	1.00 [0.97, 1.03]	0.955
	+ child & adult SEC	1.00 [0.98, 1.04]	0.600	0.97 [0.94, 1.00]	0.030	1.00 [0.97, 1.03]	0.977

* Risk ≥ 10%

Table 11.4. OR [95% CI] for women's high CVD mortality risk*, as measured by SCORE, by direct and indirect measures of childhood SEC

	Adjustment	Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
		Childhood socioeconomic circumstances					
Assets	Age	0.92 [0.83, 1.03]	0.132	0.95 [0.87, 1.03]	0.230	0.98 [0.91, 1.05]	0.565
	+ adult SEC	0.91 [0.80, 1.04]	0.154	0.96 [0.88, 1.05]	0.354	1.03 [0.95, 1.12]	0.425
	+ anthropometry	0.93 [0.83, 1.03]	0.156	0.95 [0.87, 1.04]	0.244	0.98 [0.91, 1.06]	0.630
	+ adult SEC, anthropometry	0.91 [0.80, 1.04]	0.174	0.96 [0.88, 1.05]	0.354	1.04 [0.96, 1.12]	0.372
Maternal education	Age	-	-	0.96 [0.87, 1.05]	0.362	0.94 [0.83, 1.06]	0.325
	+ adult SEC	-	-	0.96 [0.87, 1.06]	0.415	1.04 [0.90, 1.19]	0.585
	+ anthropometry	-	-	0.96 [0.88, 1.06]	0.434	0.95 [0.84, 1.07]	0.372
	+ adult SEC, anthropometry	-	-	0.96 [0.87, 1.06]	0.448	1.05 [0.91, 1.21]	0.503
Paternal education	Age	-	-	0.96 [0.89, 1.05]	0.366	0.93 [0.83, 1.03]	0.181
	+ adult SEC	-	-	0.97 [0.89, 1.06]	0.504	1.03 [0.91, 1.17]	0.649
	+ anthropometry	-	-	0.97 [0.89, 1.05]	0.459	0.93 [0.84, 1.04]	0.207
	+ adult SEC, anthropometry	-	-	0.97 [0.89, 1.06]	0.542	1.04 [0.91, 1.18]	0.564
		Anthropometry					
Height	Age	0.99 [0.97, 1.01]	0.427	0.98 [0.97, 1.00]	0.084	0.99 [0.97, 1.01]	0.517
	+ child SEC	0.99 [0.96, 1.01]	0.333	0.98 [0.97, 1.00]	0.068	1.00 [0.98, 1.02]	0.806
	+ adult SEC	0.99 [0.95, 1.02]	0.455	0.99 [0.97, 1.00]	0.127	1.00 [0.98, 1.02]	0.880
	+ child & adult SEC	0.99 [0.96, 1.02]	0.385	0.98 [0.97, 1.00]	0.093	1.00 [0.98, 1.02]	0.898
Leg length	Age	0.98 [0.95, 1.01]	0.293	0.98 [0.96, 1.00]	0.094	0.99 [0.97, 1.02]	0.576
	+ child SEC	0.98 [0.95, 1.01]	0.268	0.98 [0.95, 1.00]	0.062	1.00 [0.97, 1.03]	0.946
	+ adult SEC	0.98 [0.94, 1.01]	0.234	0.98 [0.96, 1.01]	0.127	1.00 [0.97, 1.03]	0.839
	+ child & adult SEC	0.98 [0.94, 1.01]	0.209	0.98 [0.95, 1.00]	0.072	1.00 [0.97, 1.03]	0.911
Trunk length	Age	1.00 [0.96, 1.04]	0.942	0.99 [0.96, 1.02]	0.385	0.99 [0.96, 1.03]	0.700
	+ child SEC	0.99 [0.96, 1.03]	0.776	0.99 [0.96, 1.02]	0.427	0.99 [0.96, 1.03]	0.737
	+ adult SEC	1.00 [0.96, 1.05]	0.863	0.99 [0.96, 1.02]	0.484	1.00 [0.96, 1.04]	0.995
	+ child & adult SEC	1.00 [0.96, 1.05]	0.964	0.99 [0.96, 1.02]	0.534	1.00 [0.96, 1.04]	0.942

* Risk ≥ 5%

11.5 Discussion

11.5.1 Summary of results

There was very little influence of childhood SEC on CVD risk, as predicted by SCORE. Where there were crude associations there was a large mediating effect of adult SEC, but overall very few associations were shown here, and those which were statistically significant were inconsistent.

Czech men's childhood assets positively predicted their chances of high CVD risk in middle age, so that those who had the maximum number of assets had more than twice the odds of being at high risk than men who had had no assets. A similar relationship, however, was not observed in any other group. Russian men with shorter height or trunk length were more likely to be at high risk of CVD mortality, with a 10cm decrease linked, respectively, to 22% and 36% higher chance of high risk. Again, these findings were not replicated in any other groups.

11.5.2 Limitations

The limitations of this chapter which are specific to SCORE's component factors have been discussed in previous chapters (blood pressure, chapter 7; lipids, chapter 8 and smoking, chapter 9). Those limitations which are relevant to the whole thesis are discussed in the final discussion chapter (section 12.2).

The most important, specific limitation here is the lack of data on CVD incidence. Were this data available, the relationships between, for instance, CVD mortality and the hypothesised risk factors could be measured. In the absence of this data a CVD risk score, the ESC SCORE, which has previously been shown to be a useful predictor of CVD mortality, was used to estimate CVD risk. However, SCORE may be an inadequate predictor of risk as it has also been shown to overestimate CVD mortality.[385-387]

SCORE provides a percentage risk for CVD mortality over ten years, and was dichotomised into high and low risk, as described in the methods section. This is particularly relevant amongst women, where the mean CVD risk was low, and the range narrow. Despite a lower cut off point being chosen for women, the proportions of women defined as high CVD risk were small, at 8% in the Czech Republic and Poland and 14% in Russia. This rarity of the outcome measure means that the detection of associations with the potential risk factors is difficult.

There are known CVD risk factors which are not included in SCORE, the inclusion of which may boost the utility of SCORE in predicting mortality. This may be of particular relevance in CEE, where it has been suggested that alcohol consumption[8;11;12;14;16;34;35] and stress[35] have substantial impacts upon CVD outcomes. However, SCORE only includes classical risk factors, and was designed for use in clinical practice, so in addition to the requirement that it accurately predicts CVD risk, it is imperative that it is clinically useful and easily used and that it does not require an excessive number of tests.

11.5.3 Discussion of results

The analyses in this chapter suggest that SEC in general, and particularly SEC in early life, have very little influence on overall CVD risk in middle to older age in those populations in Russia, Poland and the Czech Republic. An inverse association has frequently been observed in western populations.[41-43] The perceived lack of impact in these CEE populations could be a genuine finding, or it could be an artefact due to some limitation in either the study or the analyses, discussed above and in the final chapter (chapter 12).

Since SCORE is a composite of three of the risk factors examined in the thesis, and the relationships between childhood SEC and the individual risk factors have differed from those previously observed in western countries, the lack of major association is not surprising. Cholesterol and blood pressure showed very little association with childhood SEC, whilst taking up smoking was more common amongst those with higher SEC backgrounds.

SCORE only includes five factors and therefore may oversimplify risk, particularly in a CEE context where other factors, such as alcohol consumption[8;11;12;14;16;34;35] and stress,[35] may also be important. SCORE is not consistently accurate when predicting risk in western European populations,[385;387;421] and may be even less so in CEE.

The influence of childhood SEC upon adult height has been shown in this thesis to be similar in western countries and in these CEE countries,[214] which indicates that it is unlikely that the lack of association between CVD risk and childhood SEC is due to a difference in the impact on early life development of childhood SEC.

It is possible that the lack of observed association between childhood SEC and CVD indicates a real lack of influence. When members of the HAPIEE cohorts were children, in the years following WWII, the socioeconomic range, particularly in Czechoslovakia and Poland, was less wide than that in western countries,[40] and this may mean that, in comparing the most and least advantaged, the difference in CVD risk was too small to detect.

Additionally, the impact of childhood SEC may not be observable as a disparity in later life health outcomes in CEE countries because their populations have experienced various major social changes, which may have eclipsed any effect of childhood SEC on adult CVD risk. Data on childhood SEC, education and current SEC may not be sufficient to describe life course socioeconomic experience.

11.5.4 Conclusions

The findings from this chapter suggest that there is very little influence of childhood SEC on overall risk of CVD mortality, as measured by classical risk factors, in middle and older aged populations in Russia, Poland and the Czech Republic.

Chapter 12. Discussion

12.1 Summary of results

This thesis aimed to determine whether childhood SEC have an impact upon CVD risk in Russia, Poland and the Czech Republic, and also to investigate the relationship between different measures of SEC, both in early life and adulthood. There have been a number of interesting findings from the research undertaken, which are outlined briefly below.

Different dimensions of SEC were related to each other in similar fashions in these CEE populations to those observed previously in western countries. More highly educated families owned more assets in what were then the USSR, Poland and Czechoslovakia in the decades following WWII. There was also a continuity between early and later life SEC, for instance between parental and own educational level, with a trend to upward intergenerational educational mobility.

Those children who experienced improved SEC grew to be taller adults, although body proportions, indicated by the ratio of leg to trunk length, were not influenced by early life SEC.

In these men and women who were born between 1933 and 1957, there were secular trends to increasing height which remained even after the effects of a pattern of improving childhood SEC and of the loss of height in ageing were taken into account. These trends were not slowed or halted amongst children who were born during WWII.

Adult smoking habits were partly determined by SEC in childhood. People who were more advantaged in childhood were more likely to take up smoking, suggesting that these CEE populations were in the early stages of the tobacco epidemic in the post-war period. Additionally, men who were more advantaged in childhood and who smoked were less likely to quit their habit.

People, and particularly women, who were more advantaged in childhood were less likely to be obese in adulthood, reflecting results previously found in studies of western populations.

Finally, this study did not provide convincing evidence of an influence of early life SEC on blood pressure, cholesterol or overall risk of CVD mortality, as measured by SCORE. These findings are in contradiction to the majority of results from western countries, where improving childhood SEC has repeatedly been linked to lower blood pressure, cholesterol and risk of CVD.

12.2 Limitations

When interpreting the results described in this thesis, a number of features of the study design and of the study populations need to be considered. Some of these limitations, which were specific to particular results chapters, are only briefly outlined here but are discussed in further detail in the relevant chapters. These include:

- Height was measured at an age when age-related loss of height had already begun, which meant that maximum adult height could only be estimated (see chapter 6).
- Blood lipids from each country were analysed in a separate laboratory (see chapter 8).
- Some further data, which would have made the conclusions drawn from this research more firm, were not available. This includes birth weight (chapter 7), duration of breast feeding (chapter 8), the age when participants started or quit smoking (chapter 9) and CVD mortality (chapter 11).

Those additional limitations which may affect the thesis more generally are discussed in detail, below.

12.2.1 Power and sample size

At nearly 29 000, the sample size of the HAPIEE study is large, and is not at risk of being underpowered to detect even small differences, even where the data is stratified by both country and gender. In some cases the study was overpowered to investigate the research questions posed, and therefore extremely small effects have been detected as statistically significant. It has been important in the interpretation of the results not to overemphasise the impact of statistical significance, but to assess the importance of an observed association with regard to the size of the effect estimate.

12.2.2 Representativeness of the study sample

Participants were randomly selected from population registers in Novosibirsk, Krakow and six towns in the Czech Republic. As each of the study centres is an urban area, the selected participants can only be considered to be representative of urban populations.

The response rates for the study are outlined in more detail in chapter 4, but overall it was around 60%. Previous analyses of data collected on non-responders has shown that they were more likely to be male, younger, have lower levels of education, worse self-rated health and to smoke than responders.[102] They may also have differed in their socioeconomic backgrounds, but this could not be investigated as data were not available.

Although those who were included in the cohorts differed slightly from the general populations this does not affect the internal consistency of the findings, and therefore the results should be applicable to all middle and older aged men and women living in urban areas. Further support for the representativeness of the HAPIEE samples is the fact that the ranking of the countries by their mean SCORE corresponds with the ranking by their CVD mortality rates.[4] Additionally, the mean heights were similar and ranking of the countries identical to the MONICA data.[422]

12.2.3 Missing data and selection bias

The missing data in the HAPIEE cohort is an important limitation to this thesis. The highest proportions of missing data (11-12%) were in variables measured at the physical examination: the anthropometric measurements and the CVD risk factors.

In the Czech Republic and Poland, the questionnaire was completed during a nurse’s visit to the participants’ home and the physical examination took place during a subsequent visit to a clinic. 17.9% of Czech and 13.4% of Polish participants who completed the questionnaire did not attend the physical examination. More than 99% of missing anthropometric and CVD data were attributable to non-attendance at the physical examination.

In Russia the questionnaire and the physical examination both took place during the same visit to the clinic. There were smaller proportions of missing data than in the Czech and Polish populations, but a selection bias may have been introduced, as only those potential participants who were sufficiently healthy to make the visit to the clinic will be represented in the study population.

All participants had to travel independently to the clinic, so those who were in less good health may have been less likely to attend. This is borne out by further investigation: Czech and Polish participants who did not attend the physical examination were 50% more likely to have rated their health as poor or very poor than those who attended ($p<0.001$). They may also have differed in their CVD risk, and for example, self-reported BMI was 0.4kg/m^2 lower amongst those who did not attend the physical examination ($p<0.001$). The inaccuracies in self-reported height and weight[120-122;375;423] are unlikely to have differed between attendees and non-attendees.

In terms of SEC, those who did not attend the physical examination were less deprived, had more assets and living space, yet were less well educated (all $p<0.001$). They also had better educated parents and more assets in childhood (all $p<0.001$). Although these differences were all highly statistically significant, the actual magnitudes of the differences were not substantial.

Complete case analysis, where individuals with missing values on one or more variables included in a model are excluded from the analysis, was used throughout the thesis. This means that not all analyses used the same base of people, however this mainly affected crude analyses, in which fewer variables were included. Because missing data were clustered, the more complex models analysed very similar populations. Those Czech and Polish participants who were excluded from the analyses due to missing data from the physical examination were likely to be similar non-respondents in Russia.

That those people who were not included in the analyses were of higher SEC but were also less healthy may have introduced a bias, so that the results were skewed towards a more positive gradient in health, whereby less deprived individuals would be shown to have better health.

12.2.4 Measures of socioeconomic circumstances

Each of the measures of SEC have their own associated limitations, however there is also a broader issue with the measurement of SEC in socialist countries, as Russia, Poland and the Czech Republic were when the majority of the participants were children. As discussed in section 5.1.1.2, membership of the nomenklatura was an important determinant of the privileges an individual was afforded. As it was not possible to collect data on whether or not participants' parents were members of the nomenklatura, it has not been possible assess to the impact of this upon CVD risk in later life. It is likely that a proportion of participants' parents were in the nomenklatura (there were approximately 3 million in the USSR in the 1960s,[424] comprising about 1.3% of the population[425]), and the childhood SEC status of these individuals will not have been effectively captured.

12.2.4.1 Recalled measures of childhood SEC

Another important limitation was the retrospective collection of information on childhood circumstances. Participants were asked to recall both their parent's educational level and whether or not they had six assets in their household when they were aged ten. Although studies from the UK suggest that recall of childhood conditions is reasonably reliable over 4-5 decades,[423;426;427] no such data are available from Eastern Europe. Recall bias cannot be excluded, but errors were minimised by asking about objective conditions, rather than asking participants to make subjective assessments. However, some misclassification, which is most likely random, is probable, and this may be a reason why some associations were not detected. There was no way of assessing the extent of this problem.

12.2.4.2 Childhood asset score

The reliability of the childhood assets as a measure of early life SEC may be compromised in some circumstances. Participants were asked the following question with regard to six assets:

> 'Did you have any of the following items in your house when you were a child (about 10 years old)?'

In the USSR, and less so in the rest of CEE at the time when study participants were children, communal apartments shared between several families were commonplace.[423;428] In these flats, a family may have had access to assets, such as a kitchen, toilet or hot or cold tap water, which were not strictly owned by the family. There is, therefore, some ambiguity in the question and it may have been interpreted either way.

An additional problem with the use of the asset score is that availability of the assets may have differed between countries, even amongst those who were otherwise of equivalent SEC. Of course, it is possible that there was variation in the availability of other resources, particularly education, and this is one of the interesting dimensions of a multi-national study.

Ownership of assets should be interpreted with recognition of the influence of the socialist economy. As Connor discusses, patterns of ownership of durable goods in the USSR differed from those seen in a capitalist economy. Households in a socialist country were more likely to have a radio or television than other durable goods,[40] the suggestion being that those goods via which the state communicated with citizens were more easily available because of the influence they gave the state.[191] This is reflected in the data here, where the overall rate of ownership of a radio was 83%, 2.8 times as common as refrigerator ownership, and 1.6 times as common as having running cold water in the household.

12.2.4.3 Anthropometric measurements

Sitting height may not be a suitable proxy measure for trunk length when participants are substantially overweight, as, due to increasing buttock circumference it increases with percentage body fat.[429] As, according to the WHO definition, 74% of participants in the HAPIEE study are either overweight or obese, this measurement error would affect the trunk length measurements of a substantial proportion of participants. It would also, consequently, impact upon the accuracy of the calculated leg length and leg to trunk ratios, leading to underestimation of both.

This measurement error may have prevented associations being observed between leg or trunk length and the CVD risk factors, however it would not have affected the measurement of, or associations with, height.

12.3 Discussion of results

12.3.1 Socioeconomic circumstances and anthropometry

The results overall showed that different measures of SEC, in early life and across the life course, are related to each other in a similar manner to in western countries. This suggests that, although the Eastern and Western regions of Europe were politically and ideologically separated for much of the twentieth century, there were some fundamental similarities in the socioeconomic structures of the regions.

Educational level was a factor in partner choice in early twentieth century Russia, and even more so in Poland. It may have been more important in Poland because when most of the partnerships studied here were established, prior to WWII, Poland was not a communist country. The relationship between education and income may be stronger in capitalist countries, resulting in a greater incentive to select a highly qualified partner.

Families in these socialist economies in which the adults were more highly educated owned more assets. In line with previous research,[137;138] this suggests that there was a link between education and earnings, although the stronger relationship amongst the Polish than Russian cohort contradicts previous findings, which suggest that at this time educational income inequalities were greater in the USSR than in other socialist countries.[40] This highlights the problems associated with using assets as a proxy for income, particularly in settings where access to such assets may be only partially determined by material resources. As discussed in section 12.2.4, members of the nomenklatura, the bureaucratic class, were afforded privileges by the regime. For instance, because the state monopolised trade, scarce resources could be removed from the open market and reserved for allocation to such favoured persons.[40]

Despite the ideological and practical differences between eastern and western countries, there was continuity between childhood and later life SEC which suggests that, under the socialist regimes, there was inheritance of status as in capitalist societies. The trend to upward social mobility in Russia and Poland mirrors similar trends in other European populations,[196] and was due to rapid industrialisation in the post-war period.[40] There were stronger trends amongst women because of women's increasing participation in education in this period.

Adult height was shortest in Russia, and almost all the difference in height between countries was due to differences in leg length. The ranking of the countries by mean height corresponded with that by infant mortality and life expectancy,[39;192;193] and, consistent on an ecological level with the hypothesis that childhood conditions impact upon adult height, childhood circumstances were least favourable in Russia. In individual level analyses, childhood SEC were positively associated with adult height and leg and trunk length in a similar fashion to that observed in previous studies.[147;149;149;150;155;156;173;194] In the literature there has been a debate as to whether anthropometric indices can serve as proxy measures of childhood SEC: these findings suggests that they may, and that the negative effects on growth and adult height of disadvantage during childhood are a universal phenomenon, not specific to western populations.

Leg length was not correlated more strongly with childhood SEC than full height, and associations with leg to trunk ratio were weak and inconsistent, suggesting that anthropometric proportions did not vary across the socioeconomic range and that in these populations overall height was the most useful indicator of the effects of childhood SEC on growth. This finding was in contrast to those of some British studies, which suggest that leg growth is most vulnerable to stunting in disadvantaged children,[139;155;156] so this thesis did not resolve the question as to whether leg length is a more specific marker of childhood disadvantage than height.

Even after the effects of childhood SEC were removed, people with taller adult height attained a higher level of education and had improved adult SEC, in agreement with previous studies in western and CEE countries.[181;182;184] These patterns suggest that better opportunities were open to taller individuals, although measurement errors in measuring childhood SEC, which are likely, would also produce such results. In addition, potential confounding and mediating factors, such as cognitive abilities or self confidence, could not be investigated due to a lack of relevant data.

12.3.2 Secular trends

There was a secular trend to increasing numbers of assets in the home in childhood, indicating a steady improvement in living conditions in the post-war period in Russia, Poland and the Czech Republic. These improvements in social conditions were common across Europe in this period, and have been well documented. They were also reflected by increases in life expectancy [39;220] which, until the mid-1960s, were also universal across Europe. Unfortunately, as these cohorts did not include persons born after 1957, it was not possible to examine more recent secular trends.

There was a secular trend towards increasing height, which remained after the effects of both age-related loss of height and childhood SEC were removed. Men and women in each country showed an increase of approximately 1 cm in height per decade, a change of a similar magnitude to that suggested by Tanner,[221] and within the range of trends previously observed in European populations,[150;211;219;222-225] but weaker than those shown previously in CEE populations.[201;204;205] Here the secular trends to increasing height were strongest amongst Russians, possibly because they were the shortest to begin with, and because of the rapid post-war industrialisation of the USSR, which Poland and Czechoslovakia did not match, as they were already more developed before the onset of WWII.[40]

There were no major changes in the trend in height among adults born immediately before, during or after WWII. There were only minor reductions in the estimated maximum heights of people born during the war, most notably amongst the Russian study population. The smaller than expected effect of war in Russia may be explained by the fact that Novosibirsk, where the study is based, was far removed from the violence acutely experienced across much of Europe.

This lack of observed effect of WWII on trends in height may also be due to: a lack of power to detect small changes; a delay in the onset of decreasing growth rates at the end of adolescence,[208] and catch up growth at the end of adolescence which would prevent stunting of adult height; or the effects of hardship not being specific to one birth cohort,[226] and similarly affecting all participants.

12.3.3 Blood pressure and cholesterol

Among the CVD risk factors examined in this thesis, blood pressure is perhaps the best covered by the existing literature, however, although inverse associations between childhood SEC and both blood pressure and cholesterol were anticipated, childhood conditions were not good predictors of either CVD risk factor in these three CEE populations. Regarding blood pressure, this is in contradiction to the majority of the literature from western countries, which links disadvantage in childhood to higher blood pressure in adulthood.[260-263] The literature regarding cholesterol, on the other hand, is itself inconsistent (e.g. [96;262-264;305]).

Similar to this analysis, previous studies which did not find associations used recalled early life SEC measures,[264;266] so recall error may have attenuated the effect estimates and prevented detection of a true difference. Alternatively, it is also possible that the results reflect a true lack of association in these three CEE populations. The difference between this and western based studies may be related to the stage of the epidemiologic and nutritional transitions of the countries.[57;58] These countries of CEE were most likely in the age of receding famine[54] (receding pandemics[53]) when members of the cohort were children, whilst the western countries in which the majority of previous work has been based would have been entering the age of degenerative diseases. [57;58]

It remains a possibility that there is no difference in the blood pressure or cholesterol concentrations of people whose childhood experience was from across the socioeconomic spectrum in these former socialist CEE countries. Efforts to narrow the difference between the circumstances of the best and worst off were most successful in Czechoslovakia, and least in the USSR,[40] although it is difficult to be confident about the childhood conditions of individuals in this study. In western countries, where associations between childhood SEC and the risk factors have been observed, social inequality is greater, so the detection of a difference is more likely. This may explain why few statistically significant associations were detected, particularly in the Czech Republic.

The positive associations of men's DBP and the inverse associations of cholesterol in both genders with height and its components are consistent with the literature.[88;264;267;276;282;307;308;317] However, other predicted relationships were not consistently observed, and the effect estimates suggest only a weak association. It is unlikely that these associations with anthropometry indicate a direct effect of childhood SEC on blood pressure. The link with DBP may relate to effects of the uterine environment,[276] and that with cholesterol may relate to the post natal diet, as longer duration of breast-feeding is associated with lower total cholesterol in adolescence[89;90] and improved growth and taller adult height.[148] Unfortunately, these hypotheses cannot be tested due to the lack of relevant data.

12.3.4 Smoking and adiposity

In contrast to blood pressure and lipids, where results were largely negative, there were some associations between childhood conditions and smoking and adiposity.

Men and women who were less disadvantaged in childhood in Russia, Poland and the Czech Republic were more likely to start smoking. Previous studies in western countries showed childhood circumstances to be inversely associated with women's smoking, but not with men's,[95;96;98;333-335] although as the association between smoking and adult SEC varies throughout the tobacco epidemic,[326] it stands to reason that the effect of childhood SEC would also vary. In comparison with western countries, the CEE countries have been delayed in their progression through the tobacco epidemic, so participants here may have lived through earlier stages of the tobacco epidemic than participants in previous studies, explaining the disparity in results.

There is little previous research into the influence of early life on quitting smoking,[93;98] but there is only a weak rationale for an association, as there is potential for a greater impact of later life SEC to eclipse any effect of childhood SEC. However, other than Russian men, amongst whom higher parental education was linked to a greater likelihood of quitting smoking, those who experienced improved childhood SEC were less likely to quit smoking. Previous studies of western populations have shown that lower SEC of origin is linked to a reduced probability of quitting smoking,[93;98] and it has been suggested that this is related to higher consumption of cigarettes in adolescence, and parental smoking, both of which may make quitting more difficult and less likely.[430-432] This is consistent with the findings here as, again, the CEE countries in which this study is based were at an earlier stage of the tobacco epidemic, during which there was a positive social gradient in smoking.

People who experienced disadvantaged childhoods had higher levels of adiposity, although amongst men only maternal education appeared to have an effect. Previous studies have shown similar associations,[93;96;100;369;372-374;376;377] that are also weaker,[93;96;376]and less frequently observed[96;373] amongst men. These associations may be explained by less healthy diets amongst disadvantaged children and adolescents,[144;145] and more highly educated mothers being better able to recognise unhealthy habits in their children.[383]

Although no effect of childhood SEC on the adiposity of Czechs was observed, this was probably due to information on parental education not being available rather than an actual absence of association.

With the development of societies, smoking and adiposity move through epidemics,[57;326] during which their relationships with SEC develop in a similar pattern: obesity and smoking are initially most common amongst the wealthy, and with time the situation reverses.[326;365] Chopra and Darnton-Hill have suggested that the same driving forces, namely globalisation and the power of large trans-national companies, are the major influences upon both the obesity and tobacco epidemics.[433] However, in CEE in the post-WWII period, the closed markets meant that these factors had less influence. Industrialisation and the centralised economy, and the eventual opening up of markets in the later twentieth century, would have had greater effects on the tobacco and obesity epidemics in these populations but the secular changes were slower due to the rigid social and political system.

As smoking uptake and adiposity showed opposite patterns in relations to childhood SEC in these CEE populations, this suggests that the two epidemics have not run concurrently in CEE. The similar patterns of association between early life SEC and adiposity observed here in Central and Eastern European countries, and previously in Western European countries[93;96;100;369;372-374;376;377] suggest that the regions of Europe have passed through the nutritional transition[365] almost simultaneously, the most recent stage of which was driven by the industrialisation of agriculture[57] and the associated plentiful supply of affordable foods (although anecdotal reports from the USSR suggest that Russia was a different case) which lead to an inverse social gradient in obesity.[57] This suggestion is reinforced by the steady secular trends to increasing height observed here[434] and across Europe[150;211;219;222-225] in the period following WWII.

However, the current prevalence and the gender, age and socioeconomic distributions of smoking indicate that the Czech Republic and Poland are at stage 4, and Russia is at stage 2 of the tobacco epidemic, whilst western, and particularly northern European countries have reached the end of the epidemic, as far as it has been described.[326] This delayed progression of CEE countries through the tobacco epidemic may be due to these populations not being fully exposed to the trans-national tobacco market until after the collapse of communism in the region.[336;337] In the post-war period, the CEE countries were at an early stage of the tobacco epidemic, during which there is a positive social gradient in smoking and more advantaged children are more exposed to smoking, so less likely to quit later on. Simultaneously, Western European countries were further through the epidemic, had inverse social gradients in smoking, and therefore disadvantaged children were more exposed and less likely to quit. [93;98]

12.3.5 CVD risk

The findings here suggest that there is little influence of childhood SEC on overall CVD risk, as measured by SCORE, in middle to older age in these populations in Russia, Poland and the Czech Republic. In contrast, an inverse relationship between early life circumstances and CVD outcomes has been consistently observed in western countries.[41-43] Considering the conflicting associations shown here and discussed above, between childhood SEC and the individual CVD risk factors, perhaps the lack of association with overall CVD risk should be expected, particularly since SCORE includes only age and gender in addition to three of the risk factors examined in the thesis (systolic blood pressure, total cholesterol, smoking). Possible explanations for the lack of association, however, are discussed below.

The HAPIEE study is large and very well powered, so it is unlikely that the size of the study prevented effects from being detected. However, data on childhood SEC were collected retrospectively, and although previous studies have shown recall of similar measures to be reasonably accurate over a similar period of time,[423;426;427] they are likely to have been subject to some recall error. If these errors were unbiased in terms of their relationship to CVD risk, they would push the effect estimates towards the null value and result in greater difficulty in detecting a small socioeconomic difference in CVD risk.

SCORE may oversimplify risk of cardiovascular disease mortality, and may not predict it well. Previous research has shown SCORE to overestimate risk, both when compared to other risk scores and when compared to mortality outcomes,[385;387;421] and SCORE may be even less accurate in its prediction of CVD mortality in CEE than in other regions. For example, CVD mortality in Russia may be less closely related to the classical risk factors included in SCORE than CVD in western populations. In fact, there have been several attempts to develop SCORE that are locally specific, i.e. which calibrate it for local rates of CVD. While the SCORE modification for 'high CVD countries' has been used here, it is likely that this version does not distinguish between countries with moderately high rates, such as Poland and the Czech Republic, and very high rates, such as Russia. In fact, the same modification has been previously used in countries with much lower rates of CVD than any of these countries, such as Norway.[385] In addition, other risk factors, such as alcohol consumption[8;11;12;14;16;34;35] and stress[35] may play a significant role in differences between countries.

It is unlikely that the explanation for the lack of association between CVD risk and childhood SEC relates to a difference in the impact that childhood SEC has on early life development between these CEE countries and western countries. This thesis has shown that the impact of childhood SEC upon growth and attained adult height is similar in these CEE countries and in western countries.

As discussed above and in previous chapters, the range of socioeconomic experience in CEE countries in the post-war period, particularly in what was then Czechoslovakia, was narrower than in western countries during the same period.[40] The socioeconomic gradient in these three CEE countries at the time the study participants were children may have been insufficient for a differential effect of childhood experience on adult CVD risk to be detected.

The final possible explanation relates to life course SEC experience in CEE. The effects of childhood SEC may only be observable as a disparity in later life health outcomes in countries where there is relative stability in socioeconomic experience across the life course. CEE countries have experienced a number of major social, political and economic changes during the life course of study participants, two examples being the collapse of communism and subsequent transition to a capitalist economy. These changes had substantial effects upon both population health[4;39] and the socioeconomic differentials in health,[18;21;22;29] and these effects may have eclipsed any effect of childhood SEC on adult CVD risk. The data available here, on childhood SEC, education and current SEC, may provide insufficient information to characterise the life course socioeconomic experience of cohort members.

12.4 Recommendations for further research

My main recommendation for future research is to investigate the relationship between childhood SEC and CVD outcomes in CEE, when such data are available. The lack of data on CVD outcomes has constrained this research, and exploring the relationship with, for example, CVD mortality would enable more robust conclusions to be drawn on the possible impact of early life experiences on adult cardiovascular health in countries in CEE.

Additionally, it would be interesting to confirm how the classical CVD risk factors are related to CVD outcomes in these populations, to determine whether the relationships are similar to those which have been observed in western countries, and whether additional risk factors, such as alcohol consumption, have a large impact.

A further, related issue which would be of great interest but was outside the scope of this thesis would be to investigate the alternative theories of life course epidemiology, in terms of social influences on CVD, in these three CEE populations. This thesis has focused on separating the impacts of early and later life SEC on CVD risk, but further research should further explore the possible cumulative effects of SEC, and of social mobility, across the life course.

12.5 Conclusions

This thesis aimed to investigate the impact of socioeconomic circumstances in childhood on risk of cardiovascular disease in middle and older age in three countries in Central and Eastern Europe (Russia, Poland and the Czech Republic).

This research has not provided conclusive evidence of a link between childhood SEC and overall CVD risk, as measured by a composite score of classical risk factors, or with blood pressure or cholesterol. However, the thesis has shown that childhood SEC impacts upon both smoking habits and obesity, independently of adult SEC. Disadvantage in childhood was associated with increased adiposity and a higher likelihood of quitting smoking.

The relationships between childhood SEC and CVD risk factors in these three CEE countries do not reflect those observed in western countries, and this can be attributed to three factors. Firstly, the socio-political environment in CEE in the years following WWII when childhood exposures took place resulted in a more egalitarian society and therefore some reduction in the social gradient in health. Secondly, the positioning of these countries in the epidemiologic and nutritional transitions, as well as the tobacco epidemic, influenced the direction of the social gradient in risk factors. Thirdly, the dramatic social changes which have taken place during the lifetimes of the study participants have had effects on CVD risk which masked those of early life circumstances.

Future research should establish how childhood experiences influence the high rates of cardiovascular disease mortality in Central and Eastern Europe.

Reference List

(1) Shkolnikov V, McKee M, Leon DA. Changes in life expectancy in Russia in the mid-1990s. The Lancet 2001; 357(9260):917-921.

(2) The European Health Report 2002. 2002. Copenhagen, World Health Organisation (Regional Office for Europe).
Ref Type: Report

(3) Men T, Brennan P, Boffetta P, Zaridze D. Russian mortality trends for 1991-2001: analysis by cause and region. BMJ 2003; 327(7421):964.

(4) WHO European Health for All Database. 2007. Copenhagen, WHO.
Ref Type: Data File

(5) Shkolnikov VM, Mesle F, Vallin J. Health Crisis in Russia II. Changes in Causes of Death: a Comparison with France and England and Wales (1970-1993). Population 1996; 8:155-189.

(6) Bobak M, Marmot M. East-West mortality divide and its potential explanations: proposed research agenda. BMJ 1996; 312(7028):421-425.

(7) Mueller-Nordhorn J, Binting S, Roll S, Willich SN. An update on regional variation in cardiovascular mortality within Europe. Eur Heart J 2008; 29(10):1316-1326.

(8) Leon DA, Chenet L, Shkolnikov VM, Zakharov S, Shapiro J, Rakhmanova G et al. Huge variation in Russian mortality rates 1984-94: artefact, alcohol, or what? The Lancet 1997; 350(9075):383-388.

(9) McKee M, Shkolnikov V, Leon DA. Alcohol is Implicated in the Fluctuations in Cardiovascular Disease in Russia Since the 1980s. Annals of Epidemiology 2001; 11(1):1-6.

(10) Shkolnikov VM, Cornia GA, Leon DA, Mesle F. Causes of the Russian mortality crisis: Evidence and interpretations. World Development 1998; 26(11):1995-2011.

(11) Chenet L, Mckee M, Leon D, Shkolnikov V, Vassin S. Alcohol and cardiovascular mortality in Moscow; new evidence of a causal association. J Epidemiol Community Health 1998; 52(12):772-774.

(12) Leon DA, Saburova L, Tomkins S, Andreev E, Kiryanov N, McKee M et al. Hazardous alcohol drinking and premature mortality in Russia: a population based case-control study. The Lancet 369(9578):2001-2009.

(13) Bobak M, Marmot M. Alcohol and mortality in Russia; Is it different than elsewhere? Annals of Epidemiology 1999; 9(6):335-338.

(14) Malyutina S, Bobak M, Kurilovitch S, Gafarov V, Simonova G, Nikitin Y et al. Relation between heavy and binge drinking and all-cause and cardiovascular mortality in Novosibirsk, Russia: a prospective cohort study. The Lancet 2002; 360(9344):1448-1454.

(15) Vlassov V, Notzon FC, Komarov YM, Ermakov SP, Sempos CT, Marks JS et al. The Role of Alcohol and Social Stress in Russia's Mortality Rate. JAMA 1999; 281(4):321.

(16) Nicholson A, Bobak M, Murphy M, Rose R, Marmot M. Alcohol consumption and increased mortality in Russian men and women: a cohort study based on the mortality of relatives. Bulletin of the World Health Organisation 2005; 83:812-819.

(17) Notzon FC, Komarov YM, Ermakov SP, Sempos CT, Marks JS, Sempos EV. Causes of Declining Life Expectancy in Russia. JAMA 1998; 279(10):793-800.

(18) Murphy M, Bobak M, Nicholson A, Rose R, Marmot M. The Widening Gap in Mortality by Educational Level in the Russian Federation, 1980-2001. Am J Public Health 2006; 96(7):1293-1299.

(19) Bobak M. Relative and absolute gender gap in all-cause mortality in Europe and the contribution of smoking. European Journal of Epidemiology 2003; 18(1):15.

(20) Andreev E, Mckee M, Shkolnikov VM. Health expectancy in the Russian Federation: a new perspective on the health divide in Europe. Bulletin of the World Health Organisation 2003; 81:778-787.

(21) Plavinski SL, Plavinskaya SI, Klimov AN. Social factors and increase in mortality in Russia in the 1990s: prospective cohort study. BMJ 2003; 326(7401):1240-1242.

(22) Shkolnikov VM, Leon DA, Adamets S, Eugeniy A, Deev A. Educational level and adult mortality in Russia: An analysis of routine data 1979 to 1994. Social Science & Medicine 1998; 47(3):357-369.

(23) La Vecchia C, Levi F, Negri E. Trends in mortality from major diseases in Europe, 1980-1993. European Journal of Epidemiology 1998; 14(1):1-8.

(24) Chenet L, McKee M, Fulop N, Bojan F, Brand H, Hort A et al. Changing life expectancy in central Europe: is there a Single reason? J Public Health 1996; 18(3):329-336.

(25) Nolte E, Shkolnikov V, McKee M. Changing mortality patterns in East and West Germany and Poland. II: Short-term trends during transition and in the 1990s. J Epidemiol Community Health 2000; 54(12):899-906.

(26) Kesteloot H, Sans S, Kromhout D. Dynamics of cardiovascular and all-cause mortality in Western and Eastern Europe between 1970 and 2000. Eur Heart J 2006; 27(1):107-113.

(27) Shkolnikov VM, Andreev EM, Jasilionis D, Leinsalu M, Antonova OI, McKee M. The changing relation between education and life expectancy in central and eastern Europe in the 1990s. J Epidemiol Community Health 2006; 60(10):875-881.

(28) UNICEF. A Decade of Transition. UNICEF Innocenti Research Centre; 2007.

(29) Dzurova D. Mortality differentials in the Czech Republic during the post-1989 socio-political transformation. Health & Place 2000; 6(4):351-362.

(30) Zatonski WA, McMichael AJ, Powles JW. Ecological study of reasons for sharp decline in mortality from ischaemic heart disease in Poland since 1991. BMJ 1998; 316(7137):1047-1051.

(31) Bobak M, Skodova Z, Pisa Z, Poledne R, Marmot M. Political changes and trends in cardiovascular risk factors in the Czech Republic, 1985-92. J Epidemiol Community Health 1997; 51:272-277.

(32) Balczewska E. Smoking and tobacco control in Poland. European Journal of Dental Education 2004; 8(s4):4245.

(33) Skodova Z, Cifkova R, Adamkova V, Duskova A, Hauserova G, Hejl Z et al. Development of smoking habits in the population of the Czech Republic from 1985 to 1997/98. Casopis Lekaru Ceskych 2000; 139(5):143-147.

(34) Britton A, Mckee M. The relation between alcohol and cardiovascular disease in Eastern Europe: explaining the paradox. J Epidemiol Community Health 2000; 54(5):328-332.

(35) Walberg P, Mckee M, Shkolnikov VM, Chenet L, Leon DA. Economic change, crime, and mortality crisis in Russia: regional analysis. BMJ 1998; 317(7154):312-318.

(36) Bobak M, Pikhart H, Hertzman C, Rose R, Marmot M. Socioeconomic factors, perceived control and self-reported health in Russia. A cross-sectional survey. Social Science & Medicine 1998; 47(2):269-279.

(37) Milanovic B. Income, Inequality, and Poverty During the Transition from Planned to Market Economy. Washington, DC: World Bank Publications; 1998.

(38) Deacon B. Eastern European welfare states: the impact of the politics of globalization. Journal of European Social policy 2000; 10(2):146-161.

(39) Haynes M, Husan R. A century of state murder? Death and policy in twentieth-century Russia. London: Pluto Press; 2003.

(40) Connor WD. Socialism, Politics and Equality: Heirarchy and change in Eastern Europe and the USSR. New York: Columbia University Press; 1979.

(41) Elford J, Whincup P, Shaper AG. Early Life Experience and Adult Cardiovascular-Disease - Longitudinal and Case-Control Studies. Int J Epidemiol 1991; 20(4):833-844.

(42) Galobardes B, Lynch JW, Davey Smith G. Childhood socioeconomic circumstances and cause-specific mortality in adulthood: Systematic review and interpretation. Epidemiol Rev 2004; 26:7-21.

(43) Galobardes B, Smith GD, Lynch JW. Systematic Review of the Influence of Childhood Socioeconomic Circumstances on Risk for Cardiovascular Disease in Adulthood. Annals of Epidemiology 2006; 16(2):91-104.

(44) Kuh D, Ben-Shlomo Y, Lynch J, Hallqvist J, Power C. Life course epidemiology. J Epidemiol Community Health 2003; 57(10):778-783.

(45) Lynch J, Davey Smith G. A life course approach to chronic disease epidemiology. Annual Review of Public Health 2005; 26:1-35.

(46) Wadsworth MEJ. Health inequalities in the life course perspective. Social Science & Medicine 1997; 44(6):859-869.

(47) Kuh D, Davey Smith G. When is mortality risk determined? Historical insights into a current debate. Soc Hist Med 1993; 6(1):101-123.

(48) Rose G. Incubation period of coronary heart disease. British Medical Journal 1982; 284:1600-1601.

(49) Ben Shlomo Y, Kuh D. A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. Int J Epidemiol 2002; 31(2):285-293.

(50) Hertzman C, Power C, Matthews S, Manor O. Using an interactive framework of society and lifecourse to explain self-rated health in early adulthood. Social Science & Medicine 2001; 53(12):1575-1585.

(51) Pollitt RA, Rose K, Kaufman J. Evaluating the evidence for models of life course socioeconomic factors and cardiovascular outcomes: a systematic review. BMC Public Health 2005; 5(1):7.

(52) Forsdahl A. Living conditions in childhood and subsequent development of risk factors for arteriosclerotic heart disease. J Epidemiol Community Health 1978; 32:34-37.

(53) Holland P, Berney L, Blane D, Davey Smith G, Gunnell DJ, Montgomery SM. Life course accumulation of disadvantage: childhood health and hazard exposure during adulthood. Social Science & Medicine 2000; 50(9):1285-1295.

(54) Singh-Manoux A, Ferrie JE, Chandola T, Marmot M. Socioeconomic trajectories across the life course and health outcomes in midlife: evidence for the accumulation hypothesis? Int J Epidemiol 2004; 33(5):1072-1079.

(55) Hallqvist J, Lynch J, Bartley M, Lang T, Blane D. Can we disentangle life course processes of accumulation, critical period and social mobility? An analysis of disadvantaged socio-economic positions and myocardial infarction in the Stockholm Heart Epidemiology Program. Social Science & Medicine 2004; 58(8):1555-1562.

(56) Landry A. La Revolution Demographique. Paris: 1934.

(57) Popkin BM. Nutritional patterns and transitions. Population and Development Review 1993; 19(1):138-157.

(58) Omran AR. The epidemiologic transition. A theory of the Epidemiology of population change. 1971. Bulletin of the World Health Organisation 2001; 79(2):161-170.

(59) Marmot MG, Shipley MJ, Rose G. Inequalities in Death - Specific explanations of a general pattern? The Lancet 1984; 323(8384):1003-1006.

(60) Rose G, Marmot MG. Social class and coronary heart disease. Br Heart J 1981; 45(1):13-19.

(61) Marmot M, Adelstein A, Robinson N, Rose G. Changing social-class distribution on heart disease. British Medical Journal 1978; 2(6145):1109-1112.

(62) Sorel JE, Ragland DR, SYME SL, Davis WB. Educational Status and Blood Pressure: The Second National Health and Nutrition Examination Survey, 1976-1980, and the Hispanic Health and Nutrition Examination Survey, 1982-1984. Am J Epidemiol 1992; 135(12):1339-1348.

(63) Kunst AE, Geurts JJ, van den Berg J. International variation in socioeconomic inequalities in self reported health. J Epidemiol Community Health 1995; 49(2):117-123.

(64) Pearson TA. Education and income: double-edged swords in the epidemiologic transition of cardiovascular disease. Ethnicity and Disease 2003; 13(S2):A158-S163.

(65) Reddy KS, Yusuf S. Emerging Epidemic of Cardiovascular Disease in Developing Countries. Circulation 1998; 97(6):596-601.

(66) Rimpel AH, Pukkala EI. Cancers of affluence: Positive social class gradient and rising incidence trend in some cancer forms. Social Science & Medicine 1987; 24(7):601-606.

(67) Popkin BM. The nutrition transition and its health implications in lower-income countries. Public Health Nutrition 1998; 1(1):5-21.

(68) Olshansky SJ, Ault AB. The fourth stage of the epidemiologic transition: The age of degenerative diseases. The Milbank Memorial Fund Quarterly 1986; 64(3):355-391.

(69) Pearson TA. Cardiovascular diseases in developing countries: Myths, realities and opportunities. Cardiovascular Drugs and Therapy 1999; 13(2):95-104.

(70) Doak CM, Adair LS, Monteiro C, Popkin BM. Overweight and Underweight Coexist within Households in Brazil, China and Russia. J Nutr 2000; 130(12):2965-2971.

(71) Yusuf S, Reddy S, Ounpuu S, Anand S. Global Burden of Cardiovascular Diseases: Part I: General Considerations, the Epidemiologic Transition, Risk Factors, and Impact of Urbanization. Circulation 2001; 104(22):2746-2753.

(72) Strong JP, McGill H. The natural history of coronary atherosclerosis. American Journal of Pathology 1962; 40(1):37-49.

(73) Tracy R, Newman III WP, Wattingney W, Berenson G. Risk factors and atherosclerosis in youth autopsy findings of the Bogalusa Heart Study. American Journal of Medical Science 1995; 310(1):S37-S41.

(74) Mahoney LT, Burns TL, Stanford W, Thompson BH, Witt JD, Rost CA et al. Coronary risk factors measured in childhood and young adult life are associated with coronary artery calcification in young adults: The muscatine study. Journal of the American College of Cardiology 1996; 27(2):277-284.

(75) Barker DJP, Osmond C, Golding J, Kuh D, Wadsworth M. Growth in utero, blood pressure in childhood and adult life, and mortality from cardiovascular disease. British Medical Journal 1989; 298(6673):564-567.

(76) Barker DJP, Forsen T, Eriksson J, Osmond C. Growth and living conditions in childhood and hypertension in adult life: a longitudinal study. Journal of Hypertension 2000; 20(10):1951-1956.

(77) Barker DJP, Osmond C, Forsen TJ, Kajantie E, Eriksson JG. Maternal and Social Origins of Hypertension. Hypertension 2007; 50(3):565-571.

(78) Barker DJP. Commentary: Developmental origins of raised serum cholesterol. Int J Epidemiol 2003; 32(5):876-877.

(79) Barker DJP, Osmond C. Infant mortality, childhood nutrition, and ischaemic heart disease in England and Wales. The Lancet 1986; 1:1077-1081.

(80) Barker DJP, Winter PD, Osmond C, Margetts B, Simmonds SJ. Weight in infancy and death from ischaemic heart disease. The Lancet 1989; 2:577-581.

(81) Barker DJP, Martyn CN. The maternal and fetal origins of cardiovascular disease. J Epidemiol Community Health 1992; 46:8-11.

(82) Barker DJP. Fetal origins of coronary heart disease. BMJ 1995; 311:171-174.

(83) Perry I. Fetal growth and development: the role of nutrition and other factors. In: Kuh D, Ben-Shlomo Y, editors. A life course approach to chronic disease epidemiology. Oxford: Oxford University Press; 1997. 145-168.

(84) Eskenzai B, Bergmann J. Passive and active maternal smoking during pregnancy, as measured by serum cotinine and post-natal smoke exposure. Am J Epidemiol 1995; 142:s8-s10.

(85) Spohr H, Willms J, Steinhausen H. Parental alcohol exposure and long-term developmental consequences. Lancet 1993; 341:907-910.

(86) Lucas A, Fewtrell MS, Cole TJ. Fetal origins of adult disease---the hypothesis revisited. BMJ 1999; 319(7204):245-249.

(87) Oddy WH. Breastfeeding protects against illness and infection in infants and children: a review of the evidence. Breastfeeding Review 2001; 9(2):11-18.

(88) Benetou V, Bamia C, Trichopoulos D, Trichopoulou A. Associations of anthropometric characteristics with blood cholesterol fractions among adults. The Greek EPIC study. Eur J Clin Nutr 2006; 60(8):942-948.

(89) Bergstrom E, Hernell O, Persson L+, Vessby B. Serum lipid values in adolescents are related to family history, infant feeding, and physical growth. Atherosclerosis 1995; 117(1):1-13.

(90) Marmot MG, Page CM, Atkins E, Douglas JW. Effect of breast-feeding on plasma cholesterol and weight in young adults. J Epidemiol Community Health 1980; 34(3):164-167.

(91) Grummer-Strawn LM, Mei Z. Does Breastfeeding Protect Against Pediatric Overweight? Analysis of Longitudinal Data From the Centers for Disease Control and Prevention Pediatric Nutrition Surveillance System. Pediatrics 2004; 113(2):e81-e86.

(92) Richards M, Hardy R, Wadsworth M. Long term effects of breast feeding in a national birth cohort: educational attainment and midlife cognitive function. Public Health Nutrition 2002; 5:631-635.

(93) Power C, Graham H, Due P, Hallqvist J, Joung I, Kuh D et al. The contribution of childhood and adult socioeconomic position to adult obesity and smoking behaviour: an international comparison. Int J Epidemiol 2005; 34(2):335-344.

(94) Davey Smith G, Hart C, Hole D, MacKinnon P, Gillis C, Watt G et al. Education and occupational social class: which is the more important indicator of mortality risk? J Epidemiol Community Health 1998; 52(3):153-160.

(95) Blane D, Hart C, Davey Smith G, Gillis C, Hole D, Hawthorne V. Association of cardiovascular disease risk factors with socioeconomic position during childhood and during adulthood. British Medical Journal 1996; 313(7070):1434-1438.

(96) Brunner E, Shipley M, Blane D, Davey Smith G, Marmot M. When does cardiovascular risk start? Past and present socioeconomic circumstances and risk factors in adulthood. J Epidemiol Community Health 1999; 53:757-764.

(97) Evandrou M, Falkingham J. Smoking behaviour and socio-economic status: a cohort analysis, 1974-1998. Health Statistics Quarterly 2002; 14:30-38.

(98) Graham H, Francis B, Inskip HM, Harman J, SWS Study Group. Socioeconomic lifecourse influences on women's smoking status in early adulthood. J Epidemiol Community Health 2006; 60(3):228-233.

(99) Langenberg C, Hardy R, Kuh D, Brunner E, Wadsworth M. Central and total obesity in middle aged men and women in relation to lifetime socioeconomic status: evidence from a national birth cohort. J Epidemiol Community Health 2003; 57(10):816-822.

(100) Power C, Manor O, Matthews S. Child to adult socioeconomic conditions and obesity in a national cohort. International Journal of Obesity 2003; 27(9):1081-1086.

(101) Sobal J, Stunkard A. Socioeconomic status and obesity: A review of the literature. Psychological Bulletin 1989; 105(2):260-275.

(102) Peasey A, Bobak M, Kubinova R, Malyutina S, Pajak A, Tamosiunas A et al. Determinants of cardiovascular disease and other non-communicable diseases in Central and Eastern Europe: Rationale and design of the HAPIEE study. BMC Public Health 2006; 6(1):255-264.

(103) Tchernina N. Rising unemployment and coping strategies: the case of the Novosibirsk oblast in Russia. In: Cornia GA, Paniccia R, editors. The mortality crisis in transitional economies. New York: Oxford University Press; 2000. 151-173.

(104) Malyutina S, Simonova G, Nikitin Y. Coronary heart disease and cardiovascular mortality in the urban Siberian population. In: Weidner G, Kopp M, Kristenson M, editors. Heart disease: environment, stress and gender. Amsterdam: IOS Press; 2002.

(105) Expert Panel on Detection EaToHBCiA. Executive Summary of the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). JAMA 2001; 285(19):2486-2497.

(106) El Assaad MA, Topouchiran JA, Asmar RG. Evaluation of two devices for self-measurement of blood pressure according to the international protocol: the Omron M5-1 and the Omron 705IT. Blood Pressure Monitoring 2003; 8(3):127-133.

(107) Pickering T. Clinical applications of ambulatory blood pressure monitoring: the white coat syndrome. Journal of Clinical Investigative Medicine 1991; 14(3):212-217.

(108) Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL, Jr. et al. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: The JNC 7 Report. JAMA 2003; 289(19):2560-2571.

(109) Conroy RM, Pyorala K, Fitzgerald AP, Sans S, Menotti A, De Backer G et al. Estimation of ten-year risk of fatal cardiovascular disease in Europe: the SCORE project. Eur Heart J 2003; 24(11):987-1003.

(110) Criqui MH, Barrett-Connor E, Austin M. Differences between respondents and non-respondents in a population-based cardiovascular disease study. Am J Epidemiol 1978; 108(5):367-372.

(111) Eaker S, Bergstrom R, Bergstrom A, Adami HO, Nyren O. Response Rate to Mailed Epidemiologic Questionnaires: A Population-based Randomized Trial of Variations in Design and Mailing Routines. Am J Epidemiol 1998; 147(1):74-82.

(112) Hoeymans N, Feskens E, Van Den Bos G, Kromhout D. Non-response bias in a study of cardiovascular diseases, functional status and self-rated health among elderly men. Age Ageing 1998; 27(1):35-40.

(113) Korkeila K, Suominen S, Ahvenainen J, Ojanlatva A, Rautana P, Helenius H et al. Non-response and related factors in a nation-wide health survey. European Journal of Epidemiology 2001; 17(11):991-999.

(114) Purdie DM, Dunne MP, Boyle FM, Cook MD, Najman JM. Health and demographic characteristics of respondents in an Australian national sexuality survey: comparison with population norms. J Epidemiol Community Health 2002; 56(10):748-753.

(115) Seltzer CC, Bosse RA, Garvey AJ. Mail survey response by smoking status. Am J Epidemiol 1974; 100(6):453-457.

(116) Sheikh K, Mattingly S. Investigating non-response bias in mail surveys. J Epidemiol Community Health 1981; 35(4):293-296.

(117) Sonne-Holm S, Sorensen TI, Jensen G, Schnohr P. Influence of fatness, intelligence, education and sociodemographic factors on response rate in a health survey. J Epidemiol Community Health 1989; 43(4):369-374.

(118) Walker M, Shaper AG, Cook DG. Non-participation and mortality in a prospective study of cardiovascular disease. J Epidemiol Community Health 1987; 41(4):295-299.

(119) Donders AR, van der Heijden GJMG, Stijnen T, Moons KGM. Review: A gentle introduction to imputation of missing values. Journal of Clinical Epidemiology 2006; 59(10):1087-1091.

(120) Buckle PW. Self-reported anthropometry. Ergonomics 1985; 28(11):1575-1577.

(121) Rowland ML. Reporting bias in height and weight data. Statistical Bulletin of the Metropolitan Insurance Company 1989; 70:2-11.

(122) Stewart A, Jackson R, Ford M, Beaglehole R. Underestimation of relative weight by use of self-reported height and weight. Am J Epidemiol 1987; 125(1):122-126.

(123) Shaw M, Galobardes B, Lawlor DA, Lynch J, Wheeler B, Davey Smith G. The handbook of inequality and socioeconomic position. Bristol: Policy Press; 2007.

(124) Liberatos P, Link B, Kelsey J. The measurement of social class in epidemiology. Epidemiol Rev 1988; 10(1):87-121.

(125) Turrell G. Income non-reporting: implications for health inequalities research. J Epidemiol Community Health 2000; 54(3):207-214.

(126) Nederhof AJ. Methods of coping with social desirability bias: a review. European Journal of Social Psychology 2006; 15(3):263-280.

(127) Kunst A, Groenhof F, Mackenbach J, EU Working Group on Socioeconomic Inequalities in Health, Leon DA. Occupational class and cause specific mortality in middle aged men in 11 European countries: comparison of population based studies. Commentary: Unequal inequalities across Europe. BMJ 1998; 316(7145):1636-1642.

(128) Mackenbach JP, Bos V, Andersen O, Cardano M, Costa G, Harding S et al. Widening socioeconomic inequalities in mortality in six Western European countries. Int J Epidemiol 2003; 32(5):830-837.

(129) DFID. DFID Asset Index Seminar Report. DFID [2006 Available from: URL:http://www.dfidhealthrc.org/shared/events/events_reports/asset_index/Asset_Index_workshop.pdf

(130) Houweling T, Kunst A, Mackenbach J. Measuring health inequality among children in developing countries: does the choice of the indicator of economic status matter? International Journal for Equity in Health 2003; 2(1):8.

(131) Geyer S, Hemstrom O, Peter R, Vagero D. Education, income, and occupational class cannot be used interchangeably in social epidemiology. Empirical evidence against a common practice. J Epidemiol Community Health 2006; 60(9):804-810.

(132) Mare RD. Five decades of educational assortative mating. American Sociological Review 1991; 56(1):15-32.

(133) Blackwell DL, Lichter DT. Mate selection among married and cohabiting couples. Journal of Family Issues 2000; 21(3):275-302.

(134) Kalmijn M. Status homogamy in the United States. The American Journal of Sociology 1991; 97(2):496-523.

(135) Katrnak T, Kreidl M, Fonadova L. Trends in educational assortative mating in post-socialist Central Europe. 2005. Los Angeles, University of California. California Centre for Population Research Online Working Paper Series.
Ref Type: Report

(136) Harmon C, Oosterbeek H, Walker I. The returns to education: microeconomics. Journal of Economic Surveys 2003; 17(2):115-156.

(137) Katz K. Were there no returns to education in the USSR? Estimates from Soviet-period household data. Labour Economics 1999; 6(3):417-434.

(138) Cheidvasser S, Benitez-Silva H. The educated Russian's curse: Returns to education in the Russian Federation. 2000. Stonybrook, NY, SUNY Stonybrook, Department of Economics.
Ref Type: Report

(139) Leitch I. Growth and health. Int J Epidemiol 2001; 30(2):212-216.

(140) Silventoinen K, Kaprio J, Lahelma E, Koskenvuo M. Relative effect of genetic and environmental factors on body height: Differences across birth cohorts among Finnish men and women. Am J Public Health 2000; 90(4):627-630.

(141) Cole TJ. The secular trend in human physical growth: a biological view. Economics & Human Biology 2003; 1(2):161-168.

(142) Pietilainen KH, Kaprio J, Rasanen M, Rissanen A, Rose RJ. Genetic and Environmental Influences on the Tracking of Body Size from Birth to Early Adulthood. Obesity Res 2002; 10(9):875-884.

(143) Johnston FE. Somatic growth of the infant and preschool child. In: Falkner F, Tanner JM, editors. Human Growth. A comprehensive treatise. 2nd ed. London: Plenum Press; 1986. 3-24.

(144) Neumark-Sztainer D, Story M, Resnick M, Blum R. Correlates of inadequate fruit and vegetable consumption among adolescents. Preventive Medicine 1996; 25(5):497-505.

(145) Krebs-Smith SM, Cook A, Subar AF, Cleveland L, Friday J, Kahle LL. Fruit and vegetable intakes of children and adolescents in the United States. Arch Pediatr Adolesc Med 1996; 150(1):81-86.

(146) Egbuonu L, Starfield B. Child Health and Social Status. Pediatrics 1982; 69(5):550-557.

(147) Kuh DL, Wadsworth M. Parental Height - Childhood Environment and Subsequent Adult Height in A National Birth Cohort. Int J Epidemiol 1989; 18(3):663-668.

(148) Li L, Manor O, Power C. Early environment and child-to-adult growth trajectories in the 1958 British birth cohort. Am J Clin Nutr 2004; 80(1):185-192.

(149) Nystrom Peck AM, Vagero DH. Adult Body Height and Childhood Socioeconomic Group in the Swedish Population. J Epidemiol Community Health 1987; 41(4):333-337.

(150) Kuh DL, Power C, Rodgers B. Secular Trends in Social-Class and Sex-Differences in Adult Height. Int J Epidemiol 1991; 20(4):1001-1009.

(151) Walker M, Shaper AG, Wannamethee G. Height and Social-Class in Middle-Aged British Men. J Epidemiol Community Health 1988; 42(3):299-303.

(152) Nystrom Peck AM, Lundberg O. Short stature as an effect of economic and social conditions in childhood. Social Science & Medicine 1995; 41(5):733-738.

(153) Cole TJ. Secular trends in growth. Proceedings of the Nutrition Society 2000; 59(2):317-324.

(154) Billewicz WZ, Thomson AM, Fellowes HM. A Longitudinal-Study of Growth in Newcastle-Upon-Tyne Adolescents. Annals of Human Biology 1983; 10(2):125-133.

(155) Wadsworth MEJ, Hardy RJ, Paul AA, Marshall SF, Cole TJ. Leg and trunk length at 43 years in relation to childhood health, diet and family circumstances; evidence from the 1946 national birth cohort. Int J Epidemiol 2002; 31(2):383-390.

(156) Gunnell DJ, Davey Smith G, Frankel S, Kemp M, Peters TJ. Socioeconomic and dietary influences on leg length and trunk length in childhood. Paediatric and Perinatal Epidemiology 2005; 12 (Supplement 1):96-113.

(157) Gunnell DJ. Commentary: Early insights into height, leg length, proportionate growth and health. Int J Epidemiol 2001; 30(2):221-222.

(158) Gunnell DJ, Davey Smith G, Frankel S, Nanchahal K, Braddon FE, Pemberton J et al. Childhood leg length and adult mortality: follow up of the Carnegie (Boyd

Orr) Survey of Diet and Health in Pre-war Britain. J Epidemiol Community Health 1998; 52(3):142-152.

(159) Power C, Matthews S. Origins of health inequalities in a national population sample. The Lancet 1997; 350(9091):1584-1589.

(160) Gigante DP, Horta BL, Lima RC, Barros FC, Victora CG. Early life factors are determinants of female height at age 19 years in a population-based birth cohort (Pelotas, Brazil). J Nutr 2006; 136(2):473-478.

(161) Miller JE, Korenman S. Poverty and Childrens Nutritional-Status in the United-States. Am J Epidemiol 1994; 140(3):233-243.

(162) Tanner JM, Hayashi T, Preece MA, Cameron N. Increase in Length of Leg Relative to Trunk in Japanese-Children and Adults from 1957 to 1977 - Comparison with British and with Japanese-Americans. Annals of Human Biology 1982; 9(5):411-423.

(163) Turan S, Bereket A, Omar A, Berber M, Ozen A, Bekiroglu N. Upper segment/lower segment ratio and armspan-height difference in healthy Turkish children. Acta Paediatrica 2005; 94(4):407-413.

(164) Power C, Manor O, Li L. Are inequalities in height underestimated by adult social position? Effects of changing social structure and height selection in a cohort study. British Medical Journal 2002; 325(7356):131-134.

(165) Dangour AD, Schilg S, Hulse JA, Cole TJ. Sitting height and subischial leg length centile curves for boys and girls from Southeast England. Annals of Human Biology 2002; 29(3):290-305.

(166) Cavelaars AEJM, Kunst AE, Geurts JJM, Crialesi R, Grotvedt L, Helmert U et al. Persistent variations in average height between countries and between socio-economic groups: an overview of 10 European countries. Annals of Human Biology 2000; 27(4):407-421.

(167) Meyer HE, Selmer R. Income, educational level and body height. Annals of Human Biology 1999; 26(3):219-227.

(168) Leung SSF, Lau JTF, Xu YY, Tse LY, Huen KF, Wong GWK et al. Secular changes in standing height, sitting height and sexual maturation of Chinese - The Hong Kong growth study, 1993. Annals of Human Biology 1996; 23(4):297-306.

(169) Steckel RH. Stature and the standard of living. Journal of Economic Literature 1995; 33(4):1903-1940.

(170) Yun DJ, Yun DK, Chang YY, Lim SW, Lee MK, Kim SY. Correlations Among Height, Leg Length and Arm Span in Growing Korean Children. Annals of Human Biology 1995; 22(5):443-458.

(171) Herngreen WP, Vanbuuren S, Vanwieringen JC, Reerink JD, Verloovevanhorick SP, Ruys JH. Growth in Length and Weight from Birth to 2 Years of A Representative Sample of Netherlands Children (Born in 1988-89) Related to

Socioeconomic-Status and Other Background Characteristics. Annals of Human Biology 1994; 21(5):449-463.

(172) Monteiro CA, Benicio MHD, Gouveia ND. Secular Growth Trends in Brazil Over 3 Decades. Annals of Human Biology 1994; 21(4):381-390.

(173) Bielicki T, Szczotka H, Charzewski J. The influence of three socio-economic factors on body height in Polish military conscripts. Human Biology 1981; 53:543-555.

(174) Lipset SM, Bendix R. Social Mobility in Industrial Society. Berkeley: University of California Press; 1959.

(175) Dearden L, Machin S, Reed H. Intergenerational Mobility in Britain. The Economic Journal /1; 107(440):47-66.

(176) Rutkevich MN, Filipov FR. Principles of the Marxist approach to social structure and social mobility. In: Yanowitch M, Fisher WA, editors. Social stratification and mobility in the USSR. White Plains, New York: International Arts and Sciences Press; 1973. 229-240.

(177) Marshall G, Sydorenko S, Roberts S. Intergenerational Social Mobility in Communist Russia. Work Employment Society 1995; 9(1):1-27.

(178) Averett S, Korenman S. The economic reality of the beauty myth. Journal of Human Resources 1996; 31(2):304-330.

(179) Mitra A. Effects of physical attributes on the wages of males and females. Applied Economics Letters 2001; 8:731-735.

(180) Biddle JE, Hamermesh DS. Beauty, Productivity, and Discrimination: Lawyers' Looks and Lucre. Journal of Labor Economics 1998; 16(1):172-201.

(181) Harper B. Beauty, stature and the labour market: A British cohort study. Oxford Bulletin of Economics and Statistics 2008; 62:771-800.

(182) Judge TA, Cable DM. The effect of physical height on workplace success and income: Preliminary test of a theoretical model. Journal of Applied Psychology 2004; 89(3):428-441.

(183) Case A, Paxson C. Stature and Status: Height, Ability, and Labor Market Outcomes. Journal of Political Economy 2008; 116(3):499-532.

(184) Szklarrska A, Slawomir K, Bielicki T, Malina RM. Influence of height on attained level of education in males at 19 years of age. Journal of Biosocial Science 2007; 39(575):582.

(185) Magnusson PKE, Rasmussen F, Gyllensten UB. Height at age 18 years is a strong predictor of attained education later in life: cohort study of over 950 000 Swedish men. Int J Epidemiol 2006; 35(3):658-663.

(186) Heineck G. A note on the height-wage differential in the UK - Cross-sectional evidence from the BHPS. Economics Letters 2008; 98(3):288-293.

(187) Pini R, Tonon E, Cavallini MC, Bencini F, Di Bari M, Masotti G et al. Accuracy of equations for predicting stature from knee height, and assessment of statural loss in an older Italian population. Journals of Gerontology Series A-Biological Sciences and Medical Sciences 2001; 56(1):B3-B7.

(188) Cline MG, Meredith KE, Boyer JT, Burrows B. Decline of Height with Age in Adults in A General-Population Sample - Estimating Maximum Height and Distinguishing Birth Cohort Effects from Actual Loss of Stature with Aging. Human Biology 1989; 61(3):415-425.

(189) Davies KM, Recker RR, Stegman MR, Heaney RP. Tallness Versus Shrinkage - do Women Shrink with Age Or Grow Taller with Recent Birth Date. Journal of Bone and Mineral Research 1991; 6(10):1115-1120.

(190) Sorkin JD, Muller DC, Andres R. Longitudinal change in height of men and women: Implications for interpretation of the body mass index - The Baltimore Longitudinal Study of Aging. Am J Epidemiol 1999; 150(9):969-977.

(191) Bobrova N. 2008.
Ref Type: Personal Communication

(192) Mitchell BR. International historical statistics: Europe 1750-2000. 5 ed. New York: Palgrave Macmillan; 2003.

(193) Maly M. 2007.
Ref Type: Personal Communication

(194) Hasle H, Boldsen JL. Childhood Conditions and Adult Height. Journal of Biosocial Science 1991; 23(1):107-112.

(195) Voevoda M. 2007.
Ref Type: Personal Communication

(196) Breen R, Luijkx R, Muller W, Pollak R, Vallet L. Social Mobility in Europe. 2004. Oxford, Oxford Scholarship Online Monographs.
Ref Type: Report

(197) Floud R. Measuring European inequality, the use of height data. In: Fox AJ, editor. Health Inequalities in European Countries. Aldershot: Gower; 1989.

(198) Komlos J. Stature and nutrition in the Habsburg Monarchy: The standard of living and economic development in the Eighteenth Century. American Historical Review 1985; 90(5):1149-1161.

(199) Ulijaszek SJ. The secular trend. In: Ulijaszek SJ, Johnston FE, Preece MA, editors. The Cambridge Encyclopaedia of Human Growth and Development. Cambridge: Cambridge University Press; 1998. 395-398.

(200) Relethford JH, Lees FC. The effects of ageing and secular trend on stature in rural western Ireland. American Journal of Physical Anthropology 1980; 55(1):81-88.

(201) Dubrova YE, Kurbatova OL, Kholod ON, Prokhorovskaya VD. Secular growth trend in two generations of the Russian population. Human Biology 1995; 67(5):755-767.

(202) Schmidt IM, Jorgensen MH, Michaelsen KF. Height of conscripts in Europe: is postneonatal mortality a predictor? Annals of Human Biology 1995; 22(1):57-67.

(203) Sparen P, Vagero D, Shestov D, Plavinskaja S, Parfenova N, Hoptiar V et al. Long term mortality after severe starvation during the siege of Leningrad: prospective cohort study. BMJ 2004; 328(7430):11.

(204) Bielicki T, Malina RM, Waliszko A. Monitoring the dynamics of social stratification: Statural variation among Polish conscripts in 1976 and 1986. American Journal of Human Biology 1992; 4:345-352.

(205) Bielicki T, Szklarska A. The stratifying force of family size, urbanization and parental education in Socialist-era Poland. Journal of Biosocial Science 1999; 31:525-536.

(206) Bielicki T, Szklarska A, Koziel S, Ulijaszek SJ. Changing patterns of social variation in stature in Poland: Effects of transition from a command economy to the free-market system? Journal of Biosocial Science 2005; 37:427-434.

(207) Krawczynski M, Walkowiak J, Krzyzaniak A. Secular changes in body height and weight in children and adolescents in Poznan, Poland between 1880 and 2000. Acta Paediatrica 2003; 92(3):277-282.

(208) Vignerova J, Brabec M, Blaha P. Two centuries of growth among Czech children and youth. Economics & Human Biology 2006; 4(2):237-252.

(209) Mironov B. Birth weight and physical stature in St. Petersburg: Living standards of women in Russia, 1980-2005. Economics & Human Biology 2007; 5(1):123-143.

(210) Brainerd E. Reassessing the standard of living in the Soviet Union: An analysis using archival and anthropometric data. 2008.
Ref Type: Unpublished Work

(211) van Leer EM, van Noord PA, Seidell JC. Components of adult height and height loss. Secular trend and effects of ageing in women in the DOM project. Annals of Epidemiology 1992; 2(5):611-615.

(212) Komlos J, Kriwy P. The Biological Standard of Living in the Two Germanies. German Economic Review 2003; 4(4):459-473.

(213) Sorkin JD, Muller DC, Andres R. Longitudinal Change in the Heights of Men and Women: Consequential Effects on Body Mass Index. Epidemiol Rev 1999; 21(2):247-260.

(214) Webb E, Kuh D, Peasey A, Pajak A, Malyutina S, Kubinova R et al. Childhood socioeconomic circumstances and adult height and leg length in central and eastern Europe. J Epidemiol Community Health 2008; 62:351-357.

(215) Soboleva S. Economic migration to Western Siberia. Russian Regional Perspectives Journal 2005; 1(2):45-47.

(216) Wannamethee SG, Shaper AG, Lennon L, Whincup PH. Height Loss in Older Men: Associations With Total Mortality and Incidence of Cardiovascular Disease. Arch Intern Med 2006; 166(22):2546-2552.

(217) Golab S, Chrzanowska M, Zarow J, Sobiecki J, Brudecki J. Zmiany sekularne w rozwoju fizycznym dzieci i mlodziezy krakowskiej w ostatnim 30-leciu XX wieku. Wychowanie Fizyczne i Sport 2002; 46:301-314.

(218) Bielicki T. Physical growth as a measure of the economic well-being of populations: The twentieth century. In: Falkner F, Tanner JM, editors. Human Growth, Volume 3. New York: Plenum Press; 1986. 283-305.

(219) Bielicki T, Waliszko H. Urbanization-dependent gradients in stature among Polish conscripts in 1976 and 1986. American Journal of Human Biology 1991; 3(5):419-424.

(220) Zatonski W. Evolution of health in Poland since 1988. 1996. Warsaw, Poland, Institute of Oncology.
Ref Type: Pamphlet

(221) Tanner JM. Growth at adolescence. Oxford: Blackwell; 1962.

(222) Niewenweg R, Smit ML, Walenkamp MJ, Wit JM. Adult height corrected for shrinking and secular trend. Annals of Human Biology 2003; 30(5):563-569.

(223) Padez C, Johnston FE. Secular trends in male adult height 1904-1996 in relation to place of residence and parent's educational level in Portugal. Annals of Human Biology 1999; 26(3):287-298.

(224) Jacome de Castro J, Aleixo Dias J, Baptista F, Garcia e Costa J, Galvao-Teles A, Camilo-Alves A. Secular trends of weight, height and obesity in cohorts of young Portuguese males in the District of Lisbon: 1960 to 1990. European Journal of Epidemiology 1998; 14:299-303.

(225) Sobral F. Secular changes in stature in Southern Portugal between 1930 and 1980 according to conscript data. Human Biology 1990; 62(4):491-504.

(226) Brundtland GH, Liestol K, Walloe L. Height, weight and menarcheal age of Oslo schoolchildren during the last 60 years. Annals of Human Biology 1980; 7(4):307-322.

(227) Colhoun HM, Hemingway H, Poulter NR. Socioeconomic status and blood pressure: an overview analysis. Journal of Human Hypertension 1998; 12(2):91-110.

(228) Vargas CM, Ingram DD, Gillum RF. Incidence of Hypertension and Educational Attainment The NHANES I Epidemiologic Followup Study. Am J Epidemiol 2000; 152(3):272-278.

(229) Ford ES, Cooper RS. Risk factors for hypertension in a national cohort study. Hypertension 1991; 18(5):598-606.

(230) Waitzman NJ, Smith KR. The effects of occupational class transitions on hypertension: racial disparities among working-age men. Am J Public Health 1994; 84(6):945-950.

(231) Matthews K, Kiefe CI, Lewis CE, Liu K, Sidney S, Yunis C. Socioeconomic trajectories and incident hypertension in a biracial cohort of young adults. Hypertension 2002; 39(3):772-776.

(232) Dyer A, Liu K, Walsh M, Kiefe CI, Jacobs DR, Jr., Bild D. Ten-year incidence of elevated blood pressure and its predictors: The CARDIA Study. Journal of Human Hypertension 1999; 13(1):13-21.

(233) Hypertension Detection and Follow-up Program Cooperative Group. Race, education and prevalence of hypertension. Am J Epidemiol 1977; 106(5):351-361.

(234) Adedoyin R, Mbada C, Awofolu O, Oyebami O. The influence of socio-economic status on casual blood pressures of the adult Nigerians. European Journal of Cardiovascular Prevention and Rehabilitation 2005; 12(3):271-273.

(235) Reddy K, Rao A, Reddy T. Socioeconomic status and the prevalence of coronary heart disease risk factors. Asia Pacific Journal of Clinical Nutrition 2002; 11(2):98-103.

(236) van Rossum CTM, van de Mheen H, Witteman JCM, Hofman A, Mackenbach JP, Grobbee DE. Prevalence, Treatment, and Control of Hypertension by Sociodemographic Factors Among the Dutch Elderly. Hypertension 2000; 35(3):814-821.

(237) Svetkey LP, George LK, Burchett BM, Morgan PA, Blazer DG. Black/White Differences in Hypertension in the Elderly An Epidemiologic Analysis in Central North Carolina. Am J Epidemiol 1993; 137(1):64-73.

(238) Singh RB, Sharma JP, Rastogi V, Niaz MA, Ghosh S, Beegom R et al. Social class and coronary disease in a rural population of north India: The Indian Social Class and Heart Survey. Eur Heart J 1997; 18(4):588-595.

(239) Kraus J, Borhani N, Franti C. Socioeconomic status, ethnicity and risk of heart failure. Am J Epidemiol 1980; 111(4):407-414.

(240) Tuomilehto J, Puska P, Virtamo J, Neittaanmaki L, Koskela K. Coronary risk factors and socioeconomic status in Eastern Finland. Preventive Medicine 1978; 7(4):539-549.

(241) Millar WJ, Wigle DT. Socioeconomic disparities in risk factors for cardiovascular disease. Canadian Medical Association Journal 1986; 134(2):127-132.

(242) Regidor E, Gutierrez-Fisac JL, Banegas JR, Dominguez V, Rodriguez-Artalejo F. Association of adult socioeconomic position with hypertension in older people. J Epidemiol Community Health 2006; 60(1):74-80.

(243) van Rossum CTM, van de Mheen H, Breteler MMB, Grobbee DE, Mackenbach JP. Socioeconomic Differences in Stroke Among Dutch Elderly Women : The Rotterdam Study. Stroke 1999; 30(2):357-362.

(244) Hoeymans N, Smit HA, Verkleij H, Kromhout D. Cardiovascular risk factors in relation to educational level in 36 000 men and women in the Netherlands. Eur Heart J 1996; 17(4):518-525.

(245) Gorman BK, Sivaganesan A. The role of social support and integration for understanding socioeconomic disparities in self-rated health and hypertension. Social Science & Medicine 2007; 65(5):958-975.

(246) Syme SL, Oakes TW, Friedman GD, Feldman R, Siegelaub AB, Collen M. Social class and racial differences in blood pressure. Am J Public Health 1974; 64(6):619-620.

(247) Holme I, Hjermann I, Helgeland A, Lund-Larsen PG, Leren P. Coronary risk factors and socioeconomic status: The Oslo Study. The Lancet 1976; 308(8000):1396-1398.

(248) Jacobsen B, Thelle D. Risk factors for coronary heart disease and level of education: The Tromso Heart Study. Am J Epidemiol 1988; 127(5):923-932.

(249) Dyer AR, Stamler J, Shekelle RB, Schoenberger J. The relationship of education to blood pressure: findings on 40,000 employed Chicagoans. Circulation 1976; 54(6):987-992.

(250) Liu K, Cedres LB, Stamler J, Dyer A, Stamler R, Nanas S et al. Relationship of education to major risk factors and death from coronary heart disease, cardiovascular diseases and all causes, Findings of three Chicago epidemiologic studies. Circulation 1982; 66(6):1308-1314.

(251) Matthews K, Kelsey S, Meilahn E, Muller L, Wing R. Educational attainment and behavioral and biologic risk factors for coronary heart disease in middle-aged women. Am J Epidemiol 1989; 129(6):1132-1144.

(252) Stamler R, Shipley M, Elliott P, Dyer A, Sans S, Stamler J. Higher blood pressure in adults with less education. Some explanations from INTERSALT. Hypertension 1992; 19(3):237-241.

(253) Winkleby MA, Jatulis DE, Frank E, Fortmann SP. Socioeconomic status and health: how education, income, and occupation contribute to risk factors for cardiovascular disease. Am J Public Health 1992; 82(6):816-820.

(254) Davey Smith G, Neaton JD, Wentworth D, Stamler R, Stamler J. Socioeconomic differentials in mortality risk among men screened for the Multiple Risk Factor Intervention Trial: I. White men. Am J Public Health 1996; 86(4):486-496.

(255) Lynch J, vey Smith G, Harper S, Bainbridge K. Explaining the social gradient in coronary heart disease: comparing relative and absolute risk approaches. J Epidemiol Community Health 2006; 60(5):436-441.

(256) Khoury P, Morrison J, Laskarzewski P, Kelly K, Mellies M, King P et al. Relationships of education and occupation to coronary heart disease risk factors in schoolchildren and adults: The Princeton School District Study. Am J Epidemiol 1981; 113(4):378-395.

(257) Addor V, Wietlisbach V, Narring F, Michaud PA. Cardiovascular risk factor profiles and their social gradient from adolescence to age 74 in a Swiss region. Preventive Medicine 2003; 36(2):217-228.

(258) Rosengren A, Wedel H, Wilhelmsen L. Coronary heart disease and mortality in middle aged men from diffrerent occupational classes in Sweden. British Medical Journal 1988; 297(6662):1497-1500.

(259) Duijkers T, Kromhout D, Spuit I, Doornbos G. Inter-Mediating Risk Factors in the Relation between Socioeconomic Status and 25- Year Mortality (the Zutphen Study). Int J Epidemiol 1989; 18(3):658-662.

(260) Kivimaki M, Smith GD, Elovainio M, Pulkki L, Keltikangas-Jarvinen L, Talttonen L et al. Socioeconomic Circumstances in Childhood and Blood Pressure in Adulthood: The Cardiovascular Risk in Young Finns Study. Annals of Epidemiology 2006; 16(10):737-742.

(261) Kivimaki M, Davey Smith G, Juonala M, Ferrie JE, Keltikangas-Jarvinen L, Elovainio M et al. Socioeconomic position in childhood and adult cardiovascular risk factors, vascular structure, and function: cardiovascular risk in young Finns study. Heart 2006; 92(4):474-480.

(262) Hardy R, Kuh D, Langenberg C, Wadsworth ME. Birthweight, childhood social class, and change in adult blood pressure in the 1946 British birth cohort. The Lancet 2003; 362(9391):1178-1183.

(263) Power C, Atherton K, Strachan DP, Shepherd P, Fuller E, Davis A et al. Life-course influences on health in British adults: effects of socio-economic position in childhood and adulthood. Int J Epidemiol 2007; 36:532-539.

(264) Regidor E, Banegas JR, Gutierrez-Fisac JL, Dominguez V, Rodriguez-Artalejo F. Influence of childhood socioeconomic circumstances, height, and obesity on pulse pressure and systolic and diastolic blood pressure in older people. Journal of Human Hypertension 2006; 20(1):73-82.

(265) Koupil I, Shestov D, Sparen P, Plavinskaja S, Parfenova N, Vagero D. Blood pressure, hypertension and mortality from circulatory disease in men and women who survived the siege of Leningrad. European Journal of Epidemiology 2007; 22(4):223.

(266) Heslop P, Davey Smith G, Macleod J, Hart C. The socioeconomic position of employed women, risk factors and mortality. Social Science & Medicine 2001; 53(4):477-485.

(267) Schooling CM, Jiang C, Lam TH, Thomas GN, Heys M, Bmbs et al. Height, Its Components, and Cardiovascular Risk Among Older Chinese: A Cross-Sectional Analysis of the Guangzhou Biobank Cohort Study. Am J Public Health 2007; 97(10):1834-1841.

(268) Langenberg C, Hardy R, Kuh D, Wadsworth MEJ. Influence of height, leg and trunk length on pulse pressure, systolic and diastolic blood pressure. Journal of Hypertension 2003; 21(3):537-543.

(269) Gunnell D, Smith GD, McConnachie A, Greenwood R, Upton M, Frankel S. Separating in-utero and postnatal influences on later disease. The Lancet 1999; 354(9189):1526-1527.

(270) Whincup P, Cook D, Papacosta O, Walker M. Birth weight and blood pressure: cross sectional and longitudinal relations in childhood. BMJ 1995; 311(7008):773-776.

(271) van Doorslaer E, Masseria C, Koolman X. Inequalities in access to medical care by income in developed countries. Canadian Medical Association Journal 2006; 174(2):177-183.

(272) Allen DS, Ellison G, dos Santos Silva I, De Stavola BL, Fentiman I. Determinants of the availability and accuracy of self-reported birth weight in middle-aged and elderly women. Am J Epidemiol 2002; 155(4):379-384.

(273) Huxley RR, Shiell A, Law CM. The role of size at birth and postnatal catch-up growth in determining systolic blood pressure: a systematic review of the literature. Journal of Hypertension 2000; 18(7):815-831.

(274) Law CM, Shiell A. Is blood pressure inversely related to birth weight? The strength of evidence from a systematic review of the literature. Journal of Hypertension 1996; 14:935-941.

(275) Gamborg M, Byberg L, Rasmussen F, Andersen PK, Baker JL, Bengtsson C et al. Birth Weight and Systolic Blood Pressure in Adolescence and Adulthood: Meta-Regression Analysis of Sex- and Age-specific Results from 20 Nordic Studies. Am J Epidemiol 2007; 166(6):634-645.

(276) Leon D, Koupilova I, Lithell H, Berglund G, Mohsen R, Vagero D et al. Failure to realise growth potential in utero and adult obesity un relation to blood pressure in 50 year old Swedish men. BMJ 1996; 312(7028):401-406.

(277) Adair L, Dahly D. Developmental determinants of blood pressure in adults. Annual Review of Nutrition 2005; 25(1):407-434.

(278) Mcmillen IC, Robinson JS. Developmental Origins of the Metabolic Syndrome: Prediction, Plasticity, and Programming. Physiol Rev 2005; 85(2):571-633.

(279) Bobak M, Pikhart H, Koupilova I. Neonatal mortality of low birthweight babies is increased in mothers with higher education. BMJ 1997; 315(7112):886.

(280) Pattenden S, Dolk H, Vrijheid M. Inequalities in low birth weight: parental social class, area deprivation, and "lone mother" status. J Epidemiol Community Health 1999; 53(6):355-358.

(281) Koupilova I, Leon DA, Vagero D. Can confounding by sociodemographic and behavioural factors explain the association between size at birth and blood

pressure at age 50 in Sweden? J Epidemiol Community Health 1997; 51(1):14-18.

(282) Voors A, Harsha D, Webber L, Berenson G. Relation of blood pressure to stature in healthy young adults. Am J Epidemiol 1982; 115(6):833-840.

(283) Anderson KM, Wilson PW, Odell PM, Kannel WB. An updated coronary risk profile. A statement for health professionals. Circulation 1991; 83(1):356-362.

(284) Alberti K, Zimmet P, Shaw J. The metabolic syndrome - a new worldwide definition. The Lancet 2005; 366(9491):1059-1062.

(285) Gordon DJ, Probstfield JL, Garrison RJ, Neaton JD, Castelli WP, Knoke JD et al. High-density lipoprotein cholesterol and cardiovascular disease. Four prospective American studies. Circulation 1989; 79(1):8-15.

(286) Jacobs D, Mebane I, Bangdiwala S, Criqui MH, Tyroler HA, for the Lipid Research Clinics Program. High density lipoprotein cholesterol as a predictor of cardiovascular mortality in men ans women: The follow-up study of the Lipid Research Clinics Prevalence Study. Am J Epidemiol 1990; 131(1):32-47.

(287) Gordon T, Castelli WP, Hjortland MC, Kannel WB, Dawber TR. High density lipoprotein as a protective factor against coronary heart disease : The Framingham study. The American Journal of Medicine 1977; 62(5):707-714.

(288) Cui Y, Blumenthal RS, Flaws JA, Whiteman MK, Langenberg P, Bachorik PS et al. Non-High-Density Lipoprotein Cholesterol Level as a Predictor of Cardiovascular Disease Mortality. Arch Intern Med 2001; 161(11):1413-1419.

(289) Chen Z, Peto R, Collins R, MacMahon S, Lu J, Li W. Serum cholesterol concentration and coronary heart disease in a population with low cholesterol concentrations. BMJ 1991; 303(6808):993-994.

(290) Cai J, Pajak A, Li Y, Shestov D, Davis CE, Rywik S et al. Total Cholesterol and Mortality in China, Poland, Russia, and the US. Annals of Epidemiology 2004; 14(6):399-408.

(291) Kanjilal S, Gregg EW, Cheng YJ, Zhang P, Nelson DE, Mensah G et al. Socioeconomic Status and Trends in Disparities in 4 Major Risk Factors for Cardiovascular Disease Among US Adults, 1971-2002. Arch Intern Med 2006; 166(21):2348-2355.

(292) Leino M, Raitakari OT, Porkka KV, Taimela S, Viikari JS. Associations of education with cardiovascular risk factors in young adults: the Cardiovascular Risk in Young Finns Study. Int J Epidemiol 1999; 28(4):667-675.

(293) Garrison RJ, Gold RS, Wilson PWF, Kannel WB. Educational Attainment and Coronary Heart Disease Risk: The Framingham Offspring Study. Preventive Medicine 1993; 22(1):54-64.

(294) Luepker RV, Rosamond WD, Murphy R, Sprafka JM, Folsom AR, McGovern PG et al. Socioeconomic status and coronary heart disease risk factor trends. The Minnesota Heart Survey. Circulation 1993; 88(5):2172-2179.

(295) Winkleby MA, Kraemer HC, Ahn DK, Varady AN. Ethnic and Socioeconomic Differences in Cardiovascular Disease Risk Factors: Findings for Women From the Third National Health and Nutrition Examination Survey, 1988-1994. JAMA 1998; 280(4):356-362.

(296) Woodward M, Shewry MC, Cairns S.Smith, Tunstall-Pedoe H. Social status and coronary heart disease: Results from the Scottish heart health study. Preventive Medicine 1992; 21(1):136-148.

(297) Brunner EJ, Marmot MG, White IR, O'Brien JR, Etherington MD, Slavin BM et al. Gender and employment grade differences in blood cholesterol, apolipoproteins and haemostatic factors in the Whitehall II study. Atherosclerosis 1993; 102(2):195-207.

(298) Schroder H, Rohlfs I, Schmelz E, Marrugat J. Relationship of socioeconomic status with cardiovascular risk factors and lifestyle in a Mediterranean population. European Journal of Nutrition 2004; 43(2):77-85.

(299) Yu Z, Nissinen A, Vartiainen E, Hu G, Tian H, Guo Z. Socio-economic status and serum lipids:: A cross-sectional study in a Chinese urban population. Journal of Clinical Epidemiology 2002; 55(2):143-149.

(300) Liu K, Cedres LB, Stamler J, Dyer A, Stamler R, Nanas S et al. Relationship of education to major risk factors and death from coronary heart disease, cardiovascular diseases and all causes, Findings of three Chicago epidemiologic studies. Circulation 1982; 66(6):1308-1314.

(301) Leren P, Helgeland A, Hjermann I, Holme I. The Oslo study: CHD risk factors, socioeconomic influences, and intervention. American Heart Journal 1983; 106(5, Part 2):1200-1206.

(302) Winkleby MA, Fortmann SP, Barrett DC. Social class disparities in risk factors for disease: Eight-year prevalence patterns by level of education. Preventive Medicine 1990; 19(1):1-12.

(303) Thelle DS, Shaper AG, Whitehead TP, Bullock DG, Ashby D, Patel I. Blood lipids in middle-aged British men. Br Heart J 1983; 49(3):205-213.

(304) Parker L, Lamont DW, Unwin NC, Pearce MS, Bennett SM, Dickinson HO et al. A lifecourse study of risk for hyperinsulinaemia, dyslipidaemia and obesity (the central metabolic syndrome) at age 49–51 years. Diabetic Medicine 2003; 20(5):406-415.

(305) Lawlor DA, Ebrahim S, Davey Smith G. Socioeconomic position in childhood and adulthood and insulin resistance: cross sectional survey using data from British women's heart and health study. BMJ 2002; 325(7368):805.

(306) Arnesen E, Forsdahl A. The Tromso heart study:coronary risk factors and their associations with living conditions during childhood. J Epidemiol Community Health 1985; 39:210-214.

(307) Gunnell DJ, Whitley E, Upton MN, McConnachie A, Davey Smith G, Watt GCM. Associations of height, leg length, and lung function with cardiovascular risk

factors in the Midspan Family Study. J Epidemiol Community Health 2003; 57(2):141-146.

(308) Thorogood M, McPherson K, Mann J. Relationship of Body-Mass Index, Weight and Height to Plasma-Lipid Levels in People with Different Diets in Britain. Community Medicine 1989; 11(3):230-233.

(309) Kannam JP, Levy D, Larson M, Wilson PWF. Short Stature and Risk for Mortality and Cardiovascular-Disease Events - the Framingham Heart-Study. Circulation 1994; 90(5):2241-2247.

(310) Henriksson KM, Lindblad U, Agren B, Nilsson-Ehle P, Rastam L. Associations between body height, body composition and cholesterol levels in middle-aged men. The coronary risk factor study in southern Sweden (CRISS). European Journal of Epidemiology 2001; 17(6):521-526.

(311) Skidmore PML, Hardy RJ, Kuh DJ, Langenberg C, Wadsworth MEJ. Birth Weight and Lipids in a National Birth Cohort Study. Arterioscler Thromb Vasc Biol 2004; 24(3):588-594.

(312) Hebert PR, Rich-Edwards JW, Manson JE, Ridker PM, Cook NR, O'Connor GT et al. Height and incidence of cardiovascular disease in male physicians. Circulation 1993; 88(4):1437-1443.

(313) Lauren L, Jarvelin MR, Elliott P, Sovio U, Spellman A, McCarthy M et al. Relationship between birthweight and blood lipid concentrations in later life: evidence from the existing literature. Int J Epidemiol 2003; 32(5):862-876.

(314) Ferrie JE, Langenberg C, Shipley MJ, Marmot MG. Birth weight, components of height and coronary heart disease: evidence from the Whitehall II study. Int J Epidemiol 2006; 35(6):1532-1542.

(315) Huxley R, Owen CG, Whincup PH, Cook DG, Colman S, Collins R. Birth Weight and Subsequent Cholesterol Levels: Exploration of the "Fetal Origins" Hypothesis. JAMA 2004; 292(22):2755-2764.

(316) Perez-Escamilla R, Lutter C, Segall M, Rivera A, Trevino-Siller S, Sanghvi T. Exclusive Breast-Feeding Duration Is Associated with Attitudinal, Socioeconomic and Biocultural Determinants in Three Latin American Countries. J Nutr 1995; 125(12):2972-2984.

(317) Schooling CM, Thomas G, Leung GM, Ho SY, Janus ED, Lam TH. Is height associated with cardiovascular risk in Chinese adults? Epidemiology 2007; 18(2):274-278.

(318) Muller FH. Tabakmissbrauch und lungencarcinoma. Zeitschift Krebsforsch 1939; 49:57-85.

(319) Schaiver E, Schoniger E. Lungenkrebs und Tabakverbrauch. Zeitschift Krebsforsch 1943; 54:261-269.

(320) Wassink WF. Onstaansvoorwasrden voor Longkanker. Ned Tijdscher Geneeskd 1948; 92:3732-3747.

(321) Doll R, Hill AB. Smoking and carcinoma of the lung. British Medical Journal 1950; 221:739-748.

(322) Doll R, Hill AB. A study of the aetiology of carcinoma of the lung. British Medical Journal 1952; 225:1271-1286.

(323) Doll R, Peto R, Boreham J, Sutherland I. Mortality from cancer in relation to smoking: 50 years observations on British doctors. British Journal of Cancer 2005; 92(3):426-429.

(324) Doll R, Peto R, Wheatley K, Gray R, Sutherland I. Mortality in relation to smoking: 40 years' observations on male British doctors. BMJ 1994; 309(6959):901-911.

(325) Doll R, Peto R, Boreham J, Sutherland I. Mortality in relation to smoking: 50 years' observations on male British doctors. BMJ 2004; 328(7455):1519.

(326) Lopez AD, Collishaw NE, Piha T. A descriptive model of the cigarette epidemic in developed countries. Tob Control 1994; 3(3):242-247.

(327) Jackson C, Henriksen L. Do as I say: Parent smoking, antismoking socialization, and smoking onset among children. Addictive Behaviors 1997; 22(1):107-114.

(328) Biglan A, Duncan TE, Ary DV, Smolkowski K. Peer and parental influences on adolescent tobacco use. Journal of Behavioral Medicine 1995; 18(4):315-330.

(329) Cavelaars AEJM, Kunst AE, Geurts JJM, Crialesi R, Grotvedt L, Helmert U et al. Educational differences in smoking: international comparison. BMJ 2000; 320(7242):1102-1107.

(330) Conrad KM, Flay BR, Hill D. Why children start smoking: predictors of onset. Addiction 1992; 87(12):1711-1724.

(331) Tyas SL, Pederson LL. Psychosocial factors related to adolescent smoking: a critical review of the literature. Tob Control 1998; 7(4):409-420.

(332) Goddard E. Why children start smoking. Addiction 1992; 87(1):17-18.

(333) Jefferis BJMH, Power C, Graham H, Manor O. Effects of Childhood Socioeconomic Circumstances on Persistent Smoking. Am J Public Health 2004; 94(2):279-285.

(334) Wannamethee SG, Whincup PH, Shaper G, Walker M. Influence of fathers' social class on cardiovascular disease in middle-aged men. The Lancet 1996; 348(9037):1259-1263.

(335) Lynch J, Kaplan GA, Salonen JT. Why do poor people behave poorly? Variation in adult health behaviours and psychosocial characteristics by stages of the socioeconomic lifecourse. Social Science & Medicine 1997; 44(6):809-819.

(336) Prokhorov AV. Getting on smokin' route 66: tobacco promotion via Russian mass media. Tob Control 1997; 6(2):145-146.

(337) Gilmore AB, Mckee M. Tobacco and transition: an overview of industry investments, impact and influence in the former Soviet Union. Tob Control 2004; 13(2):136-142.

(338) Keil U, Kuulasmaa K. WHO MONICA Project: risk factors. Int J Epidemiol 1989; 18(suppl_1):S46-S55.

(339) McKee M, Bobak M, Rose R, Shkolnikov V, Chenet L, Leon D. Patterns of smoking in Russia. Tob Control 1998; 7(1):22-26.

(340) Perlman F, Bobak M, Gilmore A, McKee M. Trends in the prevalence of smoking in Russia during the transition to a market economy. Tob Control 2007; 16(5):299-305.

(341) Laatikainen T, Vartiainen E, Puska P. Comparing smoking and smoking cessation process in the Republic of Karelia, Russia and North Karelia, Finland. J Epidemiol Community Health 1999; 53(9):528-534.

(342) Bobak M, Gilmore A, Mckee M, Rose R, Marmot M. Changes in smoking prevalence in Russia, 1996-2004. Tob Control 2006; 15(2):131-135.

(343) Molarius A, Parsons RW, Dobson AJ, Evans A, Fortmann SP, Jamrozik K et al. Trends in cigarette smoking in 36 populations from the early 1980s to the mid-1990s: findings from the WHO MONICA Project. Am J Public Health 2001; 91(2):206-212.

(344) Bobak M, Jha P, Nguyen S, Jarvis MJ. Poverty and Smoking. In: Jha P, Chaloupka F, editors. Tobacco control in developing countries. Oxford: Oxford University Press; 2000. 41-61.

(345) Nikitin Y, Shalaurova IY, Serova NV. The validation of serum thiocyanate smoking data in a population survey. Revue d'epidemiologie et de sante publique 1990; 38(5):469-472.

(346) Bobak M. Determinants of the Epidemic of Coronary Heart Disease in the Czech Republic [1996.

(347) Baik I, Ascherio A, Rimm EB, Giovannucci E, Spiegelman D, Stampfer MJ et al. Adiposity and Mortality in Men. Am J Epidemiol 2000; 152(3):264-271.

(348) Tuomilehto J, Salonen JT, Marti B, Jalkanen L, Puska P, Nissinen A et al. Body weight and risk of myocardial infarction and death in the adult population of eastern Finland. British Medical Journal 1987; 295:623-627.

(349) Sidney S, Friedman G, Siegelaub A. Thiness and mortality. Am J Public Health 1987; 77(3):317-322.

(350) Dorn JM, Schisterman EF, Winkelstein W, Trevisan M. Body mass index and mortality in a general population sample of men and women. Am J Epidemiol 1997; 146(11):919-931.

(351) Losonczy K, Harris T, Cornoni-Huntley J, Simonsick EM, Wallace R, Cook N et al. Does weight loss from middle age to old age explain the inverse weight mortality relation in old age? Am J Epidemiol 1995; 141(4):312-321.

(352) Stevens J, Cai J, Pamuk E, Williamson D, Thun MJ, Wood J. The effect of age on the association between Body Mass Index and mortality. New England Journal of Medicine 1998; 338:1-7.

(353) Ajani UA, Lotufo PA, Gaziano JM, Lee IM, Spelsberg A, Buring JE et al. Body mass index and mortality among US male physicians. Annals of Epidemiology 2004; 14(10):731-739.

(354) Calle E, Thun MJ, Petrelli J, Rodriguez C, Heath C. Body Mass Index and mortality in a prospective cohort of US adults. New England Journal of Medicine 1999; 341:1097-1105.

(355) Yuan JM, Ross RK, Gao YT, Yu M. Body weight and mortality: a prospective evaluation in a cohort of middle-aged men in Shanghai, China. Int J Epidemiol 1998; 27(5):824-832.

(356) Hoffmans M, Kromhout D, de Lezenne Coulander C. The impact of body mass index of 78,612 18-year old Dutch men on 32-year mortality from all causes. International Journal of Obesity 1988; 41(8):749-756.

(357) Rissanen A, Knekt P, Heliovaara M, Aromaa A, Reunanen A, Maatela J. Weight and mortaltiy in Finnish women. J Clin Endocrinol Metab 1991; 44(8):787-795.

(358) Rissanen A, Heliovaara M, Knekt P, Aromaa A, Reunanen A, Maatela J. Weight and mortality in Finnish men. Journal of Clinical Epidemiology 1989; 42(8):781-789.

(359) Seidell JC, Verschuren WMM, van Leer EM, Kromhout D. Overweight, underweight and mortality. Arch Intern Med 1996; 156:958-963.

(360) Lee IM, Manson J, Hennekens CH, Paffenbarger Jr RS. Body weight and mortality. JAMA 1993; 270(23):2823-2828.

(361) Hubert HB, Feinleib M, McNamara PM, Castelli WP. Obesity as an independent risk factor for cardiovascular disease: a 26- year follow-up of participants in the Framingham Heart Study. Circulation 1983; 67(5):968-977.

(362) Lapidus L, Bengtsson C, Larsson B, Pennert K, Rybo E, Sjostrom L. Distribution of adipose tissue and risk of cardiovascular disease and death: a 12 year follow up of participants in the population study of women in Gothenburg, Sweden. BMJ 1984; 289(6454):1257-1261.

(363) Grundy SM. Obesity, Metabolic Syndrome, and Cardiovascular Disease. J Clin Endocrinol Metab 2004; 89(6):2595-2600.

(364) Rogers EM. Diffusion of innovations. 3 ed. London: Collier Macmillan Publishers; 1995.

(365) Popkin BM. The Nutrition Transition and Obesity in the Developing World. J Nutr 2001; 131(3):871S-8873.

(366) McLaren L. Socioeconomic Status and Obesity. Epidemiol Rev 2007; 29(1):29-48.

(367) Monteiro CA, Moura EC, Wolney LC, Popkin BM. Socioeconomic status and obesity in adult populations of developing countries: a review. Bulletin of the World Health Organisation 2004; 82(12):940-946.

(368) Ball K, Crawford D. Socioeconomic status and weight change in adults: a review. Social Science & Medicine 2005; 60(9):1987-2010.

(369) Parsons TJ, Power C, Logan S. Childhood predictors of adult obesity: a review. International Journal of Obesity Related Metablic Disorders 1999; 23(Supplement 8):S1-S107.

(370) Lasker GW, Mascie-Taylor CGN. Effects of social class differences and social mobility on growth in height, weight and body mass index in a British cohort. Annals of Human Biology 1989; 16(1):1-8.

(371) Power C, Matthews S. Origins of health inequalities in a national population sample. The Lancet 1997; 350(9091):1584-1589.

(372) Ball K, Mishra GD. Whose socioeconomic status influences a woman's obesity risk: her mother's, her father's, or her own? Int J Epidemiol 2006; 35(1):131-138.

(373) Novak M, Ahlgren C, Hammarstrom A. A life-course approach in explaining social inequality among young men and women. International Journal of Obesity 2006; 30(1):191-200.

(374) Lahman PH, Lissner L, Gulberg B, Berglund G. Sociodemographic factors associated with long-term weight gain, current body fatness and central adiposity in Swedish women. International Journal of Obesity 2000; 24:685-694.

(375) Lawlor DA, Bedford C, Taylor M, Ebrahim S. Agreement between measured and self-reported weight in older women. Results from the British Women's Heart and Health Study. Age Ageing 2002; 31(3):169-174.

(376) Wilsgaard T, Jacobsen BK, Arnesen E. Determining Lifestyle Correlates of Body Mass Index using Multilevel Analyses: The Tromso Study, 1979-2001. Am J Epidemiol 2005; 162(12):1179-1188.

(377) Okasha M, McCarron P, McEwen J, Durnin J, vey Smith G. Childhood social class and adulthood obesity: findings from the Glasgow Alumni Cohort. J Epidemiol Community Health 2003; 57(7):508-509.

(378) Benn RT. Some mathematical properties of weight-for-height indices used as measures of adiposity. British Journal of Preventative and Social Medicine 1971; 25:42-50.

(379) Freeman J, Power C, Rodgers B. Weight-for-Height Indices of Adiposity: Relationships with Height in Childhood and Early Adult Life. Int J Epidemiol 1995; 24(5):970-976.

(380) Heymsfield SB, Gallagher D, Mayer L, Beetsch J, Pietrobelli A. Scaling of human composition to stature: new insights into body mass index. Am J Clin Nutr 2007; 86(1):82-91.

(381) Han TS, Seidell JC, Currall J, Morrison CE, Deurenburg P, Lean M. The influences of height and age on waist circumference as an index of adiposity. International Journal of Obesity 1997; 21(1):83-90.

(382) Frayling TM, Timpson NJ, Weedon MN, Zeggini E, Freathy RM, Lindgren CM et al. A Common Variant in the FTO Gene Is Associated with Body Mass Index and Predisposes to Childhood and Adult Obesity. Science 2007; 316(5826):889-894.

(383) Baughcum AE, Chamberlin LA, Deeks CM, Powers SW, Whitaker RC. Maternal Perceptions of Overweight Preschool Children. Pediatrics 2000; 106(6):1380-1386.

(384) Gordon T, Sorlie P, Kannel WB. Coronary heart disease, atherothrombotic brain infarction, intermittent claudication - A multivariate analysis of some factors related to their incidence: Framingham Study, 16 year followup. In: Kannel WB, Gordon T, editors. The Framingham Study: An epidemiological investigation of cardiovascular disease. Washington D. C.: US Government Printing Office; 1971.

(385) Lindman AS, Veierod MB, Pedersen JI, Tverdal A, Njolstad I, Selmer R. The ability of the SCORE high-risk model to predict 10-year cardiovascular disease mortality in Norway. European Journal of Cardiovascular Prevention & Rehabilitation 2007; 14(4):501-507.

(386) Ramirez F, Barroso LC, Herrera ND, Muro EC, Simon B, Sanchez IP. Comparison of the SCORE function chart and the Framingham-REGICOR equation to estimate the cardiovascular risk in an urban population after 10 years of follow-up. Medicina Clinica 2006; 127(10):368-373.

(387) Ulmer H, Kollerits B, Kelleher C, Diem G, Concin H. Predictive accuracy of the SCORE risk function for cardiovascular disease in clinical practice: a prospective evaluation of 44,649 Austrian men and women. European Journal of Cardiovascular Prevention & Rehabilitation 2005; 12(5):433-441.

(388) Bosma H, Schrijvers C, Mackenbach J. Socioeconomic inequalities in mortality and importance of perceived control: cohort study. BMJ 1999; 319(7223):1469-1470.

(389) Mackenbach J, Kunst A, Groenhof F, Borgan JK, Costa G, Faggiano F et al. Socioeconomic inequalities in mortality among women and among men: an international study. Am J Public Health 1999; 89(12):1800-1806.

(390) Malyutina S, Bobak M, Simonova G, Gafarov V, Nikitin Y, Marmot M. Education, marital status, and total and cardiovascular mortality in novosibirsk, Russia: A prospective cohort study. Annals of Epidemiology 2004; 14(4):244-249.

(391) Dennis BH, Zhukovsky GS, Shestov DB, Davis C, Deev AD, Kim H et al. The association of education with coronary heart disease mortality in the USSR Lipid Research Clinics Study. Int J Epidemiol 1993; 22(3):420-427.

(392) Koskinen S, Martelin T. Why are socioeconomic mortality differences smaller among women than among men? Social Science & Medicine 1994; 38(10):1385-1396.

(393) Hemmingsson T, Lundberg I. How far are socioeconomic differences in coronary heart disease hospitalization, all-cause mortality and cardiovascular mortality among adult Swedish males attributable to negative childhood circumstances and behaviour in adolescence? Int J Epidemiol 2005; 34(2):260-267.

(394) Davey Smith G, Shipley MJ, Rose G. Magnitude and causes of socioeconomic differentials in mortality: further evidence from the Whitehall Study. J Epidemiol Community Health 1990; 44(4):265-270.

(395) Marmot MG, Rose G, Shipley M, Hamilton PJ. Employment grade and coronary heart disease in British civil servants. J Epidemiol Community Health 1978; 32(4):244-249.

(396) Rosvall M, Chaix B, Lynch J, Lindstrom M, Merlo J. Similar support for three different life course socioeconomic models on predicting premature cardiovascular mortality and all-cause mortality. BMC Public Health 2006; 6(1):203.

(397) Pekkanen J, Tuomilehto J, Uutela A, Vartiainen E, Nissinen A. Social class, health behaviour, and mortality among men and women in eastern Finland. British Medical Journal 1995; 311:589-593.

(398) Bucher HC, Ragland DR. Socioeconomic indicators and mortality from coronary heart disease and cancer: a 22-year follow-up of middle-aged men. Am J Public Health 1995; 85(9):1231-1236.

(399) Thurston RC, Kubzansky LD, Kawachi I, Berkman LF. Is the association between socioeconomic position and coronary heart disease stronger in women than in men? Am J Epidemiol 2005; 162(1):57-65.

(400) Paffenbarger Jr R, Wolf P, Notkin J, Thorne M. Chronic disease in former college students: I. early precursors of fatal coronary heart disease. Am J Epidemiol 1966; 83:314-328.

(401) Bobak M, Hertzman C, Marmot M. Own education, current conditions, parental material circumstances, and risk of myocardial infarction in a former communist country. J Epidemiol Community Health 2000; 54(2):91-96.

(402) Osler M, Andersen AMN, Due P, Lund R, Damsgaard MT, Holstein BE. Socioeconomic position in early life, birth weight, childhood cognitive function, and adult mortality. A longitudinal study of Danish men born in 1953. J Epidemiol Community Health 2003; 57(9):681-686.

(403) O'Leary SR, Wingard DL, Edelstein SL, Criqui MH, Tucker JS, Friedman HS. Is birth order associated with adult mortality? Annals of Epidemiology 1996; 6(1):34-40.

(404) Gliksman MD, Kawachi I, Hunter D, Colditz GA, Manson JE, Stampfer MJ et al. Childhood Socioeconomic-Status and Risk of Cardiovascular-Disease in Middle-Aged Us Women - A Prospective-Study. J Epidemiol Community Health 1995; 49(1):10-15.

(405) Lundberg M, Diderichsen F, Hallqvist J. Is the association between short stature and myocardial infarction explained by childhood exposures - a population-based case referent study (SHEEP). Scandinavian Journal of Public Health 2002; 30(4):249-258.

(406) Langenberg C, Shipley MJ, Batty D, Marmot MG. Adult socioeconomic position and the association between height and coronary heart disease mortality: Findings from 33 years of follow-up in the Whitehall Study. Am J Public Health 2005; 95(4):628-632.

(407) McCarron P, Okasha M, McEwen J, Davey Smith G. Height in young adulthood and risk of death from cardiorespiratory disease: A prospective study of male former students of Glasgow University, Scotland. Am J Epidemiol 2002; 155(8):683-687.

(408) Jousilahti P, Tuomilehto J, Vartiainen E, Eriksson J, Puska P. Relation of adult height to cause-specific and total mortality: A prospective follow-up study of 31,199 middle-aged men and women in Finland. Am J Epidemiol 2000; 151(11):1112-1120.

(409) Parker DR, Lapane KL, Lasater TM, Carleton RA. Short stature and cardiovascular disease among men and women from two southeastern New England communities. Int J Epidemiol 1998; 27(6):970-975.

(410) McCarron P, Hart CL, Hole D, Davey Smith G. The relation between adult height and haemorrhagic and ischaemic stroke in the Renfrew/Paisley study. J Epidemiol Community Health 2001; 55(6):404-405.

(411) Wannamethee SG, Shaper AG, Whincup PH, Walker M. Adult height, stroke, and coronary heart disease. Am J Epidemiol 1998; 148(11):1069-1076.

(412) Silventoinen K, Kaprio J, Koskenvuo M, Lahelma E. The association between body height and coronary heart disease among Finnish twins and singletons. Int J Epidemiol 2003; 32(1):78-82.

(413) Krahn AD, Manfreda J, Tate RB, Mathewson FAL, Cuddy TE. Evidence That Height Is An Independent Risk Factor For Coronary-Artery Disease (the Manitoba Follow-Up-Study). American Journal of Cardiology 1994; 74(4):398-399.

(414) Yarnell JWG, Limb ES, Layzell JM, Baker IA. Height - A Risk Marker for Ischemic Heart Disease - Prospective Results from the Caerphilly Heart Disease Study and Speedwell Heart Disease Study. Eur Heart J 1992; 13(12):1602-1605.

(415) Blumchen G, Jette M. Relationship Between Stature and Coronary Heart-Disease in A German Male-Population. International Journal of Cardiology 1992; 36(3):351-355.

(416) Silventoinen K, Zdravkovic S, Skytthe A, McCarron P, Herskind AM, Koskenvuo M et al. Association between Height and Coronary Heart Disease Mortality: A Prospective Study of 35,000 Twin Pairs. Am J Epidemiol 2006; 163(7):615-621.

(417) Lawlor DA, Taylor M, Davey Smith G, Gunnell D, Ebrahim S. Associations of components of adult height with coronary heart disease in postmenopausal women: the British women's heart and health study. Heart 2004; 90(7):745-749.

(418) Davey Smith G, Greenwood R, Gunnell D, Sweetnam P, Yarnell J, Elwood P. Leg length, insulin resistance, and coronary heart disease risk: The Caerphilly Study. J Epidemiol Community Health 2001; 55(12):867-872.

(419) Langenberg C, Hardy R, Breeze E, Kuh D, Wadsworth MEJ. Influence of short stature on the change in pulse pressure, systolic and diastolic blood pressure from age 36 to 53 years: an analysis using multilevel models. Int J Epidemiol 2005; 34(4):905-913.

(420) Graham I, Atar D, Borch-Johnsen K, Boysen G, Burell G, Cifkova R et al. Fourth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease prevention in Clinical Practice. European Journal of Cardiovascular Prevention and Rehabilitation 2007; 14(S2):E1-E40.

(421) Mostaza JM, Vicente I, Taboada M, Laguna F, Echaniz A, Garcia-Iglesias F et al. The application of the SCORE charts to advanced age males triple the number of high-risk subjects compared to the Framingham function. Medicina Clinica 2005; 124(13):487-490.

(422) Tolonen H, Kuulasmaa K, Ruokokoski E, WHO MONICA Project. MONICA Population Survey Data Book: Height. MONICA Data Centre [2000 [cited 2007 Feb. 19]; Available from: URL:http://www.ktl.fi/publications/monica/surveydb/bmi/table633index.htm

(423) Berney LR, Blane DB. Collecting retrospective data: Accuracy of recall after 50 years judged against historical records. Social Science & Medicine 1997; 45(10):1519-1525.

(424) Harasymiw B. Nomenklatura: The Soviet Communist Party's Leadership Recruitment System. Canadian Journal of Political Science / Revue canadienne de science politique /12; 2(4):493-512.

(425) Chabe AM. Soviet Public School and Organization Enrollments. Peabody Journal of Education 1970; 47(5):290-298.

(426) Krieger N, Okamoto A, Selby JV. Adult female twins' recall of childhood social class and father's education: a validation study for public health research. Am J Epidemiol 1998; 147(7):704-708.

(427) Batty GD, Lawlor DA, Macintyre S, Clark H, Leon DA. Accuracy of adults' recall of childhood social class: findings from the Aberdeen children of the 1950s study. J Epidemiol Community Health 2005; 59(10):898-903.

(428) Gerasimova E. The Soviet Communal Apartment. In: Smith J, editor. Beyond the Limits: The Concept of Space in Russian History and Culture. Helsinki: SHS; 1999.

(429) Bogin B, Varela-Silva MI. Fatness biases the use of estimated leg length as an epidemiological marker for adults in the NHANES III sample. Int J Epidemiol 2008; 37(1):201-209.

(430) Green G, Macintyre S, West P, Ecob R. Like parent like child? Associations between drinking and smoking behaviour of parents and their children. British Journal of Addiction 1991; 86:745-758.

(431) Jefferis BJMH, Graham H, Manor O, Power C. Cigarette consumption and socio-economic circumstances in adolescence as predictors of adult smoking. Addiction 2003; 98(12):1765-1772.

(432) Rossow I, Rise J. Concordance of parental and adolescent health behaviors. Social Science & Medicine 1994; 38(9):1299-1305.

(433) Chopra M, Darnton-Hill I. Tobacco and obesity epidemics: not so different after all? BMJ 2004; 328(7455):1558-1560.

(434) Webb EA, Kuh D, Pajak A, Kubinova R, Malyutina S, Bobak M. Secular trends in adult height and childhood socioeconomic circumstances in three Eastern European populations. Economics & Human Biology 2008; 6(2):228-236.

Appendix 1. Abbreviations

BMI	Body mass index
CEE	Central and Eastern Europe: has been defined as the 12 formerly planned economies in Europe which were not part of the USSR, includes Poland and the Czech Republic, but is here used to refer to all the European countries which had planned economies, including Russia
CIS	Commonwealth of Independent States (alliance of 11 former Soviet Republics, including Russia)
CVD	Cardiovascular disease
DBP	Diastolic blood pressure
ESC	European Society of Cardiology
EU	European Union
FRS	Framingham Risk Score
FSU	Former Soviet Union
HDL	High density lipoprotein
IHD	Ischaemic heart disease
LDL	Low density lipoprotein
LTR	Leg to trunk length ratio
RGSC	Registrar General Social Class
RLMS	Russia Longitudinal Monitoring Survey
SBP	Systolic blood pressure
SCORE	ESC CVD risk score (Systematic COronary Risk Evaluation)
SEC	Socioeconomic circumstances
USSR	Union of Soviet Socialist Republics, the Soviet Union
WHR	Waist to hip ratio

Appendix 2. Association of anthropometric measures with childhood SEC

Table A2.1. Mean leg length [SD] in cm for given measures of childhood socioeconomic circumstances

	Men			Women		
	Czech Republic	**Russia**	**Poland**	**Czech Republic**	**Russia**	**Poland**
Asset score						
0	84.1 [5.2]	80.1 [4.1]	80.6 [4.4]	75.9 [4.4]	72.9 [4.1]	73.3 [4.5]
1	83.4 [4.2]	80.4 [4.4]	80.7 [4.3]	76.1 [4.1]	72.7 [4.1]	73.6 [4.2]
2	84.2 [4.5]	80.6 [4.1]	81.5 [4.3]	76.5 [3.8]	72.9 [4.1]	74.0 [4.1]
3	84.2 [4.3]	80.9 [4.2]	81.4 [4.3]	76.5 [4.2]	73.5 [4.2]	73.9 [4.4]
4	84.7 [4.5]	81.6 [4.4]	82.2 [4.4]	76.9 [4.1]	73.1 [4.5]	74.3 [4.3]
5	85.3 [4.4]	81.6 [4.7]	82.2 [4.4]	77.4 [4.4]	74.1 [4.5]	74.6 [4.3]
6	85.5 [4.8]	82.1 [4.4]	83.1 [4.7]	77.7 [4.4]	74.2 [4.2]	75.2 [4.3]
p for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Maternal education						
< primary	-	80.0 [4.2]	81.1 [4.5]	-	72.6 [4.1]	73.9 [4.5]
Primary	-	80.6 [4.4]	81.4 [4.4]	-	73.1 [4.1]	74.0 [4.2]
Vocational	-	80.9 [4.5]	82.0 [4.7]	-	73.1 [4.1]	74.5 [4.4]
Secondary	-	81.2 [4.2]	82.8 [4.3]	-	73.5 [4.3]	74.9 [4.3]
University	-	82.8 [4.2]	83.9 [4.3]	-	74.2 [4.7]	75.9 [4.6]
p for trend	-	<0.001	<0.001	-	<0.001	<0.001
Paternal education						
< primary	-	80.1 [4.2]	80.7 [4.4]	-	72.5 [4.0]	73.8 [4.4]
Primary	-	80.5 [4.2]	81.3 [4.4]	-	73.2 [4.2]	73.9 [4.3]
Vocational	-	81.1 [4.6]	81.9 [4.4]	-	73.1 [4.2]	74.4 [4.1]
Secondary	-	80.9 [4.5]	82.6 [4.4]	-	73.2 [4.1]	74.7 [4.4]
University	-	81.7 [4.5]	83.4 [4.6]	-	73.8 [4.3]	75.5 [4.3]
p for trend	-	<0.001	<0.001	-	<0.001	<0.001

Table A2.2. Mean trunk length [SD] in cm for given measures of childhood socioeconomic circumstances

	Men			Women		
	Czech Republic	Russia	Poland	Czech Republic	Russia	Poland
Asset score						
0	88.6 [4.5]	89.2 [3.4]	89.5 [3.4]	83.6 [5.0]	83.9 [3.2]	84.2 [3.2]
1	88.3 [3.7]	90.0 [3.5]	89.3 [3.6]	82.9 [3.7]	84.6 [3.3]	84.2 [3.4]
2	89.4 [3.5]	90.4 [3.4]	90.0 [3.4]	83.8 [3.3]	85.1 [3.2]	84.6 [3.3]
3	89.6 [3.7]	90.7 [3.3]	90.2 [3.6]	84.3 [3.7]	85.6 [3.1]	84.9 [3.4]
4	89.8 [3.8]	90.9 [3.4]	90.6 [3.3]	84.5 [3.7]	85.9 [3.2]	85.2 [3.2]
5	90.7 [3.8]	91.4 [3.6]	90.8 [3.5]	85.4 [3.6]	86.0 [3.1]	85.4 [3.3]
6	91.1 [3.7]	91.6 [3.7]	91.4 [3.7]	85.9 [3.5]	86.9 [3.3]	86.0 [3.2]
p for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Maternal education						
< primary	-	89.5 [3.5]	89.5 [3.6]	-	84.2 [3.2]	84.2 [3.5]
Primary	-	90.2 [3.5]	90.1 [3.5]	-	85.2 [3.3]	84.9 [3.3]
Vocational	-	90.9 [3.4]	90.8 [3.5]	-	85.4 [3.5]	85.6 [3.2]
Secondary	-	90.9 [3.3]	91.1 [3.5]	-	85.7 [3.1]	85.5 [3.4]
University	-	91.7 [3.3]	91.5 [4.1]	-	86.6 [3.2]	86.0 [3.3]
p for trend	-	<0.001	<0.001	-	<0.001	<0.001
Paternal education						
< primary	-	89.4 [3.6]	89.4 [3.7]	-	84.2 [3.2]	84.1 [3.5]
Primary	-	90.2 [3.5]	89.9 [3.5]	-	85.1 [3.4]	84.7 [3.2]
Vocational	-	90.8 [3.4]	90.7 [3.4]	-	85.4 [3.5]	85.3 [3.2]
Secondary	-	90.7 [3.4]	91.0 [3.5]	-	85.6 [3.1]	85.7 [3.5]
University	-	91.1 [3.3]	91.3 [3.9]	-	85.9 [3.1]	85.7 [3.5]
p for trend	-	<0.001	<0.001	-	<0.001	<0.001

Table A2.3. Mean LTR [SD] for given measures of childhood socioeconomic circumstances

	Men			Women		
	Czech Republic	Russia	Poland	Czech Republic	Russia	Poland
Asset score						
0	0.95 [0.07]	0.90 [0.05]	0.90 [0.05]	0.91 [0.07]	0.87 [0.06]	0.87 [0.06]
1	0.95 [0.05]	0.89 [0.05]	0.90 [0.05]	0.92 [0.06]	0.86 [0.05]	0.88 [0.06]
2	0.94 [0.06]	0.89 [0.05]	0.91 [0.05]	0.91 [0.06]	0.86 [0.05]	0.88 [0.05]
3	0.94 [0.06]	0.89 [0.05]	0.90 [0.06]	0.91 [0.06]	0.86 [0.05]	0.87 [0.06]
4	0.94 [0.06]	0.90 [0.05]	0.91 [0.05]	0.91 [0.06]	0.85 [0.05]	0.87 [0.06]
5	0.94 [0.06]	0.89 [0.05]	0.91 [0.05]	0.91 [0.06]	0.86 [0.06]	0.88 [0.06]
6	0.94 [0.06]	0.90 [0.05]	0.91 [0.06]	0.91 [0.06]	0.85 [0.05]	0.88 [0.06]
p for trend	0.212	0.635	0.035	0.012	<0.001	0.630
Maternal education						
< primary	-	0.90 [0.05]	0.91 [0.06]	-	0.86 [0.05]	0.88 [0.06]
Primary	-	0.89 [0.05]	0.90 [0.05]	-	0.86 [0.05]	0.87 [0.06]
Vocational	-	0.89 [0.05]	0.90 [0.06]	-	0.86 [0.05]	0.87 [0.05]
Secondary	-	0.89 [0.05]	0.91 [0.05]	-	0.86 [0.05]	0.88 [0.06]
University	-	0.90 [0.05]	0.92 [0.05]	-	0.86 [0.06]	0.88 [0.05]
p for trend	-	0.507	0.002	-	0.033	0.314
Paternal education						
< primary	-	0.90 [0.05]	0.90 [0.06]	-	0.86 [0.05]	0.88 [0.06]
Primary	-	0.89 [0.05]	0.91 [0.05]	-	0.86 [0.05]	0.87 [0.06]
Vocational	-	0.89 [0.05]	0.90 [0.05]	-	0.86 [0.05]	0.87 [0.05]
Secondary	-	0.89 [0.05]	0.91 [0.05]	-	0.86 [0.05]	0.87 [0.06]
University	-	0.90 [0.05]	0.92 [0.06]	-	0.86 [0.05]	0.88 [0.05]
p for trend	-	0.466	<0.001	-	0.037	0.390

Appendix 3. Blood pressure

Table A3.1. Change [95% CI] in men's systolic blood pressure (mmHg) for a one unit change in direct and indirect measures of childhood SEC†, adjusted for age, BMI, smoking and antihypertensive use

		Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	0.20 [-0.30, 0.70]	0.427	0.05 [-0.38, 0.48]	0.828	-0.48 [-0.81, -0.16]	0.003
	+ adult SEC	0.37 [-0.18, 0.92]	0.184	0.12 [-0.31, 0.56]	0.579	0.04 [-0.31, 0.39]	0.814
	+ anthropometry	0.19 [-0.31, 0.69]	0.452	0.09 [-0.35, 0.52]	0.701	-0.50 [-0.82, -0.17]	0.003
	+ adult SEC, anthropometry	0.34 [-0.21, 0.89]	0.222	0.14 [-0.29, 0.58]	0.521	0.01 [-0.34, 0.36]	0.949
Maternal education	Age, BMI and smoking	-	-	-0.21 [-0.78, 0.36]	0.471	-1.15 [-1.69, -0.60]	<0.001
	+ adult SEC	-	-	0.21 [-0.39, 0.81]	0.487	-0.14 [-0.75, 0.48]	0.666
	+ anthropometry	-	-	-0.16 [-0.73, 0.42]	0.593	-1.16 [-1.71, -0.61]	<0.001
	+ adult SEC, anthropometry	-	-	0.24 [-0.36, 0.84]	0.441	-0.17 [-0.79, 0.44]	0.583
Paternal education	Age, BMI and smoking	-	-	-0.07 [-0.62, 0.48]	0.795	-1.25 [-1.73, -0.76]	<0.001
	+ adult SEC	-	-	0.34 [-0.24, 0.91]	0.254	-0.33 [-0.89, 0.23]	0.249
	+ anthropometry	-	-	-0.04 [-0.59, 0.51]	0.889	-1.28 [-1.77, -0.78]	<0.001
	+ adult SEC, anthropometry	-	-	0.34 [-0.23, 0.92]	0.243	-0.38 [-0.94, 0.18]	0.185
Anthropometry							
Height	Age, BMI and smoking	0.06 [-0.04, 0.15]	0.230	-0.10 [-0.21, 0.01]	0.064	-0.01 [-0.10, 0.08]	0.837
	+ child SEC	0.03 [-0.06, 0.13]	0.491	-0.08 [-0.19, 0.03]	0.135	0.06 [-0.04, 0.15]	0.231
	+ adult SEC	0.09 [-0.02, 0.20]	0.095	-0.06 [-0.17, 0.04]	0.245	0.09 [-0.01, 0.18]	0.076
	+ child and adult SEC	0.09 [-0.02, 0.20]	0.107	-0.05 [-0.16, 0.06]	0.386	0.11 [0.01, 0.20]	0.027
Leg length	Age, BMI and smoking	0.09 [-0.05, 0.22]	0.216	-0.13 [-0.29, 0.02]	0.088	0.03 [-0.10, 0.16]	0.634
	+ child SEC	0.06 [-0.08, 0.20]	0.367	-0.12 [-0.28, 0.04]	0.131	0.11 [-0.02, 0.24]	0.106
	+ adult SEC	0.08 [-0.06, 0.23]	0.263	-0.09 [-0.25, 0.06]	0.238	0.12 [-0.01, 0.25]	0.074
	+ child and adult SEC	0.09 [-0.06, 0.24]	0.237	-0.09 [-0.25, 0.07]	0.292	0.14 [0.01, 0.27]	0.040
Trunk length	Age, BMI and smoking	0.05 [-0.12, 0.21]	0.575	-0.13 [-0.32, 0.07]	0.217	-0.08 [-0.24, 0.08]	0.329
	+ child SEC	0.01 [-0.16, 0.18]	0.927	-0.08 [-0.29, 0.12]	0.417	0.00 [-0.16, 0.17]	0.955
	+ adult SEC	0.14 [-0.04, 0.32]	0.138	-0.06 [-0.27, 0.14]	0.534	0.07 [-0.09, 0.24]	0.395
	+ child and adult SEC	0.12 [-0.06, 0.31]	0.194	-0.02 [-0.23, 0.18]	0.815	0.11 [-0.06, 0.28]	0.198

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table A3.2. Change [95% CI] in women's systolic blood pressure (mmHg) for a one unit change in direct and indirect measures of childhood SEC†, adjusted for age, BMI, smoking and antihypertensive use

		Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	-0.48 [-0.97, 0.01]	0.057	-0.08 [-0.52, 0.37]	0.738	-0.14 [-0.45, 0.16]	0.359
	+ adult SEC	-0.39 [-0.94, 0.17]	0.173	0.02 [-0.42, 0.46]	0.932	0.31 [-0.02, 0.65]	0.069
	+ anthropometry	-0.43 [-0.92, 0.06]	0.087	-0.03 [-0.47, 0.41]	0.888	-0.10 [-0.41, 0.21]	0.510
	+ adult SEC, anthropometry	-0.35 [-0.91, 0.20]	0.214	0.05 [-0.40, 0.49]	0.833	0.33 [-0.01, 0.67]	0.056
Maternal education	Age, BMI and smoking	-	-	-0.24 [-0.81, -0.33]	0.406	-0.98 [-1.50, -0.46]	<0.001
	+ adult SEC	-	-	0.00 [-0.59, 0.60]	0.988	-0.19 [-0.77, 0.40]	0.533
	+ anthropometry	-	-	-0.18 [-0.75, 0.40]	0.544	-0.93 [-1.45, -0.41]	<0.001
	+ adult SEC, anthropometry	-	-	0.03 [-0.56, 0.63]	0.910	-0.17 [-0.76, 0.42]	0.575
Paternal education	Age, BMI and smoking	-	-	-0.32 [-0.87, 0.22]	0.245	-1.06 [-1.53, -0.59]	<0.001
	+ adult SEC	-	-	-0.09 [-0.66, 0.48]	0.761	-0.29 [-0.84, 0.26]	0.296
	+ anthropometry	-	-	-0.27 [-0.82, 0.27]	0.328	-1.01 [-1.49, -0.54]	<0.001
	+ adult SEC, anthropometry	-	-	-0.07 [-0.64, 0.50]	0.809	-0.28 [-0.82, 0.27]	0.324
Anthropometry							
Height	Age, BMI and smoking	-0.14 [-0.24, -0.04]	0.004	-0.22 [-0.34, -0.11]	<0.001	-0.12 [-0.21, -0.03]	0.012
	+ child SEC	-0.12 [-0.22, -0.02]	0.018	-0.23 [-0.35, -0.11]	<0.001	-0.10 [-0.19, 0.00]	0.045
	+ adult SEC	-0.14 [-0.25, -0.03]	0.013	-0.20 [-0.31, -0.08]	0.001	-0.06 [-0.16, 0.04]	0.215
	+ child and adult SEC	-0.13 [-0.24, -0.02]	0.018	-0.21 [-0.33, -0.09]	0.001	-0.06 [-0.16, 0.04]	0.227
Leg length	Age, BMI and smoking	-0.19 [-0.33, -0.05]	0.006	-0.28 [-0.44, -0.13]	<0.001	-0.16 [-0.29, -0.04]	0.010
	+ child SEC	-0.16 [-0.30, -0.02]	0.022	-0.29 [-0.45, -0.13]	<0.001	-0.14 [-0.27, -0.02]	0.026
	+ adult SEC	-0.19 [-0.34, -0.04]	0.013	-0.25 [-0.41, -0.10]	0.002	-0.10 [-0.23, 0.02]	0.113
	+ child and adult SEC	-0.18 [-0.34, -0.03]	0.017	-0.26 [-0.43, -0.10]	0.002	-0.11 [-0.24, 0.02]	0.087
Trunk length	Age, BMI and smoking	-0.12 [-0.29, 0.04]	0.148	-0.24 [-0.45, -0.04]	0.021	-0.09 [-0.25, 0.08]	0.299
	+ child SEC	-0.10 [-0.27, -0.07]	0.238	-0.26 [-0.48, -0.05]	0.017	-0.05 [-0.22, 0.12]	0.570
	+ adult SEC	-0.11 [-0.30, 0.08]	0.254	-0.21 [-0.42, 0.00]	0.053	-0.01 [-0.18, 0.16]	0.938
	+ child and adult SEC	-0.10 [-0.29, 0.09]	0.293	-0.23 [-0.44, -0.01]	0.038	0.01 [-0.16, 0.19]	0.881

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table A3.3. Change [95% CI] in men's diastolic blood pressure (mmHg) for a one unit change in direct and indirect measures of childhood SEC†, adjusted for age, BMI, smoking and antihypertensive use

		Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	0.21 [-0.08, 0.51]	0.156	0.03 [-0.22, 0.29]	0.790	-0.10 [-0.29, 0.10]	0.322
	+ adult SEC	0.28 [-0.04, 0.61]	0.086	0.03 [-0.22, 0.29]	0.803	0.05 [-0.16, 0.27]	0.613
	+ anthropometry	0.16 [-0.13, 0.46]	0.277	0.01 [-0.24, 0.27]	0.910	-0.15 [-0.34, 0.05]	0.141
	+ adult SEC, anthropometry	0.24 [-0.09, 0.56]	0.154	0.01 [-0.25, 0.26]	0.940	0.02 [-0.19, 0.23]	0.855
Maternal education	Age, BMI and smoking	-	-	0.08 [-0.26, 0.41]	0.659	-0.12 [-0.44, 0.21]	0.475
	+ adult SEC	-	-	0.24 [-0.11, 0.59]	0.185	0.16 [-0.21, 0.53]	0.403
	+ anthropometry	-	-	0.05 [-0.29, 0.39]	0.773	-0.19 [-0.52, 0.14]	0.257
	+ adult SEC, anthropometry	-	-	0.21 [-0.14, 0.56]	0.235	0.11 [-0.26, 0.48]	0.229
Paternal education	Age, BMI and smoking	-	-	0.12 [-0.20, 0.44]	0.462	-0.01 [-0.30, 0.28]	0.939
	+ adult SEC	-	-	0.27 [-0.07, 0.61]	0.117	0.27 [-0.07, 0.61]	0.117
	+ anthropometry	-	-	0.10 [-0.22, 0.42]	0.554	-0.09 [-0.39, 0.21]	0.550
	+ adult SEC, anthropometry	-	-	0.25 [-0.09, 0.59]	0.143	0.21 [-0.13, 0.55]	0.225
Anthropometry							
Height	Age, BMI and smoking	0.13 [0.08, 0.19]	<0.001	0.05 [-0.02, 0.11]	0.138	0.08 [0.03, 0.13]	0.004
	+ child SEC	0.12 [0.06, 0.18]	<0.001	0.05 [-0.01, 0.11]	0.132	0.10 [0.04, 0.15]	0.001
	+ adult SEC	0.15 [0.09, 0.21]	<0.001	0.06 [0.00, 0.13]	0.052	0.12 [0.06, 0.17]	<0.001
	+ child and adult SEC	0.15 [0.08, 0.21]	<0.001	0.07 [0.00, 0.13]	0.049	0.12 [0.06, 0.18]	<0.001
Leg length	Age, BMI and smoking	0.18 [0.10, 0.26]	<0.001	0.04 [-0.05, 0.12]	0.436	0.11 [0.04, 0.19]	0.004
	+ child SEC	0.17 [0.09, 0.26]	<0.001	0.04 [-0.06, 0.13]	0.445	0.13 [0.05, 0.21]	0.001
	+ adult SEC	0.19 [0.10, 0.28]	<0.001	0.05 [-0.04, 0.14]	0.267	0.14 [0.07, 0.22]	<0.001
	+ child and adult SEC	0.19 [0.10, 0.28]	<0.001	0.05 [-0.04, 0.14]	0.286	0.14 [0.06, 0.22]	0.001
Trunk length	Age, BMI and smoking	0.12 [0.02, 0.22]	0.015	0.10 [-0.01, 0.22]	0.081	0.07 [-0.02, 0.17]	0.141
	+ child SEC	0.10 [0.00, 0.20]	0.058	0.11 [-0.01, 0.23]	0.072	0.10 [0.00, 0.20]	0.054
	+ adult SEC	0.15 [0.04, 0.25]	0.008	0.13 [0.01, 0.25]	0.030	0.13 [0.03, 0.23]	0.011
	+ child and adult SEC	0.13 [0.02, 0.24]	0.017	0.14 [0.02, 0.26]	0.024	0.14 [0.04, 0.25]	0.006

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table A3.4. Change [95% CI] in women's diastolic blood pressure (mmHg) for a one unit change in direct and indirect measures of childhood SEC†, adjusted for age, BMI, smoking and antihypertensive use

		Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	0.06 [-0.21, 0.34]	0.649	0.06 [-0.18, 0.30]	0.614	0.13 [-0.05, 0.30]	0.156
	+ adult SEC	0.11 [-0.21, 0.43]	0.492	0.09 [-0.15, 0.33]	0.477	0.27 [0.07, 0.46]	0.007
	+ anthropometry	0.06 [-0.22, 0.34]	0.668	0.06 [-0.18, 0.30]	0.621	0.13 [-0.05, 0.31]	0.145
	+ adult SEC, anthropometry	0.12 [-0.20, 0.43]	0.476	0.08 [-0.16, 0.32]	0.496	0.27 [0.07, 0.47]	0.007
Maternal education	Age, BMI and smoking	-	-	0.15 [-0.16, 0.46]	0.332	-0.13 [-0.43, 0.16]	0.384
	+ adult SEC	-	-	0.22 [-0.10, 0.54]	0.181	0.16 [-0.18, 0.49]	0.368
	+ anthropometry	-	-	0.16 [-0.15, 0.46]	0.321	-0.13 [-0.43, 0.17]	0.398
	+ adult SEC, anthropometry	-	-	0.21 [-0.11, 0.53]	0.191	0.16 [-0.18, 0.49]	0.364
Paternal education	Age, BMI and smoking	-	-	0.01 [-0.29, 0.30]	0.958	-0.12 [-0.39, 0.15]	0.370
	+ adult SEC	-	-	0.06 [-0.24, 0.37]	0.683	0.14 [-0.17, 0.46]	0.381
	+ anthropometry	-	-	0.01 [-0.28, 0.30]	0.945	-0.13 [-0.40, 0.14]	0.359
	+ adult SEC, anthropometry	-	-	0.06 [-0.25, 0.36]	0.708	0.14 [-0.18, 0.45]	0.398
Anthropometry							
Height	Age, BMI and smoking	0.01 [-0.05, 0.06]	0.812	-0.04 [-0.11, 0.02]	0.153	-0.02 [-0.07, 0.04]	0.580
	+ child SEC	0.02 [-0.04, 0.07]	0.580	-0.05 [-0.11, 0.01]	0.114	-0.01 [-0.07, 0.04]	0.651
	+ adult SEC	0.00 [-0.06, 0.06]	0.968	-0.04 [-0.10, 0.03]	0.254	0.01 [-0.05, 0.07]	0.712
	+ child and adult SEC	0.00 [-0.06, 0.06]	0.989	-0.04 [-0.10, 0.02]	0.206	0.01 [-0.05, 0.06]	0.823
Leg length	Age, BMI and smoking	-0.03 [-0.11, 0.05]	0.485	-0.10 [-0.19, -0.02]	0.015	-0.06 [-0.13, 0.01]	0.085
	+ child SEC	-0.02 [-0.10, 0.06]	0.686	-0.10 [-0.19, -0.01]	0.022	-0.06 [-0.14, 0.01]	0.081
	+ adult SEC	-0.02 [-0.11, 0.06]	0.619	-0.09 [-0.18, -0.01]	0.029	-0.04 [-0.11, 0.04]	0.323
	+ child and adult SEC	-0.02 [-0.11, 0.06]	0.608	-0.09 [-0.18, 0.00]	0.044	-0.05 [-0.12, 0.03]	0.196
Trunk length	Age, BMI and smoking	0.06 [-0.03, 0.15]	0.215	0.03 [-0.08, 0.15]	0.555	0.06 [-0.03, 0.16]	0.190
	+ child SEC	0.07 [-0.03, 0.17]	0.157	0.01 [-0.11, 0.12]	0.892	0.08 [-0.02, 0.17]	0.127
	+ adult SEC	0.04 [-0.07, 0.14]	0.494	0.05 [-0.07, 0.16]	0.427	0.10 [0.00, 0.20]	0.049
	+ child and adult SEC	0.03 [-0.07, 0.14]	0.541	0.02 [-0.10, 0.14]	0.729	0.11 [0.01, 0.21]	0.034

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table A3.5. Prevalence (%) of hypertension (160/95mmHg) by age and measures of childhood SEC

	Men			Women		
	Czech Republic	Russia	Poland	Czech Republic	Russia	Poland
Age						
45-49	38.0	33.9	38.2	29.1	38.2	28.1
50-54	50.2	41.8	43.5	39.1	47.3	38.9
55-59	62.0	51.1	58.5	52.5	58.8	53.0
60-64	66.0	47.6	58.6	57.1	65.0	59.8
65-69	71.3	56.2	63.8	69.3	67.1	64.2
70+	75.0	52.9	58.7	74.5	80.0	69.4
p for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Assets in childhood						
0	68.3	50.2	58.0	70.8	65.0	55.8
1	68.9	48.3	57.7	60.2	60.3	59.8
2	67.3	47.2	55.9	61.6	57.7	54.9
3	66.1	43.6	54.4	57.0	52.0	49.0
4	59.6	46.6	57.3	52.9	48.8	48.2
5	54.3	50.0	50.7	43.5	49.2	47.2
6	53.6	43.7	44.1	41.9	45.8	38.0
p for trend	<0.001	0.100	<0.001	<0.001	<0.001	<0.001
Paternal education						
< primary	-	49.9	50.8	-	61.6	55.9
Primary	-	47.5	55.8	-	56.0	51.9
Vocational	-	46.6	51.9	-	53.4	48.3
Secondary	-	46.3	51.9	-	54.7	44.8
University	-	46.5	49.6	-	53.2	38.9
p for trend	-	0.168	0.042	-	0.001	<0.001
Maternal education						
< primary	-	50.2	51.7	-	62.7	57.1
Primary	-	47.4	55.7	-	55.8	50.8
Vocational	-	45.6	50.4	-	54.2	48.8
Secondary	-	45.2	50.8	-	52.9	42.7
University	-	48.0	47.3	-	46.2	35.8
p for trend	-	0.055	0.012	-	<0.001	<0.001

Table A3.6. OR [95% CI] for hypertension (160/95mmHg) for a one unit change in adult SEC†

	Czech Republic		Russia		Poland	
	OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Men						
Education	0.95 [0.87, 1.04]	0.241	0.94 [0.88, 1.00]	0.043	0.99 [0.93, 1.06]	0.854
Deprivation	0.98 [0.94, 1.01]	0.191	0.97 [0.95, 0.99]	0.001	0.97 [0.95, 0.99]	0.005
People per room	1.13 [1.00, 1.28]	0.046	0.91 [0.78, 1.07]	0.257	1.07 [0.96, 1.20]	0.219
Assets	0.98 [0.95, 1.02]	0.349	0.95 [0.92, 0.98]	0.002	0.99 [0.96, 1.01]	0.327
Women						
Education	0.90 [0.83, 0.97]	0.006	0.99 [0.92, 1.05]	0.644	0.90 [0.85, 0.97]	0.003
Deprivation	0.99 [0.96, 1.02]	0.679	0.98 [0.96, 1.00]	0.034	0.97 [0.95, 0.99]	0.007
People per room	0.98 [0.90, 1.08]	0.729	0.93 [0.82, 1.05]	0.252	0.93 [0.85, 1.03]	0.187
Assets	0.95 [0.92, 0.99]	0.007	0.99 [0.96, 1.02]	0.413	0.97 [0.94, 1.00]	0.033

† One higher level of education, one point higher on material position scale, one more room per person in home or one more asset

Table A3.7. OR [95% CI] for hypertension (140/90mmHg) for a one unit change in adult SEC†, excluding those on anti-hypertensive treatment

	Czech Republic		Russia		Poland	
	OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Men						
Education	0.91 [0.82, 1.02]	0.108	0.86 [0.80, 0.93]	<0.001	0.83 [0.76, 0.90]	<0.001
Deprivation	0.98 [0.94, 1.02]	0.372	0.97 [0.95, 1.00]	0.019	0.96 [0.94, 0.99]	0.006
People per room	1.10 [0.95, 1.29]	0.196	0.92 [0.77, 1.10]	0.355	0.95 [0.82, 1.10]	0.492
Assets	0.93 [0.89, 0.97]	0.001	0.95 [0.91, 0.98]	0.004	0.97 [0.94, 1.01]	0.111
Women						
Education	0.98 [0.89, 1.08]	0.661	0.96 [0.88, 1.04]	0.322	0.89 [0.82, 0.98]	0.013
Deprivation	1.02 [0.99, 1.06]	0.206	1.01 [0.99, 1.03]	0.398	0.98 [0.95, 1.01]	0.167
People per room	0.91 [0.80, 1.03]	0.135	0.80 [0.68, 0.94]	0.008	0.98 [0.85, 1.13]	0.805
Assets	1.01 [0.97, 1.05]	0.759	0.96 [0.92, 1.00]	0.032	0.95 [0.91, 0.99]	0.012

† One higher level of education, one point higher on material position scale, one more room per person in home or one more asset

Table A3.8. OR [95% CI] for hypertension (160/95mmHg) for a one unit change in adult SEC†, excluding those on anti-hypertensive treatment

	Czech Republic		Russia		Poland	
	OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Men						
Education	0.94 [0.84, 1.06]	0.319	0.89 [0.83, 0.96]	0.003	0.91 [0.82, 0.99]	0.037
Deprivation	0.98 [0.94, 1.03]	0.429	0.98 [0.96, 1.00]	0.065	0.96 [0.93, 0.99]	0.004
People per room	1.16 [0.99, 1.35]	0.059	0.81 [0.67, 0.98]	0.034	0.82 [0.68, 0.98]	0.033
Assets	0.96 [0.92, 1.01]	0.084	0.95 [0.91, 0.98]	0.004	0.95 [0.91, 0.99]	0.010
Women						
Education	0.92 [0.82, 1.04]	0.167	0.97 [0.89, 1.06]	0.550	0.89 [0.79, 1.01]	0.070
Deprivation	1.00 [0.96, 1.05]	0.905	1.00 [0.98, 1.03]	0.837	0.97 [0.94, 1.01]	0.147
People per room	0.89 [0.75, 1.04]	0.146	0.77 [0.64, 0.92]	0.004	0.89 [0.72, 1.09]	0.271
Assets	0.98 [0.93, 1.04]	0.530	0.96 [0.92, 1.01]	0.092	0.95 [0.90, 1.00]	0.069

† One higher level of education, one point higher on material position scale, one more room per person in home or one more asset

Table A3.9. OR [95% CI] for men's hypertension (160/95mmHg) for a one unit change in direct and indirect measures of childhood SEC[†]

		Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	1.03 [0.97, 1.10]	0.311	1.05 [1.01, 1.10]	0.022	0.99 [0.95, 1.02]	0.479
	+ adult SEC	1.05 [0.98, 1.13]	0.140	1.06 [1.01, 1.10]	0.015	0.98 [0.94, 1.02]	0.391
	+ anthropometry	1.03 [0.97, 1.10]	0.362	1.05 [1.01, 1.10]	0.025	0.99 [0.95, 1.02]	0.496
	+ adult SEC, anthropometry	1.05 [0.98, 1.12]	0.169	1.05 [1.01, 1.10]	0.018	0.98 [0.94, 1.02]	0.379
Maternal education	Age, BMI and smoking	-	-	1.02 [0.97, 1.08]	0.390	1.02 [0.96, 1.09]	0.453
	+ adult SEC	-	-	1.06 [1.00, 1.12]	0.055	1.02 [0.95, 1.09]	0.552
	+ anthropometry	-	-	1.02 [0.97, 1.08]	0.410	1.03 [0.96, 1.09]	0.420
	+ adult SEC, anthropometry	-	-	1.06 [1.00, 1.12]	0.062	1.02 [0.95, 1.09]	0.565
Paternal education	Age, BMI and smoking	-	-	0.99 [0.94, 1.05]	0.789	1.02 [0.97, 1.08]	0.457
	+ adult SEC	-	-	1.02 [0.96, 1.08]	0.494	1.02 [0.95, 1.08]	0.596
	+ anthropometry	-	-	0.99 [0.94, 1.05]	0.734	1.02 [0.97, 1.08]	0.421
	+ adult SEC, anthropometry	-	-	1.02 [0.96, 1.08]	0.533	1.02 [0.95, 1.08]	0.615
Anthropometry							
Height	Age, BMI and smoking	1.01 [1.00, 1.02]	0.060	1.00 [0.99, 1.01]	0.716	1.00 [0.99, 1.01]	0.624
	+ child SEC	1.01 [1.00, 1.02]	0.173	1.00 [0.99, 1.01]	0.613	1.00 [0.99, 1.01]	0.762
	+ adult SEC	1.01 [1.00, 1.02]	0.113	1.00 [0.99, 1.01]	0.451	1.00 [0.99, 1.01]	0.797
	+ child and adult SEC	1.01 [1.00, 1.02]	0.168	1.00 [0.99, 1.02]	0.398	1.00 [0.99, 1.01]	0.881
Leg length	Age, BMI and smoking	1.02 [1.00, 1.03]	0.070	1.00 [0.98, 1.01]	0.903	1.01 [0.99, 1.02]	0.443
	+ child SEC	1.01 [1.00, 1.03]	0.159	1.00 [0.98, 1.02]	0.959	1.01 [0.99, 1.02]	0.330
	+ adult SEC	1.01 [1.00, 1.03]	0.128	1.00 [0.99, 1.02]	0.868	1.01 [0.99, 1.02]	0.292
	+ child and adult SEC	1.01 [0.99, 1.03]	0.166	1.00 [0.99, 1.02]	0.848	1.01 [0.99, 1.02]	0.275
Trunk length	Age, BMI and smoking	1.01 [0.99, 1.03]	0.295	1.01 [0.99, 1.03]	0.404	0.98 [0.97, 1.00]	0.064
	+ child SEC	1.01 [0.99, 1.03]	0.524	1.01 [0.99, 1.03]	0.315	0.98 [0.97, 1.00]	0.076
	+ adult SEC	1.01 [0.99, 1.03]	0.399	1.01 [0.99, 1.03]	0.236	0.98 [0.96, 1.00]	0.071
	+ child and adult SEC	1.01 [0.98, 1.03]	0.514	1.01 [0.99, 1.04]	0.187	0.98 [0.97, 1.00]	0.096

[†] One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table A3.10. OR [95% CI] for men's hypertension (140/90mmHg) for a one unit change in direct and indirect measures of childhood SEC†, excluding those on anti-hypertensive treatment

		Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	0.97 [0.90, 1.05]	0.454	1.04 [0.99, 1.09]	0.127	0.98 [0.94, 1.03]	0.455
	+ adult SEC	1.02 [0.94, 1.10]	0.701	1.04 [1.00, 1.10]	0.074	1.02 [0.97, 1.07]	0.460
	+ anthropometry	0.96 [0.89, 1.04]	0.351	1.04 [0.99, 1.09]	0.119	0.98 [0.93, 1.02]	0.300
	+ adult SEC, anthropometry	1.01 [0.93, 1.09]	0.900	1.04 [1.00, 1.10]	0.077	1.01 [0.97, 1.06]	0.596
Maternal education	Age, BMI and smoking	-	-	0.97 [0.91, 1.03]	0.282	0.95 [0.88, 1.02]	0.154
	+ adult SEC	-	-	1.01 [0.94, 1.08]	0.790	1.01 [0.92, 1.09]	0.895
	+ anthropometry	-	-	0.97 [0.91, 1.03]	0.292	0.94 [0.87, 1.01]	0.089
	+ adult SEC, anthropometry	-	-	1.01 [0.94, 1.08]	0.814	1.00 [0.92, 1.09]	0.979
Paternal education	Age, BMI and smoking	-	-	0.99 [0.93, 1.05]	0.728	0.96 [0.89, 1.02]	0.196
	+ adult SEC	-	-	1.03 [0.97, 1.10]	0.356	1.02 [0.94, 1.10]	0.593
	+ anthropometry	-	-	0.99 [0.93, 1.05]	0.710	0.94 [0.88, 1.01]	0.094
	+ adult SEC, anthropometry	-	-	1.03 [0.96, 1.10]	0.390	1.01 [0.93, 1.09]	0.794
Anthropometry							
Height	Age, BMI and smoking	1.02 [1.00, 1.03]	0.022	1.00 [0.99, 1.01]	0.587	1.01 [1.00, 1.03]	0.050
	+ child SEC	1.02 [1.00, 1.03]	0.049	1.00 [0.99, 1.01]	0.635	1.02 [1.00, 1.03]	0.013
	+ adult SEC	1.03 [1.01, 1.04]	0.002	1.00 [0.99, 1.01]	0.937	1.02 [1.01, 1.03]	0.003
	+ child and adult SEC	1.02 [1.01, 1.04]	0.004	1.00 [0.99, 1.01]	0.951	1.02 [1.01, 1.03]	0.002
Leg length	Age, BMI and smoking	1.02 [1.00, 1.04]	0.035	0.99 [0.97, 1.01]	0.219	1.02 [1.00, 1.03]	0.058
	+ child SEC	1.02 [1.00, 1.04]	0.068	0.99 [0.97, 1.00]	0.213	1.02 [1.00, 1.04]	0.017
	+ adult SEC	1.03 [1.01, 1.05]	0.015	0.99 [0.98, 1.01]	0.431	1.02 [1.01, 1.04]	0.011
	+ child and adult SEC	1.03 [1.00, 1.05]	0.028	0.99 [0.98, 1.01]	0.395	1.02 [1.01, 1.04]	0.011
Trunk length	Age, BMI and smoking	1.02 [0.99, 1.04]	0.171	1.01 [0.98, 1.03]	0.560	1.01 [0.99, 1.03]	0.293
	+ child SEC	1.02 [0.99, 1.04]	0.249	1.01 [0.99, 1.03]	0.463	1.02 [0.99, 1.04]	0.178
	+ adult SEC	1.03 [1.01, 1.06]	0.017	1.01 [0.99, 1.04]	0.241	1.02 [1.00, 1.05]	0.053
	+ child and adult SEC	1.03 [1.00, 1.06]	0.028	1.01 [0.99, 1.04]	0.222	1.03 [1.00, 1.05]	0.039

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table A3.11. OR [95% CI] for men's hypertension (160/95mmHg) for a one unit change in direct and indirect measures of childhood SEC†, excluding those on anti-hypertensive treatment

		Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	1.06 [0.98, 1.15]	0.165	1.01 [0.96, 1.07]	0.591	0.99 [0.93, 1.04]	0.575
	+ adult SEC	1.07 [0.98, 1.17]	0.116	1.02 [0.97, 1.08]	0.418	1.00 [0.94, 1.06]	0.999
	+ anthropometry	1.05 [0.97, 1.13]	0.257	1.01 [0.96, 1.07]	0.612	0.98 [0.93, 1.03]	0.400
	+ adult SEC, anthropometry	1.06 [0.97, 1.16]	0.203	1.02 [0.97, 1.07]	0.455	0.99 [0.94, 1.05]	0.858
Maternal education	Age, BMI and smoking	-	-	0.99 [0.93, 1.06]	0.841	0.97 [0.89, 1.06]	0.517
	+ adult SEC	-	-	1.03 [0.96, 1.10]	0.440	1.02 [0.92, 1.12]	0.768
	+ anthropometry	-	-	0.99 [0.93, 1.06]	0.824	0.96 [0.88, 1.05]	0.375
	+ adult SEC, anthropometry	-	-	1.03 [0.96, 1.10]	0.470	1.01 [0.91, 1.12]	0.864
Paternal education	Age, BMI and smoking	-	-	0.96 [0.90, 1.03]	0.266	0.98 [0.91, 1.07]	0.704
	+ adult SEC	-	-	0.99 [0.93, 1.06]	0.828	1.02 [0.93, 1.12]	0.701
	+ anthropometry	-	-	0.96 [0.90, 1.03]	0.232	0.97 [0.90, 1.05]	0.478
	+ adult SEC, anthropometry	-	-	0.99 [0.92, 1.06]	0.761	1.01 [0.92, 1.11]	0.861
Anthropometry							
Height	Age, BMI and smoking	1.03 [1.01, 1.04]	0.001	1.00 [0.99, 1.01]	0.949	1.01 [1.00, 1.03]	0.068
	+ child SEC	1.02 [1.01, 1.04]	0.007	1.00 [0.99, 1.01]	0.859	1.02 [1.00, 1.04]	0.016
	+ adult SEC	1.03 [1.01, 1.05]	0.001	1.00 [0.99, 1.02]	0.694	1.02 [1.00, 1.04]	0.014
	+ child and adult SEC	1.03 [1.01, 1.05]	0.002	1.00 [0.99, 1.02]	0.594	1.02 [1.01, 1.04]	0.007
Leg length	Age, BMI and smoking	1.04 [1.01, 1.06]	0.001	0.99 [0.97, 1.01]	0.357	1.02 [1.00, 1.04]	0.067
	+ child SEC	1.03 [1.01, 1.06]	0.004	0.99 [0.97, 1.01]	0.428	1.03 [1.00, 1.05]	0.023
	+ adult SEC	1.04 [1.01, 1.06]	0.002	0.99 [0.98, 1.01]	0.582	1.03 [1.00, 1.05]	0.018
	+ child and adult SEC	1.04 [1.01, 1.06]	0.004	1.00 [0.98, 1.01]	0.610	1.03 [1.01, 1.05]	0.015
Trunk length	Age, BMI and smoking	1.02 [0.99, 1.05]	0.135	1.01 [0.99, 1.04]	0.281	1.01 [0.99, 1.04]	0.375
	+ child SEC	1.02 [0.99, 1.04]	0.255	1.02 [0.99, 1.04]	0.174	1.02 [0.99, 1.05]	0.193
	+ adult SEC	1.03 [1.00, 1.06]	0.041	1.02 [0.99, 1.04]	0.147	1.02 [0.99, 1.05]	0.192
	+ child and adult SEC	1.03 [1.00, 1.06]	0.083	1.02 [1.00, 1.05]	0.099	1.02 [1.00, 1.05]	0.105

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table A3.12. OR [95% CI] for women's hypertension (160/95mmHg) for a one unit change in direct and indirect measures of childhood SEC†

		Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	1.02 [0.96, 1.09]	0.454	1.01 [0.97, 1.05]	0.613	0.98 [0.95, 1.02]	0.386
	+ adult SEC	1.04 [0.97, 1.12]	0.223	1.01 [0.97, 1.06]	0.504	1.00 [0.96, 1.04]	0.887
	+ anthropometry	1.03 [0.97, 1.09]	0.401	1.01 [0.97, 1.05]	0.683	0.99 [0.95, 1.02]	0.527
	+ adult SEC, anthropometry	1.04 [0.97, 1.12]	0.228	1.01 [0.97, 1.06]	0.561	1.00 [0.97, 1.05]	0.812
Maternal education	Age, BMI and smoking	-	-	1.02 [0.96, 1.07]	0.587	0.97 [0.91, 1.03]	0.308
	+ adult SEC	-	-	1.03 [0.97, 1.08]	0.382	1.01 [0.94, 1.08]	0.811
	+ anthropometry	-	-	1.01 [0.96, 1.07]	0.642	0.97 [0.92, 1.04]	0.414
	+ adult SEC, anthropometry	-	-	1.02 [0.97, 1.08]	0.423	1.01 [0.94, 1.08]	0.761
Paternal education	Age, BMI and smoking	-	-	1.04 [0.98, 1.09]	0.184	0.98 [0.92, 1.03]	0.386
	+ adult SEC	-	-	1.04 [0.99, 1.10]	0.118	1.01 [0.95, 1.08]	0.738
	+ anthropometry	-	-	1.03 [0.98, 1.09]	0.209	0.98 [0.93, 1.04]	0.523
	+ adult SEC, anthropometry	-	-	1.04 [0.99, 1.10]	0.139	1.01 [0.95, 1.08]	0.680
Anthropometry							
Height	Age, BMI and smoking	0.99 [0.98, 1.00]	0.137	1.00 [0.99, 1.01]	0.904	0.99 [0.98, 1.00]	0.026
	+ child SEC	0.99 [0.98, 1.00]	0.163	1.00 [0.99, 1.01]	0.835	0.99 [0.98, 1.00]	0.037
	+ adult SEC	0.99 [0.98, 1.01]	0.243	1.00 [0.99, 1.01]	0.846	0.99 [0.98, 1.00]	0.134
	+ child and adult SEC	0.99 [0.98, 1.01]	0.261	1.00 [0.99, 1.01]	0.907	0.99 [0.98, 1.00]	0.124
Leg length	Age, BMI and smoking	1.00 [0.98, 1.01]	0.717	0.99 [0.98, 1.01]	0.285	0.99 [0.97, 1.00]	0.052
	+ child SEC	1.00 [0.98, 1.01]	0.768	0.99 [0.97, 1.00]	0.181	0.99 [0.97, 1.00]	0.049
	+ adult SEC	1.00 [0.98, 1.02]	0.990	0.99 [0.98, 1.01]	0.310	0.99 [0.97, 1.01]	0.190
	+ child and adult SEC	1.00 [0.98, 1.02]	0.909	0.99 [0.97, 1.01]	0.209	0.99 [0.97, 1.00]	0.125
Trunk length	Age, BMI and smoking	0.98 [0.96, 1.00]	0.041	1.02 [1.00, 1.04]	0.104	0.99 [0.97, 1.01]	0.180
	+ child SEC	0.98 [0.96, 1.00]	0.048	1.01 [0.99, 1.04]	0.167	0.99 [0.97, 1.01]	0.285
	+ adult SEC	0.98 [0.96, 1.00]	0.050	1.02 [1.00, 1.04]	0.092	0.99 [0.97, 1.01]	0.370
	+ child and adult SEC	0.98 [0.95, 1.00]	0.041	1.02 [0.99, 1.04]	0.151	0.99 [0.97, 1.01]	0.503

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table A3.13. OR [95% CI] for women's hypertension (140/90mmHg) for a one unit change in direct and indirect measures of childhood SEC†, excluding those on anti-hypertensive treatment

		Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	1.03 [0.95, 1.11]	0.464	1.02 [0.97, 1.07]	0.510	1.03 [0.98, 1.08]	0.305
	+ adult SEC	1.02 [0.93, 1.11]	0.700	1.03 [0.98, 1.08]	0.304	1.05 [1.00, 1.11]	0.063
	+ anthropometry	1.03 [0.96, 1.11]	0.405	1.02 [0.97, 1.07]	0.523	1.03 [0.98, 1.08]	0.236
	+ adult SEC, anthropometry	1.02 [0.94, 1.11]	0.662	1.03 [0.97, 1.08]	0.321	1.06 [1.00, 1.12]	0.057
Maternal education	Age, BMI and smoking	-	-	1.00 [0.94, 1.08]	0.916	0.94 [0.87, 1.03]	0.170
	+ adult SEC	-	-	1.02 [0.95, 1.10]	0.586	1.00 [0.91, 1.11]	0.935
	+ anthropometry	-	-	1.00 [0.94, 1.08]	0.922	0.95 [0.87, 1.03]	0.227
	+ adult SEC, anthropometry	-	-	1.02 [0.95, 1.10]	0.612	1.01 [0.91, 1.11]	0.902
Paternal education	Age, BMI and smoking	-	-	1.00 [0.94, 1.07]	0.935	0.95 [0.88, 1.02]	0.165
	+ adult SEC	-	-	1.02 [0.95, 1.09]	0.629	0.99 [0.91, 1.09]	0.869
	+ anthropometry	-	-	1.00 [0.94, 1.07]	0.960	0.95 [0.88, 1.03]	0.236
	+ adult SEC, anthropometry	-	-	1.02 [0.95, 1.09]	0.672	0.99 [0.91, 1.09]	0.911
Anthropometry							
Height	Age, BMI and smoking	0.99 [0.98, 1.00]	0.177	1.00 [0.98, 1.01]	0.752	0.99 [0.97, 1.00]	0.068
	+ child SEC	0.99 [0.98, 1.01]	0.202	1.00 [0.98, 1.01]	0.665	0.99 [0.97, 1.00]	0.087
	+ adult SEC	0.99 [0.97, 1.00]	0.134	1.00 [0.99, 1.01]	0.962	0.99 [0.98, 1.01]	0.438
	+ child and adult SEC	0.99 [0.97, 1.00]	0.142	1.00 [0.98, 1.01]	0.859	0.99 [0.98, 1.01]	0.362
Leg length	Age, BMI and smoking	0.98 [0.96, 1.00]	0.097	0.99 [0.97, 1.01]	0.305	0.98 [0.96, 1.00]	0.089
	+ child SEC	0.98 [0.96, 1.01]	0.146	0.99 [0.97, 1.01]	0.315	0.98 [0.96, 1.00]	0.097
	+ adult SEC	0.98 [0.96, 1.01]	0.167	0.99 [0.97, 1.01]	0.376	0.99 [0.97, 1.01]	0.374
	+ child and adult SEC	0.99 [0.96, 1.01]	0.208	0.99 [0.97, 1.01]	0.385	0.99 [0.97, 1.01]	0.266
Trunk length	Age, BMI and smoking	1.00 [0.97, 1.02]	0.806	1.01 [0.99, 1.04]	0.445	0.99 [0.96, 1.01]	0.338
	+ child SEC	1.00 [0.97, 1.02]	0.714	1.01 [0.98, 1.03]	0.602	0.99 [0.96, 1.02]	0.418
	+ adult SEC	0.99 [0.96, 1.02]	0.414	1.01 [0.99, 1.04]	0.287	1.00 [0.97, 1.03]	0.855
	+ child and adult SEC	0.99 [0.96, 1.01]	0.363	1.01 [0.98, 1.04]	0.420	1.00 [0.97, 1.03]	0.904

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table A3.14. OR [95% CI] for women's hypertension (160/95mmHg) for a one unit change in direct and indirect measures of childhood SEC†, excluding those on anti-hypertensive treatment

		Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age, BMI and smoking	1.11 [1.01, 1.22]	0.036	1.03 [0.97, 1.09]	0.360	1.02 [0.95, 1.09]	0.665
	+ adult SEC	1.12 [1.00, 1.24]	0.042	1.04 [0.98, 1.10]	0.221	1.05 [0.97, 1.13]	0.233
	+ anthropometry	1.11 [1.01, 1.22]	0.029	1.03 [0.97, 1.09]	0.385	1.02 [0.95, 1.09]	0.563
	+ adult SEC, anthropometry	1.12 [1.01, 1.24]	0.038	1.04 [0.98, 1.10]	0.241	1.05 [0.97, 1.13]	0.212
Maternal education	Age, BMI and smoking	-	-	1.06 [0.98, 1.14]	0.152	0.93 [0.83, 1.05]	0.254
	+ adult SEC	-	-	1.08 [1.00, 1.17]	0.059	0.97 [0.85, 1.11]	0.682
	+ anthropometry	-	-	1.06 [0.98, 1.14]	0.163	0.94 [0.84, 1.06]	0.309
	+ adult SEC, anthropometry	-	-	1.08 [0.99, 1.17]	0.068	0.98 [0.85, 1.12]	0.715
Paternal education	Age, BMI and smoking	-	-	1.06 [0.99, 1.14]	0.098	0.95 [0.85, 1.05]	0.305
	+ adult SEC	-	-	1.08 [1.00, 1.16]	0.054	0.97 [0.86, 1.10]	0.614
	+ anthropometry	-	-	1.06 [0.99, 1.14]	0.111	0.95 [0.86, 1.06]	0.382
	+ adult SEC, anthropometry	-	-	1.07 [1.00, 1.16]	0.065	0.97 [0.86, 1.10]	0.648
Anthropometry							
Height	Age, BMI and smoking	0.99 [0.97, 1.01]	0.324	1.00 [0.98, 1.01]	0.753	0.98 [0.96, 1.00]	0.106
	+ child SEC	0.99 [0.97, 1.01]	0.281	1.00 [0.98, 1.01]	0.572	0.98 [0.96, 1.01]	0.148
	+ adult SEC	0.99 [0.97, 1.01]	0.288	1.00 [0.98, 1.01]	0.925	0.99 [0.97, 1.01]	0.407
	+ child and adult SEC	0.99 [0.97, 1.01]	0.270	1.00 [0.98, 1.01]	0.753	0.99 [0.97, 1.01]	0.394
Leg length	Age, BMI and smoking	0.99 [0.96, 1.01]	0.286	0.99 [0.97, 1.01]	0.200	0.97 [0.95, 1.00]	0.064
	+ child SEC	0.98 [0.96, 1.01]	0.238	0.98 [0.96, 1.01]	0.167	0.97 [0.95, 1.00]	0.069
	+ adult SEC	0.99 [0.96, 1.01]	0.317	0.99 [0.97, 1.01]	0.265	0.98 [0.96, 1.01]	0.251
	+ child and adult SEC	0.98 [0.96, 1.01]	0.275	0.99 [0.97, 1.01]	0.232	0.98 [0.95, 1.01]	0.199
Trunk length	Age, BMI and smoking	0.99 [0.97, 1.02]	0.723	1.02 [0.99, 1.04]	0.267	0.99 [0.96, 1.03]	0.702
	+ child SEC	0.99 [0.96, 1.03]	0.717	1.01 [0.98, 1.04]	0.433	1.00 [0.96, 1.04]	0.912
	+ adult SEC	0.99 [0.96, 1.02]	0.583	1.02 [0.99, 1.05]	0.198	1.00 [0.96, 1.04]	0.934
	+ child and adult SEC	0.99 [0.96, 1.03]	0.617	1.01 [0.99, 1.04]	0.321	1.00 [0.97, 1.04]	0.818

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Appendix 4. Lipids

Table A4.1. Prevalence (%) of high total cholesterol (>5mMol/l) by year of birth and childhood SEC

	Men			Women		
	Czech Republic	**Russia**	**Poland**	**Czech Republic**	**Russia**	**Poland**
High total cholesterol (%)	72.2	80.4	75.8	79.4	90.0	82.4
Year of birth						
1933-37	72.7	82.3	71.1	84.1	93.3	84.1
1938-42	71.5	83.6	73.1	84.3	93.1	86.7
1943-47	70.8	78.1	78.6	83.4	93.3	86.6
1948-52	73.9	81.0	79.4	76.9	88.4	82.5
1953-57	72.0	76.3	76.4	67.5	82.7	73.7
p for trend	0.729	0.001	<0.001	<0.001	<0.001	<0.001
Childhood assets						
0	73.5	81.6	72.2	100.0	93.8	81.9
1	66.4	82.3	74.6	83.1	92.1	83.1
2	73.7	81.0	74.8	82.9	89.4	82.1
3	71.3	74.7	76.4	83.5	86.8	83.7
4	73.8	80.2	76.3	80.5	89.2	84.5
5	70.6	77.9	75.2	78.6	87..8	82.1
6	73.9	77.7	77.7	72.4	85.8	79.1
p for trend	0.545	0.008	0.067	<0.001	<0.001	0.070
Paternal education						
< primary	-	78.7	75.1	-	91.2	80.9
Primary	-	80.5	75.2	-	89.7	83.4
Vocational	-	83.0	76.0	-	90.3	81.3
Secondary	-	79.8	76.6	-	90.1	81.1
University	-	80.0	76.2	-	88.3	83.3
p for trend	-	0.583	0.435	-	0.247	0.738
Maternal education						
< primary	-	81.5	74.6	-	91.6	78.9
Primary	-	79.6	75.6	-	89.5	83.7
Vocational	-	82.2	75.3	-	90.0	79.6
Secondary	-	79.3	77.3	-	89.6	82.4
University	-	80.2	75.0	-	87.9	83.3
p for trend	-	0.495	0.389	-	0.078	0.902

Table A4.2. OR [95% CI] of men's high total cholesterol (>5mMol/l) for a one unit increase in direct and indirect measures of childhood SEC†

		Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	1.02 [0.96, 1.09]	0.521	0.96 [0.91, 1.01]	0.117	1.01 [0.97, 1.05]	0.739
	+ adult SEC	1.01 [0.94, 1.08]	0.767	0.96 [0.91, 1.00]	0.077	1.01 [0.97, 1.06]	0.638
	+ anthropometry	1.03 [0.97, 1.10]	0.355	0.96 [0.92, 1.01]	0.140	1.01 [0.97, 1.05]	0.553
	+ adult SEC, anthropometry	1.02 [0.95, 1.09]	0.609	0.96 [0.91, 1.01]	0.093	1.01 [0.97, 1.06]	0.555
Maternal education	Age	-	-	1.01 [0.94, 1.08]	0.753	1.00 [0.94, 1.07]	0.969
	+ adult SEC	-	-	0.99 [0.92, 1.06]	0.764	1.01 [0.93, 1.09]	0.836
	+ anthropometry	-	-	1.02 [0.95, 1.09]	0.655	1.01 [0.94, 1.08]	0.859
	+ adult SEC, anthropometry	-	-	0.99 [0.93, 1.07]	0.878	1.01 [0.93, 1.09]	0.867
Paternal education	Age	-	-	1.05 [0.98, 1.12]	0.172	1.00 [0.94, 1.06]	0.978
	+ adult SEC	-	-	1.03 [0.96, 1.10]	0.426	1.01 [0.95, 1.09]	0.700
	+ anthropometry	-	-	1.05 [0.98, 1.12]	0.157	1.01 [0.95, 1.07]	0.828
	+ adult SEC, anthropometry	-	-	1.03 [0.96, 1.10]	0.391	1.01 [0.94, 1.09]	0.705
Anthropometry							
Height	Age	0.99 [0.98, 1.00]	0.073	0.99 [0.98, 1.00]	0.107	0.99 [0.98, 1.00]	0.102
	+ child SEC	0.99 [0.97, 1.00]	0.052	0.99 [0.98, 1.00]	0.224	0.99 [0.98, 1.00]	0.046
	+ adult SEC	0.99 [0.97, 1.00]	0.057	0.99 [0.97, 1.00]	0.055	0.99 [0.98, 1.00]	0.136
	+ child & adult SEC	0.99 [0.97, 1.00]	0.065	0.99 [0.98, 1.00]	0.159	0.99 [0.98, 1.00]	0.074
Leg length	Age	0.99 [0.97, 1.01]	0.177	0.98 [0.96, 1.00]	0.019	0.99 [0.97, 1.00]	0.112
	+ child SEC	0.99 [0.97, 1.00]	0.119	0.98 [0.96, 1.00]	0.043	0.98 [0.97, 1.00]	0.040
	+ adult SEC	0.99 [0.97, 1.01]	0.232	0.98 [0.96, 0.99]	0.010	0.99 [0.97, 1.00]	0.159
	+ child & adult SEC	0.99 [0.97, 1.01]	0.238	0.98 [0.96, 1.00]	0.032	0.99 [0.97, 1.00]	0.075
Trunk length	Age	0.98 [0.96, 1.01]	0.163	1.00 [0.98, 1.02]	0.960	0.99 [0.97, 1.01]	0.390
	+ child SEC	0.98 [0.96, 1.01]	0.166	1.00 [0.98, 1.03]	0.711	0.99 [0.97, 1.01]	0.383
	+ adult SEC	0.98 [0.96, 1.00]	0.074	1.00 [0.97, 1.02]	0.858	0.99 [0.97, 1.01]	0.417
	+ child & adult SEC	0.98 [0.96, 1.00]	0.090	1.00 [0.98, 1.03]	0.849	0.99 [0.97, 1.01]	0.394

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table A4.3. OR [95% CI] of women's high total cholesterol (>5mMol/l) for a one unit increase in direct and indirect measures of childhood SEC†

		Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	0.95 [0.88, 1.02]	0.140	0.96 [0.91, 1.02]	0.232	1.02 [0.98, 1.07]	0.301
	+ adult SEC	0.92 [0.85, 1.00]	0.043	0.95 [0.90, 1.01]	0.109	1.03 [0.98, 1.08]	0.272
	+ anthropometry	0.95 [0.89, 1.02]	0.162	0.97 [0.91, 1.03]	0.328	1.03 [0.98, 1.07]	0.206
	+ adult SEC, anthropometry	0.92 [0.85, 1.00]	0.041	0.96 [0.90, 1.02]	0.164	1.03 [0.98, 1.08]	0.207
Maternal education	Age	-	-	1.04 [0.96, 1.14]	0.328	1.07 [0.99, 1.15]	0.092
	+ adult SEC	-	-	1.01 [0.92, 1.10]	0.834	1.07 [0.98, 1.16]	0.117
	+ anthropometry	-	-	1.05 [0.97, 1.14]	0.253	1.07 [1.00, 1.16]	0.060
	+ adult SEC, anthropometry	-	-	1.01 [0.93, 1.11]	0.759	1.08 [0.99, 1.17]	0.089
Paternal education	Age	-	-	1.03 [0.95, 1.12]	0.427	1.03 [0.97, 1.11]	0.318
	+ adult SEC	-	-	1.01 [0.92, 1.10]	0.883	1.05 [0.97, 1.13]	0.237
	+ anthropometry	-	-	1.03 [0.95, 1.12]	0.417	1.04 [0.98, 1.12]	0.217
	+ adult SEC, anthropometry	-	-	1.00 [0.92, 1.09]	0.926	1.06 [0.98, 1.14]	0.181
Anthropometry							
Height	Age	0.99 [0.98, 1.01]	0.331	0.98 [0.96, 0.99]	0.006	0.99 [0.98, 1.00]	0.174
	+ child SEC	0.99 [0.98, 1.00]	0.179	0.98 [0.96, 1.00]	0.015	0.99 [0.98, 1.00]	0.118
	+ adult SEC	0.99 [0.98 1.01]	0.471	0.97 [0.96, 0.99]	0.002	0.99 [0.97, 1.00]	0.098
	+ child & adult SEC	0.99 [0.98, 1.01]	0.378	0.98 [0.96, 0.99]	0.006	0.99 [0.97, 1.00]	0.082
Leg length	Age	0.99 [0.97, 1.01]	0.184	0.97 [0.95, 1.00]	0.025	0.99 [0.97, 1.01]	0.185
	+ child SEC	0.99 [0.97, 1.01]	0.152	0.98 [0.95, 1.00]	0.049	0.99 [0.97, 1.01]	0.157
	+ adult SEC	0.99 [0.97, 1.01]	0.181	0.97 [0.95, 0.99]	0.009	0.99 [0.97, 1.00]	0.121
	+ child & adult SEC	0.99 [0.96, 1.01]	0.189	0.97 [0.95, 1.00]	0.023	0.99 [0.97, 1.00]	0.116
Trunk length	Age	1.00 [0.98, 1.02]	0.986	0.97 [0.94, 1.00]	0.040	0.99 [0.97, 1.02]	0.527
	+ child SEC	0.99 [0.97, 1.02]	0.610	0.97 [0.94, 1.00]	0.065	0.99 [0.97, 1.01]	0.387
	+ adult SEC	1.01 [0.98, 1.03]	0.656	0.96 [0.93, 0.99]	0.019	0.99 [0.97, 1.01]	0.399
	+ child & adult SEC	1.00 [0.98, 1.03]	0.888	0.97 [0.94, 1.00]	0.039	0.99 [0.96, 1.01]	0.334

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table A4.4. Prevalence (%) of low HDL cholesterol (<1.0mMol/l) by year of birth and childhood SEC

	Men			Women		
	Czech Republic	Russia	Poland	Czech Republic	Russia	Poland
N (% low HDL cholesterol)	3130 (23.8)	4133 (4.1)	4516 (15.0)	3661 (33.7)	4910 (22.7)	4756 (26.8)
Year of birth						
1933-37	23.4	3.9	14.0	36.6	23.7	30.1
1938-42	24.7	2.6	15.1	38.2	25.4	25.2
1943-47	27.0	4.3	16.0	33.6	23.6	28.5
1948-52	23.7	4.6	15.6	29.4	19.8	26.2
1953-57	19.1	5.2	14.0	29.9	21.0	25.0
p for trend	0.076	0.026	0.940	<0.001	0.005	0.068
Childhood assets						
0	27.3	4.1	16.2	38.1	22.0	31.1
1	26.9	3.8	15.4	41.0	24.1	29.0
2	26.0	3.4	15.6	37.5	22.0	29.9
3	25.8	5.9	15.6	34.5	22.7	25.8
4	23.3	2.0	13.6	33.2	23.4	24.2
5	22.4	4.9	14.9	31.8	19.3	26.4
6	21.8	6.1	13.6	31.4	20.4	25.2
p for trend	0.045	0.110	0.178	0.010	0.140	0.006
Paternal education						
< primary	-	3.9	18.1	-	22.5	31.0
Primary	-	4.0	16.3	-	21.8	27.8
Vocational	-	4.5	12.5	-	24.5	26.9
Secondary	-	4.3	12.7	-	21.1	24.6
University	-	4.0	15.2	-	24.5	22.8
p for trend	-	0.698	0.017	-	0.701	0.001
Maternal education						
< primary	-	3.6	19.0	-	23.3	28.3
Primary	-	3.8	15.1	-	23.4	27.4
Vocational	-	3.8	13.3	-	24.0	29.0
Secondary	-	5.2	14.0	-	20.2	24.3
University	-	5.0	12.9	-	19.8	19.8
p for trend	-	0.074	0.023	-	0.072	0.011

Table A4.5. OR [95% CI] of men's low HDL cholesterol (<1.0mMol/l) for a one unit increase in direct and indirect measures of childhood SEC†

		Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	0.95 [0.89, 1.02]	0.161	1.03 [0.94, 1.14]	0.497	0.97 [0.92, 1.01]	0.153
	+ adult SEC	0.98 [0.91, 1.06]	0.625	1.03 [0.93, 1.13]	0.598	0.99 [0.94, 1.04]	0.609
	+ anthropometry	0.95 [0.88, 1.01]	0.113	1.02 [0.92, 1.12]	0.701	0.95 [0.91, 1.00]	0.053
	+ adult SEC, anthropometry	0.98 [0.91, 1.05]	0.564	1.02 [0.92, 1.12]	0.765	0.98 [0.93, 1.03]	0.465
Maternal education	Age	-	-	1.08 [0.95, 1.24]	0.232	0.91 [0.84, 0.98]	0.020
	+ adult SEC	-	-	1.07 [0.93, 1.23]	0.366	0.93 [0.85, 1.02]	0.129
	+ anthropometry	-	-	1.07 [0.93, 1.22]	0.349	0.89 [0.82, 0.97]	0.008
	+ adult SEC, anthropometry	-	-	1.06 [0.92, 1.22]	0.426	0.93 [0.85, 1.02]	0.143
Paternal education	Age	-	-	0.99 [0.87, 1.13]	0.910	0.91 [0.85, 0.98]	0.015
	+ adult SEC	-	-	0.97 [0.85, 1.11]	0.672	0.92 [0.85, 1.00]	0.063
	+ anthropometry	-	-	0.98 [0.86, 1.11]	0.710	0.89 [0.83, 0.96]	0.004
	+ adult SEC, anthropometry	-	-	0.96 [0.84, 1.10]	0.588	0.92 [0.84, 1.00]	0.054
Anthropometry							
Height	Age	1.01 [0.99, 1.02]	0.357	1.03 [1.01, 1.06]	0.013	1.03 [1.01, 1.04]	<0.001
	+ child SEC	1.01 [1.00, 1.02]	0.143	1.03 [1.00, 1.06]	0.028	1.03 [1.01, 1.04]	<0.001
	+ adult SEC	1.01 [0.99, 1.02]	0.460	1.03 [1.00, 1.06]	0.031	1.03 [1.01, 1.04]	<0.001
	+ child & adult SEC	1.01 [0.99, 1.02]	0.339	1.03 [1.00, 1.05]	0.050	1.03 [1.01, 1.04]	0.001
Leg length	Age	1.00 [0.98, 1.02]	0.913	1.01 [0.97, 1.05]	0.638	1.00 [0.98, 1.02]	0.793
	+ child SEC	1.00 [0.98, 1.02]	0.948	1.00 [0.96, 1.04]	0.939	1.00 [0.98, 1.02]	0.810
	+ adult SEC	1.00 [0.98, 1.02]	0.758	1.00 [0.97, 1.04]	0.811	1.00 [0.98, 1.02]	0.925
	+ child & adult SEC	1.00 [0.98, 1.02]	0.753	1.00 [0.96, 1.04]	0.952	1.00 [0.98, 1.02]	0.932
Trunk length	Age	1.02 [1.00, 1.04]	0.092	1.10 [1.05, 1.15]	<0.001	1.08 [1.06, 1.11]	<0.001
	+ child SEC	1.03 [1.01, 1.05]	0.016	1.10 [1.05, 1.16]	<0.001	1.09 [1.06, 1.11]	<0.001
	+ adult SEC	1.02 [1.00, 1.05]	0.098	1.09 [1.04, 1.15]	<0.001	1.08 [1.06, 1.11]	<0.001
	+ child & adult SEC	1.03 [1.00, 1.05]	0.042	1.10 [1.04, 1.15]	<0.001	1.08 [1.05, 1.11]	<0.001

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table A4.6. OR [95% CI] of women's low HDL cholesterol (<1.0mMol/l) for a one unit increase in direct and indirect measures of childhood SEC†

		Czech Republic		Russia		Poland	
		OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Childhood socioeconomic circumstances							
Assets	Age	0.97 [0.92, 1.03]	0.332	1.00 [0.95, 1.05]	0.935	0.96 [0.92, 1.00]	0.027
	+ adult SEC	1.01 [0.95, 1.08]	0.716	1.00 [0.95, 1.05]	0.906	1.00 [0.96, 1.05]	0.820
	+ anthropometry	0.98 [0.92, 1.04]	0.453	0.99 [0.95, 1.04]	0.737	0.96 [0.92, 0.99]	0.018
	+ adult SEC, anthropometry	1.02 [0.95, 1.09]	0.594	0.99 [0.95, 1.04]	0.725	1.00 [0.96, 1.05]	0.864
Maternal education	Age	-	-	0.98 [0.92, 1.04]	0.485	0.93 [0.87, 0.99]	0.023
	+ adult SEC	-	-	1.00 [0.94, 1.06]	0.996	1.02 [0.95, 1.10]	0.515
	+ anthropometry	-	-	0.97 [0.92, 1.03]	0.367	0.93 [0.87, 0.99]	0.019
	+ adult SEC, anthropometry	-	-	0.99 [0.93, 1.06]	0.854	1.02 [0.95, 1.10]	0.520
Paternal education	Age	-	-	1.04 [0.98, 1.10]	0.229	0.92 [0.87, 0.97]	0.003
	+ adult SEC	-	-	1.06 [0.99, 1.12]	0.073	1.00 [0.94, 1.07]	0.935
	+ anthropometry	-	-	1.03 [0.97, 1.09]	0.335	0.91 [0.86, 0.97]	0.002
	+ adult SEC, anthropometry	-	-	1.05 [0.99, 1.11]	0.117	1.00 [0.94, 1.07]	0.953
Anthropometry							
Height	Age	0.99 [0.98, 1.00]	0.190	1.01 [1.00, 1.02]	0.205	1.00 [0.99, 1.02]	0.455
	+ child SEC	0.99 [0.98, 1.00]	0.173	1.01 [0.99, 1.02]	0.308	1.01 [1.00, 1.02]	0.168
	+ adult SEC	1.00 [0.98, 1.01]	0.463	1.01 [1.00, 1.02]	0.120	1.01 [1.00, 1.02]	0.075
	+ child & adult SEC	1.00 [0.98, 1.01]	0.494	1.01 [1.00, 1.02]	0.205	1.01 [1.00, 1.02]	0.053
Leg length	Age	0.97 [0.96, 0.99]	0.001	0.99 [0.98, 1.01]	0.272	1.00 [0.99, 1.02]	0.839
	+ child SEC	0.97 [0.96, 0.99]	0.001	0.99 [0.97, 1.01]	0.206	1.00 [0.99, 1.02]	0.538
	+ adult SEC	0.98 [0.96, 0.99]	0.008	0.99 [0.98, 1.01]	0.429	1.01 [0.99, 1.02]	0.474
	+ child & adult SEC	0.98 [0.96, 0.99]	0.010	0.99 [0.97, 1.01]	0.318	1.01 [0.99, 1.02]	0.406
Trunk length	Age	1.02 [1.00, 1.04]	0.076	1.04 [1.02, 1.07]	<0.001	1.01 [0.99, 1.03]	0.296
	+ child SEC	1.02 [1.00, 1.04]	0.097	1.04 [1.02, 1.07]	<0.001	1.02 [1.00, 1.04]	0.108
	+ adult SEC	1.02 [1.00, 1.05]	0.040	1.04 [1.02, 1.07]	<0.001	1.02 [1.00, 1.05]	0.030
	+ child & adult SEC	1.02 [1.00, 1.05]	0.041	1.04 [1.02, 1.07]	<0.001	1.03 [1.00, 1.05]	0.022

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

Table A4.7. Change [95% CI] in total cholesterol (mMol/l) associated with 1cm increase in maximum or measured height

		Czech Republic		Russia		Poland	
		Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Men							
Maximum height	Age	-0.01 [-0.01, 0.00]	0.016	-0.01 [-0.01, 0.00]	0.035	-0.01 [-0.01, 0.00]	0.002
	+ child SEC	-0.01 [-0.01, 0.00]	0.006	-0.01 [-0.01, 0.00]	0.043	-0.01 [-0.01, 0.00]	0.001
	+ adult SEC	-0.01 [-0.01, 0.00]	0.015	-0.01 [-0.02, 0.00]	0.003	-0.01 [-0.01, 0.00]	0.001
	+ child & adult SEC	-0.01 [-0.02, 0.00]	0.013	-0.01 [-0.01, 0.00]	0.008	-0.01 [-0.02, 0.00]	0.001
Measured height	Age	-0.01 [-0.01, 0.00]	0.018	-0.01 [-0.01, 0.00]	0.043	-0.01 [-0.01, 0.00]	0.002
	+ child SEC	-0.01 [-0.01, 0.00]	0.007	-0.01 [-0.01, 0.00]	0.053	-0.01 [-0.02, 0.00]	0.001
	+ adult SEC	-0.01 [-0.01, 0.00]	0.017	-0.01 [-0.01, 0.00]	0.003	-0.01 [-0.01, 0.00]	0.001
	+ child & adult SEC	-0.01 [-0.02, 0.00]	0.014	-0.01 [-0.01, 0.00]	0.010	-0.01 [-0.02, 0.00]	0.001
Women							
Maximum height	Age	-0.01 [-0.01, 0.00]	0.044	-0.01 [-0.02, 0.00]	0.001	0.00 [-0.01, 0.00]	0.126
	+ child SEC	-0.01 [-0.01, 0.00]	0.025	-0.01 [-0.02, -0.01]	<0.001	0.00 [-0.01, 0.00]	0.103
	+ adult SEC	-0.01 [-0.01, 0.00]	0.034	-0.01 [-0.02, -0.01]	<0.001	0.00 [-0.01, 0.00]	0.177
	+ child & adult SEC	-0.01 [-0.01, 0.00]	0.020	-0.01 [-0.02, -0.01]	<0.001	0.00 [-0.01, 0.00]	0.175
Measured height	Age	-0.01 [-0.01, 0.00]	0.038	-0.01 [-0.02, -0.01]	<0.001	0.00 [-0.01, 0.00]	0.114
	+ child SEC	-0.01 [-0.01, 0.00]	0.021	-0.01 [-0.02, -0.01]	<0.001	0.00 [-0.01, 0.00]	0.092
	+ adult SEC	-0.01 [-0.01, 0.00]	0.028	-0.01 [-0.02, -0.01]	<0.001	0.00 [-0.01, 0.00]	0.163
	+ child & adult SEC	-0.01 [-0.01, 0.00]	0.016	-0.01 [-0.02, -0.01]	<0.001	0.00 [-0.01, 0.00]	0.160

Appendix 5. BMI

Table A5.1. Age-adjusted change [95% CI] in self-reported BMI (kg/m^2) with unit increase in direct and indirect measures of childhood SEC†

	Czech Republic		Russia		Poland	
	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value	Coeff. [95% CI]	p-value
Men						
Assets	-0.15 [-0.25, -0.06]	0.001	0.05 [-0.04, 0.13]	0.310	-0.07 [-0.13, -0.01]	0.028
Maternal education	-	-	-0.03 [-0.14, 0.09]	0.667	-0.21 [-0.31, -0.11]	<0.001
Paternal education	-	-	0.13 [0.02, 0.24]	0.022	-0.12 [-0.21, -0.03]	0.011
Women						
Assets	-0.22 [-0.35, -0.10]	<0.001	-0.20 [-0.30, -0.09]	<0.001	-0.26 [-0.33, -0.19]	<0.001
Maternal education	-	-	-0.25 [-0.39, -0.11]	<0.001	-0.59 [-0.71, -0.47]	<0.001
Paternal education	-	-	-0.20 [-0.33, -0.06]	0.004	-0.54 [-0.65, -0.44]	<0.001

† One additional asset or one higher level of parental education, 1cm change in height, leg length or trunk length

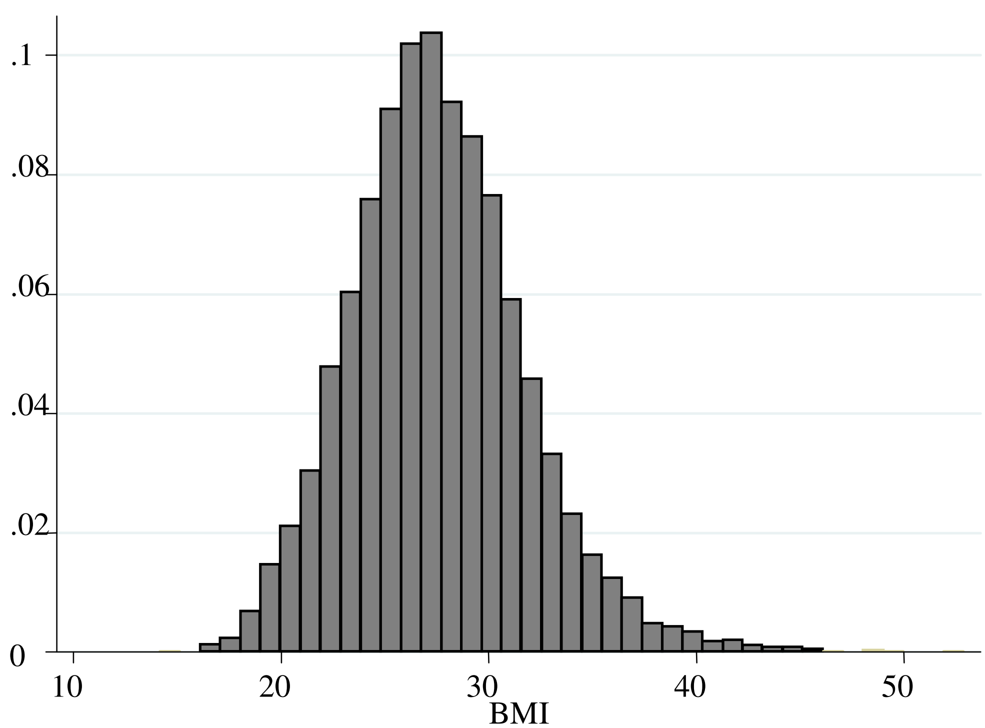

Figure A5.1. Distribution of male BMI

Table A5.2. Change [95% CI] in self-reported BMI (kg/m^2) with unit increase in leg to trunk ratio*

	Czech Republic		Russia		Poland	
	OR [95% CI]	p-value	OR [95% CI]	p-value	OR [95% CI]	p-value
Men						
Age	-11.88 [-14.18, -9.58]	<0.001	-19.33 [-21.92, -16.74]	<0.001	-15.05 [-17.18, -12.93]	<0.001
+ adult SEC, anth.	-11.14 [-13.64, -8.64]	<0.001	-19.84 [-22.50, -17.18]	<0.001	-14.26 [-16.46, -12.07]	<0.001
Women						
Age	-10.35 [-13.01, -7.69]	<0.001	-22.56 [-25.52, -19.59]	<0.001	-15.17 [-17.62, -12.72]	<0.001
+ adult SEC, anth.	-11.36 [-14.33, -8.40]	<0.001	-20.99 [-24.05, -17.94]	<0.001	-14.90 [-17.45, -12.35]	<0.001

*LTR is multiplied by 1000

Appendix 6. SCORE

Age	Systolic blood pressure (mmHg)	Women										Men									
		Non-smoker Cholesterol (mmol)					**Smoker** Cholesterol (mmol)					**Non-smoker** Cholesterol (mmol)					**Smoker** Cholesterol (mmol)				
		4	5	6	7	8	4	5	6	7	8	4	5	6	7	8	4	5	6	7	8
65	180	7	8	9	10	12	13	15	17	19	22	14	16	19	22	26	26	30	35	41	47
	160	5	5	6	7	8	9	10	12	13	16	9	11	13	15	16	18	21	25	29	34
	140	3	3	4	5	6	6	7	8	9	11	6	8	9	11	13	13	15	17	20	24
	120	2	2	3	3	4	4	5	5	6	7	4	5	6	7	9	9	10	12	14	17
60	180	4	4	5	6	7	8	9	10	12	13	9	11	13	15	18	18	21	24	28	33
	160	3	3	3	4	5	5	6	7	8	9	6	7	9	10	12	12	14	17	20	24
	140	2	2	2	3	3	3	4	5	5	6	4	5	6	7	9	8	10	12	14	17
	120	1	1	2	2	2	2	3	3	4	4	3	3	4	5	6	6	7	8	10	12
55	180	2	2	3	3	4	4	5	5	6	7	6	7	8	10	12	12	13	16	19	22
	160	1	2	2	2	3	3	3	4	4	5	4	5	6	7	8	8	9	11	13	16
	140	1	1	1	1	2	2	2	2	3	3	3	3	4	5	6	5	6	8	9	11
	120	1	1	1	1	1	1	1	2	2	2	2	2	3	3	4	4	4	5	6	8
50	180	1	1	1	2	2	2	2	3	3	4	4	4	5	6	7	7	8	10	12	14
	160	1	1	1	1	1	1	2	2	2	3	2	3	3	4	5	5	6	7	8	10
	140	0	1	1	1	1	1	1	1	1	2	2	2	2	3	3	3	4	5	6	7
	120	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	3	3	4	5
40	180	0	0	0	0	0	0	0	0	1	1	1	1	1	2	2	2	2	3	3	4
	160	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	2	2	3
	140	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	2	2
	120	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Figure A6.1. Percentage 10-year risk of fatal cardiovascular disease in populations at high risk of cardiovascular disease, from Conroy et al.[420]