SOCIOECONOMIC POSITION, SELF-RATED HEALTH AND MORTALITY IN RUSSIA

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Abstract

Background: In Russia, the educational gradient in mortality increased during the 1990s. However, there have been few comparisons of gradients using different socioeconomic indicators.

Aims: These were to study the association of different measures of socioeconomic position with each other and with health, together with possible explanations.

Data: The Russia Longitudinal Monitoring Survey is a large, nationally representative panel study. Data from 7 rounds (1994-2001) were used to study 11,482 adults aged over 18. Social and economic measures, self-rated health and deaths (reported by a household member) were recorded.

Methods: Correlations between income, education, occupation and subjective social status were measured. Their associations with self-rated health and mortality were studied using logistic regression and Cox proportional hazards analysis respectively, including multivariate analyses.

Results: Education and occupation were strongly correlated (R=0.52). Both were weakly associated with income (R=0.08 and 0.13 respectively). Education (3 categories) was strongly protective against mortality [0.66 (0.59-0.74) men, 0.66 (0.59-0.74) women], and education explained the weaker associations between income, occupation and mortality. Although alcohol consumption and smoking predicted mortality, they did not explain its association with socioeconomic position. Income, occupation and education were all moderately associated with self-rated health. Subjective social status strongly predicted self-rated health, but not mortality. Ownership of consumer goods, satisfaction and optimism predicted self-rated health, but did not fully explain its association with socioeconomic position. Unemployment and insecure employment were associated with health, although inconsistently.

Discussion: Income was weakly associated with education and occupation compared to the West. Socioeconomic gradients in self-rated health and mortality were demonstrated, and were not fully explained by alcohol, smoking, material and psychosocial measures. The strong association between education and mortality could perhaps be because it reflects lifetime socioeconomic position. Associations between education, smoking and mortality were comparable to other studies, supporting the reliability of the data.

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1 Introduction

In this thesis I study the association between socioeconomic position, mortality and self-rated health in post-transition Russia.

1.1 Background

Russia has undergone major political, social and economic change since the break up of the former Soviet Union in 1991. During the early 1990s, many people suffered considerable financial loss. At the same time, however a smaller number became very rich, and income inequalities widened greatly. At the same time there was a major decline in life expectancy, within which there were several major fluctuations. Middle-aged adults, especially men, were worst affected. The principal causes of death responsible for the excess mortality were coronary heart disease, accidents and violence [1]. Stressful socioeconomic conditions and heavy alcohol consumption are thought to provide the most plausible underlying explanations for the increase in mortality, although there is some debate as to their relative importance.

A socioeconomic gradient in health has been demonstrated in Russia, as elsewhere. Low education is associated with a higher risk of mortality, and people with less education experienced a greater increase in mortality during the 1990s [2;3]. Education, income and deprivation are all associated with poor self-rated health in Russia [4;5].

1.2 Reasons for the choice of topic

I selected the topic of socioeconomic position and health in Russia because it is an important area of research. There are several reasons why this is so. It is only recently that there has been a significant amount of research into socioeconomic conditions and health in Russia, and the picture is still incomplete. Prior to the collapse of the Soviet Union in 1991, such research was officially restricted [3], and information about health in Russia was limited mainly to official statistical data, often of questionable reliability. Since the transition, there has been a small but growing body of research, although this is limited in several respects. Many studies to date are based on

ecological data. Others are cross-sectional studies that use self-reported health outcomes. There have been few prospective studies, and only a limited amount of research into the determinants of mortality.

Studying the association between health and socioeconomic position in different societies can add to our overall understanding of the socioeconomic determinants of health, especially in societies such as Russia where the associations between different socioeconomic measures differ from the West. Income returns to education in Russia are relatively low [6], and therefore income and education are less closely correlated in Russia than they are in the West.

Identifying the measure of socioeconomic position most strongly associated with health in Russia, the factors that explain the socioeconomic gradient in health and mortality, would be particularly valuable in view of the societal differences. Of more practical importance, identifying the socioeconomic and behavioural determinants of health can inform policy development in Russia.

1.3 The Russia Longitudinal Monitoring Survey (RLMS)

In this thesis I analysed data from an existing dataset, the Russia Longitudinal Monitoring Survey (RLMS) [7]. The second phase of this panel study commenced in 1994. The dataset contains a wide range of social and economic variables. It also contains self-reported measures of health, as well as mortality data based on the report of a household member. The RLMS dataset is described in greater detail in Chapter 4.

Although data from RLMS have been in the public domain for some time, relatively few papers have been published, and of these, most are based on cross-sectional analysis.

1.4 Structure of the thesis

I have structured the thesis as follows. In Chapter 2 I review the literature about the social and economic changes of the transition in Russia, the accompanying changes in

health, and the relationship between socioeconomic position and health, together with the possible reasons for this association.

I describe the aims and objectives of the project in Chapter 3, and the methods in Chapter 4. The main results of the data analysis are described in Chapter 5, followed by the results of analyses in the working population in Chapter 6, and some additional analyses in Chapter 7. Chapter 8 consists of a discussion of the findings, together with some conclusions and suggested directions for future research.

2 Literature review

2.1 Introduction

In this chapter I review literature relevant to several important aspects of this thesis. Part of the literature review addresses the themes outlined in the introductory chapter in more detail, and the remainder looks at associated issues.

The literature review is structured as follows. First I describe the social and economic history of Russia before the transition, and the way in which the social structure changed during the transition. After this I describe the Russian "mortality crisis", that is the dramatic decline in life expectancy in Russia that followed the transition, and the proposed explanations for this crisis. I then describe the evidence for the socioeconomic gradient in health and mortality and mechanisms through which socioeconomic position may influence health. Then follows a review of the literature about self-rated health and its relationship with mortality. I then discuss the limitations of research to date, and finally draw some conclusions that will be used to form the basis for the aims and objectives of this project and to guide some aspects of the methodology.

2.2 Russian society and history

The study of socioeconomic position and health needs to be put in the context of Russia's recent history, in particular the major social, economic and political changes of the last 15 years.

2.2.1 Before the transition

Before the Russian revolution of 1917, 85% of the Russian population were peasants. The majority of the remaining inhabitants formed the nobility, and there was a very small middle class.

The formation of the Soviet Union in 1917 was followed by a sustained period of economic growth that lasted throughout the earlier part of the 20th century. The

'command' economy of the Soviet Union, in which production targets set by the government were implemented through a bureaucratic system, was partly responsible for this growth. However, the economy became increasingly inefficient over time, and during the 1960s and 1970s economic growth slowed, until by the 1980s it was almost zero.

Major social change also occurred after 1917. The Soviet social structure gradually came into being, influenced by Stalin between the 1930s and the 1950s, and consolidated further following his death. This structure stayed in place until the collapse of the Soviet Union[8].

Different social strata existed in the Soviet Union, and membership of a particular class was strongly influenced by occupation and Communist party connections[9]. By the mid-1980s the social structure was as follows. The Nomenklatura, or Communist party elite, formed 0.7% of the working population, and leaders and senior administrators of key industries and agencies a further 3.5%. The literary and artistic intelligentsia formed 1.8%, and technical specialists 18.8%. (The latter two groups were the equivalent of social classes one and two in the West, but with a much lower income.) Low-skilled clerical or technical workers formed 5.0% of the workforce, and industrial workers formed the largest group at 41.3%. The remainder of the working population consisted of service workers (13.0%) and peasants and agricultural workers (15.0%) [8]. This wide array of social groups was not officially recognised.

Incomes were more equally distributed in the Soviet Union than in most Western countries, largely because official salaries were controlled by the State. Relative incomes for different occupations also differed, and in particular well-educated, highly trained professionals were often paid less than manual workers [8]. Consequently, the income returns to education were poor [10].

Women earned less than men, partly because they were paid on average one-third less for the same work, and partly because they were often in lower status occupations, in particular being less likely to hold prestigious managerial jobs [8].

Jobs were guaranteed, and were frequently undemanding. Although salaries were often poor there were considerable additional non-monetary benefits, particularly through opportunities to conduct unofficial business during working hours, and from social benefits linked to a particular workplace [8]. These factors, together with state-owned housing that was rented for a nominal sum, meant that opportunities to satisfy material needs were not closely related to belonging to a particular social stratum [8]. A few people obtained significant additional unofficial 'income' from extra privileges connected with certain jobs and Communist party positions [8].

In addition to occupational earnings and benefits, it was possible to obtain material possessions, especially consumer goods that were not easily available, through a system of favours. Thus, there was a large unofficial economy [11].

2.2.2 The transition

In the mid-to-late 1980s, the final years of the Communist regime, several policies were introduced under Gorbachev in an attempt to improve the ailing economy. The influence of central bureaucrats and production targets was reduced, private co-operatives were allowed, and there was greater openness to the West. Although the economy failed to improve, the political reforms weakened the regime and opened the way to the collapse of the Soviet Union.

In 1991 the Communist system fell, and the Soviet Union ceased to exist. The command economy was dismantled the following year, and was rapidly superseded by a market economy. In 1991 the state monopoly of foreign trade was relaxed, and in 1992 price controls were abolished abruptly. Large state enterprises were privatised over a very short time, and in many cases were acquired at a low price by former senior Communist party officials [9].

The rapid removal of state restrictions on the economy in 1991 and 1992 was followed by an increase in the annual inflation rate to 2500%, and a dramatic fall in macroeconomic indicators such as gross domestic product (GDP) [12]. As a result of inflation, real average household incomes declined substantially. Wage arrears,

compulsory unpaid leave and payment of salaries in goods were all widespread, and contributed further to the reduction in incomes [13]. The savings of many ordinary people disappeared, either as a result of inflation, or through failed investments in the many new 'private' banks, some of which were little more than scams [14].

The decline in real incomes, together with the loss of savings, led to a major increase in poverty. In 1992, 11% of people were living below the poverty line, but by 1999 this figure had increased to 39%, and these percentages were even higher amongst children and pensioners [13]. However, caution is required when interpreting these figures since the proportion of people under the poverty line is an approximation. Additionally, there are many methods of defining the poverty line, and in this case it was based on income in relation to the cost of food (all values being adjusted to the value of the 1992 rouble). People in the lowest income groups experienced the greatest decline in real income after the economic shocks. Between 1991 and 1994 the 10^{th} centile for real income dropped by 62%, whereas the 90^{th} centile dropped by only 26% [10].

At the same time, though, the income of a significant minority had increased dramatically, and by the mid 1990s, between three and five per cent of the population were considered "wealthy" [8]. Income inequalities in the population widened greatly, and between 1991 and 1994 the income differential between the top and bottom 10% of the population increased from a factor of 4.5 to a factor of 15, one of the widest differentials within any country [15].

In the first half of 1998, after a period of relative economic stability, the inflation rate had settled at around 3% per month. However, in August 1998 the 'rouble crisis' occurred [13], and the monthly inflation rate increased to 40% within a single month. Again, many people suffered financially, but this time the new 'entrepreneurs' were worst affected, many of whom lost their businesses [16]. Following this, there was a period of greater economic stability, however, and the income of people in the lowest income groups started to increase a little in relation to the rest of society [10]. By 2001 the proportion living below the poverty line had reduced to just under 20% [13]. It remains to be seen how long the present state of relative political and economic stability will last.

There was widespread dissatisfaction amongst ordinary people with the rapid political and economic changes. The 1996 New Russia Barometer survey showed that the majority, especially older people, preferred the old system [17]. The proportion of Russians who were satisfied with their lives in the World Values Surveys declined from over 70 percent in 1981 to 45% in 1990, and to less than 40% in 1995 [18].

2.2.3 Social structure in post-transition Russia

The occupational and income structures in Russia altered along with the economic and political changes of the transition, and are described below.

Occupational class

The most affluent class in post-transition Russia consists of successful capitalist entrepreneurs and leading government officials. This elite group showed a remarkable degree of continuity during the transition, despite the social transformation. Many former members of the 'Nomenklatura' and senior industry managers successfully transferred to senior positions in economic enterprises in the new Russia, often becoming wealthy after acquiring state assets for far less than their real value [9]. Many of the elite were university educated men whose fathers were part of the elite in the Soviet Union [19], and it is thought that social and family connections played an important part in the continuity [19].

Self employment has become increasingly common, especially amongst younger people, men, and people with more years of education [20]. A small, professional, well-educated middle class continues to exist, whose members are often still poorly paid, but have some social standing as a result of their education and skills [8].

Manual workers have fared badly since 1991. They have lost their previously comparatively high status, can no longer gain access to privileges through work as Communist party officials, and their lack of skills has made them vulnerable to

unemployment, especially those aged over 40 [21]. The decline in manual jobs has been accompanied by an increase in low-grade service jobs [22].

Finally, an expanding 'underclass' consists of people with very low socioeconomic position, such as the unemployed from obsolete industries, unskilled labourers and peasants. Elderly people receiving inadequate state pensions, although not part of the work force, form part of this underclass.

Social mobility

In most societies an individual's occupational class is strongly influenced by that of his parents [23], and Russia is no exception [22].

Intergenerational social mobility (social class mobility between consecutive generations) in Russia has declined by 20% since 1991, at which time it was similar to that in Britain [24], and occupation in Russia is now increasingly determined by social origins [22]. The rapid overall reduction in social mobility is very unusual for any society [22], even apart from the particular case of social and economic elite [19].

In Russia, as in most societies, the most important route through which occupational class is transmitted from parents to their adult children is through education [23], and education is strongly associated with occupation in Russia [25] as it is in the West [23]. The association between educational attainment and parental social class did not decrease during the transition [6]. Education may be influenced by parental resources, for example children from single-parent households were less likely to complete their education due lack of money [26]. In Russia, education was strongly associated with category of first employment both before and after 1991, despite the major social and economic changes [25].

Social mobility has decreased overall. However, within this pattern, downward mobility is more common than upward mobility. This is partly because of changes in employment opportunities, as in the replacement of skilled manual work by lower-

grade service jobs, and partly due to the increase in self-employment[22], which was previously unknown.

Intragenerational social mobility, the change in socioeconomic position within an individual generation, has been very high in post-transition Russia. Income mobility was strongly associated with initial income, and those in the lowest paid groups experienced the greatest falls in income [6].

As well as this, large short-term fluctuations in household income were widespread during the early years of the transition. In each year between 1994 and 1996, only 20% of households remained in the same monthly income quintile[13]. Changes in income were largely explained by changes in the individual's workplace (e.g. wage arrears, compulsory leave) and by macroeconomic factors [27], and by changes in employment between the private and state sectors, jobs in the latter sector being less well paid [27].

Income structure

The low (income) returns to education in Russia before 1991 reflected a relatively equal income structure in which professionals were poorly paid. Before the transition, people with a degree could only expect to earn 17% more than those with a high school certificate, and only 42% more than those with incomplete secondary education [6]. This is much lower than in the USA [28] where graduates can expect to earn at least two-and-a-half times as much as people who did not graduate from high school. In general, the returns to education in Russia have not increased greatly during the transition [6], and education does not seem to have played a great part in the rapid increase in income inequality [25].

Since 1991, the income structure in Russia has changed considerably due to the economic changes and to the presence of 3 'economies', or sectors. Earnings are often greater in the private sector than the state sector, and are generally lowest of all in the informal economy, where they are often non-monetary. These three sectors have been

described respectively by qualitative researchers as the 'market', 'Soviet' and 'traditional' economies [29], and particular occupations predominate in different sectors.

Many people who have gained financially did so through employment in the private sector, or 'market' economy. Such people include 'proprietors' and 'entrepreneurs', who by definition are self-employed, workers in particular industries (such as the construction industry [20]), and managers, the majority of whom work in the private sector [6]. Earnings through the 'market' economy my be high, but for businessmen there are associated financial risks and the threat of being targeted by the Mafia [29].

Professionals, technicians and skilled manual workers continue to be poorly paid because they are employed predominantly in the state sector [29], where low wages and wage arrears are common. By 1995 the income of professionals had fallen considerably in relation to that of managers and proprietors, and was only slightly more than that of unskilled workers in the private sector. Well-qualified professionals, such as doctors and engineers, may therefore no longer have access to the goods and lifestyle they had in Soviet times. Skilled manual workers' earnings stayed the same or fell in relation to those of unskilled workers [27]. Paradoxically, however, managers in the state sector earned as much as those in the private sector, and their earnings have increased in relation to manual workers' earnings [6].

Selling or exchanging home-grown produce, or buying and selling second-hand goods was an important source of extra income during the 1990s, and this forms Russia's third economy, the 'traditional' economy [29].

Families have adopted different earning strategies, with some choosing to rely on earnings from more than one 'economy'[29]. Individuals have also used different strategies. In one survey in 1996, 18% of employed respondents had more than one job [30].

Income in post-transition Russia is influenced by demographic factors. In two surveys, younger workers earned more than older workers did. The age of peak income, 33 years in one Russian survey and 43 years in the other, was much younger than in a Western survey, in which peak income occurred at 55 years [10]. However,

this may be a cohort effect, since younger people in Russia are more likely to earn money through entrepreneurship and self-employment[20].

Since the transition, women have continued to fare much worse than men in the labour market, earning on average only 70% of men's wages[10], and being more vulnerable to unemployment [21].

Rural dwellers in Russia are becoming increasingly disadvantaged in terms of income. Incomes of residents of Moscow and St Petersburg increased in relation to those of rural residents from only a slight difference in 1991, to 50% more by 1995 [10;31]. Incomes in rural Russia are more often non-monetary[31], resulting in further disadvantage. However, the cost of living in rural areas is likely to be lower than in cities.

2.2.4 Subjective social status

The rapid social and economic change in Russia means that it is hard to define the most important marker or determinant of socioeconomic status in Russia. Subjective social status, a measure of people's own perception of their position in society, may help to cast further light on the determinants of socioeconomic position in post-transition Russia.

Results from a British study suggest that subjective social status may reflect a "cognitive averaging of standard markers of socioeconomic situation" [32]. In Russia, subjective social status in both sexes has been shown to be influenced by education, income, employment status, deprivation, number of consumer goods and satisfaction with the family economic situation [33]. However, the socioeconomic measures above explained only 21% of the variation in subjective social status in a Russian population sample [33] compared with a study of UK civil servants where a similar range of measures explained 48% of the variation [32]. This could imply that the determinants of socioeconomic position are more complex in Russia than in the UK, or simply that Russians are less used to the concept of social status and do not interpret it in a consistent manner.

2.2.5 Social networks in Russia

An important element of Russia's social structure, considered later in this thesis, is its social networks. These differ considerably in structure and function from the West. In the Soviet Union, informal social networks were important for obtaining scarce goods and other services, for example an apartment or healthcare, and were known as '*blat*'[11]. Networks also provided support for ordinary people in an environment where trust in the government and state organisations was low[34]. Networks have changed in some respects during the transition [11]. They continue to be important for obtaining goods and services, particularly for the less well off. However, newly wealthy Russians appear to have lost more of their former networks [35], and networks may be less of an asset in the 'new world' than professional qualifications and business skills. The saying "A hundred friends are worth more than a hundred roubles" has changed to "A hundred dollars are worth more than a hundred friends"[11].

Networks in Russia, unlike in the West, do not appear to form part of civil society. Civil society, defined as "the set of institutions, organisations and behaviour situated between the state, the business world and the family"[36], barely existed in the Soviet Union, since most organisations and societies apart from the Communist Party were banned. Civil society has remained weak in Russia since the transition [34]. The association between social networks and health will be considered further in Section 2.4.2 (c).

2.2.6 Conclusions about Russian social structure

In conclusion, the Russian social structure has some similarities to Western societies, although it differs significantly in some respects. Education is associated with occupation in Russia [25], as in the West. However, poor income returns to education in Russia [37;38], predominantly due to low occupational earnings amongst professionals [8], mean that education and occupation are both much less strongly associated with income than they are in Western societies.

The relatively weak explanation of subjective social status by objective socioeconomic measures in Russia may mean that individuals interpret their status inconsistently, perhaps reflecting the rapid changes in social structure.

2.3 Health during the transition in Russia and the countries of Eastern Europe, and the East West divide

The transition in Russia was accompanied by a major increase in mortality, known as the "mortality crisis". Understanding trends, patterns and proposed causes of the excess mortality may provide important clues about the determinants of health in Russia, even though the "mortality crisis" is not the topic of this thesis.

Figure 2.1 shows the trends in life expectancy at age 15 in Russia, and the averages for the countries of the then European Union (Western Europe), the countries of Eastern Europe, and the countries of the former Soviet Union.

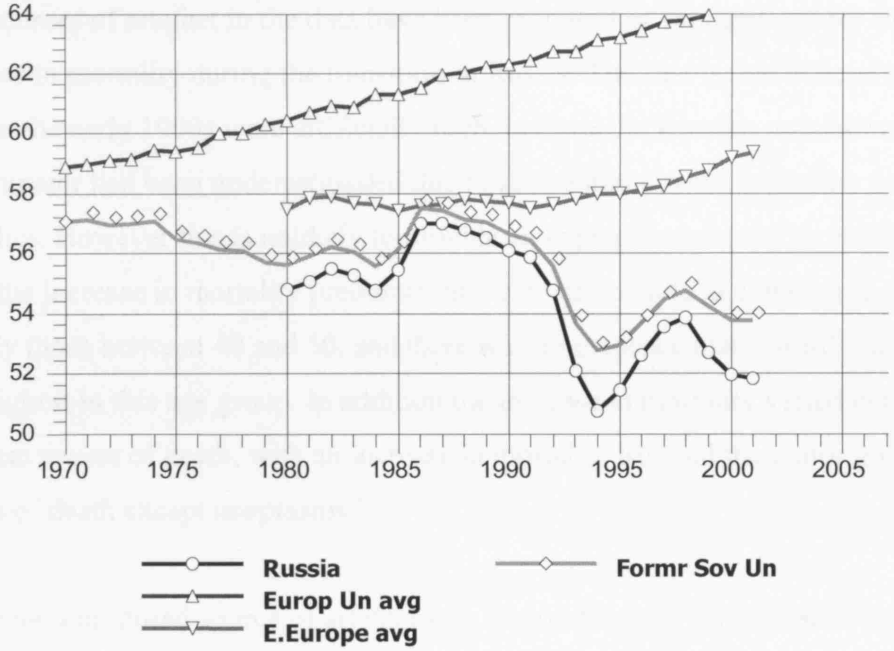
In 1970, life expectancy at age 15 in Russia was only 4 years less than in Western Europe [39], following an improvement in Russia after World War II. However, during the 1970s, life expectancy in Russia stagnated, and fell further behind the EU average, which continued to increase (Figure 2.1) [39]. Life expectancy in Russia increased briefly during the mid-1980s. However, after the fall of Communism in 1991, it declined dramatically, together with several major fluctuations. Life expectancy in Russia reached its lowest in 1994 and, following a brief improvement, it declined again after 1998 to reach another trough in 2001 (Figure 2.1). Official data, from as recently as 2003, suggest that the mortality rate in Russia is continuing to increase (www.gks.ru).

Overall, life expectancy in Russia has diverged gradually further from the pattern in the EU [39]. The gap in male life expectancy at age 15 increased from 4 years in 1970 to 6 years in 1985 and over 12 years in 1997. The difference in female life expectancy at this age increased to a lesser degree, from 4 years in 1985 to 6 years in 1997. The

fluctuations in mortality during the 1980s and 1990s were much more pronounced amongst men [40].

Although the trend in life expectancy between the 1960s and the 1980s was fairly similar in Russia and the other former Communist countries, the patterns diverged following the transition. The fluctuations seen in Russia and the other countries of the former Soviet Union were broadly similar, although they were generally somewhat greater in Russia. In contrast, however, life expectancy in countries such as Poland and the Czech Republic has shown a gradual but sustained improvement since 1990[12].

Figure 2.1 Life expectancy at age 15 (WHO)[39] - international comparisons



The majority of the excess deaths in Russia during the 1990s were due to non-communicable disease in middle aged adults, especially men. Leading causes of mortality in Russia are cardiovascular disease (coronary heart disease, including sudden cardiac deaths, and strokes), followed by external causes (accidents, violence

and suicide) [40]. Mortality from these causes peaked in 1994[3], and accounted for a major proportion of the excess deaths during the 1990s [3]. Other important causes, especially tuberculosis [1], alcohol poisoning, cirrhosis and infectious diseases[3], also showed pronounced fluctuations during the transition period.

2.3.1 Proposed explanations for the Russian 'mortality crisis'

Several explanations have been proposed for the Russian 'mortality crisis'. These are artefact in the data, stress due to socioeconomic conditions, behavioural risk factors (especially heavy alcohol consumption), the failing health care system, and environmental pollution. I will discuss each in turn as to whether it provides a plausible explanation for the decline in life expectancy in Russia.

Artefact

Two sources of artefact in the data have been proposed as explanations for the increase in mortality during the transition in Russia. The first is that official mortality rates in the early 1990s were artificially high, because the Russian population denominator had been underestimated due to substantial inward migration from the republics. However this is unlikely to provide an explanation for the mortality crisis, since the increase in mortality predominantly affected people in certain age groups, notably those between 40 and 50, and there was no evidence that inward migration was highest in this age group. In addition the increase in mortality varied between different causes of death, with an increase in mortality from all the major groups of causes of death except neoplasms [41].

The second proposed source of artefact was the existence of discrepancies in death certification before and after the fall of the Soviet Union. However, this explanation is implausible for several reasons. It is unlikely to account for the size of the increase in mortality; certification is likely to be more accurate, and therefore more consistent, in middle-aged people, amongst whom the increase in mortality was greatest [41]; and it does not account for the increase in selected causes of death [41]. In addition, neither of

these proposed explanations is likely to account for the second increase in mortality at the end of the 1990s (Figure 2.1).

Socioeconomic conditions

As stated previously, the 1980s and 1990s covered a period of major social and economic transformation, and the changes in life expectancy after 1991 paralleled the changes in macroeconomic indicators. Life expectancy declined suddenly by 5 years between 1991 and 1994 after the demise of the Soviet Union at the same time that GDP fell by 40% [1]. A subsequent decrease in life expectancy of 2 years occurred in the period following the 'rouble crisis' of 1998 (Figure 2.1). Together these findings provide strong support for a link between socioeconomic conditions and health. However, it is difficult to separate the effects on health of different macroeconomic factors, since the increase in mortality in Russia accompanied both a rapid decline in GDP and a marked increase in income inequalities. It is possible to implicate absolute poverty, characterised by low GDP and low per capita income, since many individuals experienced a dramatic decline in income [13;14]. However, in countries where GDP has always been low, infant mortality is typically high [39], whereas in Russia it has remained relatively low during the transition (15 per 1,000 in 1996 and 13 per 1,000 in 2003 [42]). In this respect, the pattern of mortality in Russia is similar to that in wealthier countries. In affluent countries, life expectancy has been shown to be more closely associated with income inequalities than GDP [43]. Taking this into consideration, the increase in mortality in Russia is as likely to be associated with the rapid increase in income inequalities as the fall in GDP [44].

Income inequalities are thought to influence health and mortality because they are a marker of low social cohesion [43]. In support of this mechanism, areas within Russia that had greater income inequality experienced higher mortality. Furthermore, the areas in which income inequalities were greatest also had higher unemployment, crime and divorce rates [45], and these features of low social cohesion were more strongly associated with regional mortality than were measures of absolute deprivation [45].

In addition, there is evidence from two population studies that socioeconomic inequalities in mortality increased in Russia during the transition. One study, based on census data, showed a much greater increase in mortality during the transition amongst people with low educational attainment than those with university education[3]. The other, based on individual level data from two St Petersburg cohorts from the mid 1970s and the mid 1980s, showed an increase in the educational gradient in mortality over time during the transition[2]. Similar findings have been reported in Estonia[46] and Hungary [47].

The mortality crisis was associated temporally with a period of social, economic and political upheaval, providing powerful support for the role of socioeconomic factors in the mortality crisis. The sudden increase in mortality was associated with an increase in deprivation, as well as a rapid increase in income inequalities and an associated loss of social cohesion. There is evidence to support both these mechanisms, especially the role of income inequality, although their relative importance is not fully clear.

Since socioeconomic factors are likely to be important in the mortality crisis, and because socioeconomic position and health is the principal focus of this thesis, evidence for the influence of socioeconomic position on health and possible mechanisms will be discussed further in Section 2.4.

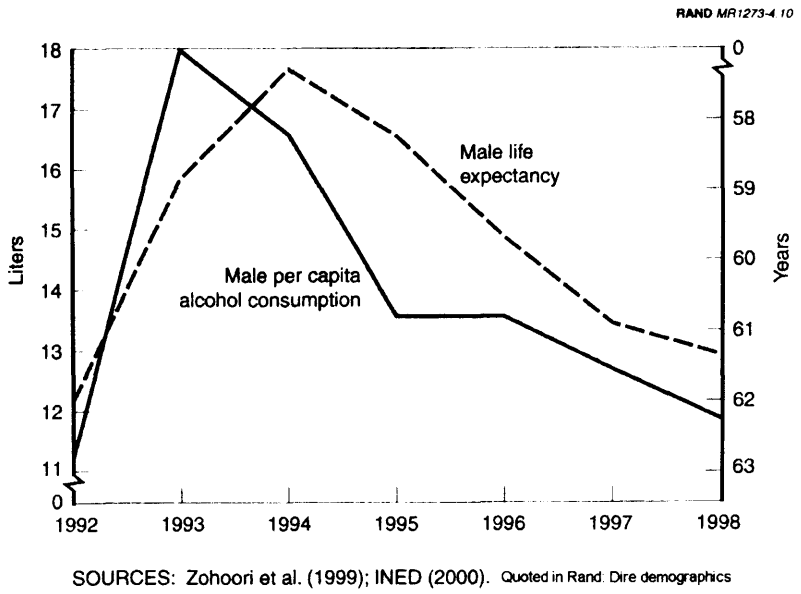
Health behaviours

(a) Alcohol

Alcohol consumption has also been proposed as an explanation for the mortality crisis. Frequent drinking and binge drinking, the consumption of a large quantity of alcohol on an individual occasion, are common in Russia, particularly amongst young and middle-aged adult males, and this is part of a longstanding cultural pattern[8]. In one survey, 59% of 40-49 year old men drank more than the equivalent of 80g of pure alcohol in a sitting [17]. The average consumption of pure alcohol per person per year is estimated at 11 to 14.5 litres, of which an estimated 7.5 to 8.5 litres comes from illicit sources including home distilling [40]. The widespread consumption of illicit alcohol

clearly makes total alcohol consumption hard to measure, and the true figure could be even higher.

Figure 2.2 Fluctuations in life expectancy and alcohol consumption (RAND[1])



SOURCES: Zohoori et al. (1999); INED (2000). Quoted in Rand: Dire demographics

Alcohol Consumption and Life Expectancy for Russian Males, 1992–98 (note inverted scale for life expectancy)

The overall reduction in mortality in Russia in the late 1980s coincided with Gorbachev's anti-alcohol campaign [48], and the rapid increase in mortality that occurred after the transition occurred at a time when alcohol was increasingly available and affordable. Giving further weight to the role of alcohol in the Russian mortality crisis, the increase in mortality that followed the transition was smaller amongst males in the Moslem areas of Russia, in which it may be assumed that there is a higher proportion of non-drinkers than in other areas[1]. Similar temporal changes during the transition in per capita alcohol consumption and life expectancy suggest that alcohol may have contributed to the recent mortality crisis (Figure 2.2 [1]). However, caution is required when interpreting these trends. In those data [1], alcohol consumption was derived indirectly from mortality attributable to alcohol, and so this is not a valid comparison. In contrast, survey data from Novosibirsk indicate that rates of binge drinking did not increase between 1988-9, the period immediately preceding

the transition, and 1994-5 a time when the transition was well underway [49] and mortality was at one of its highest levels during the 1990s in Russia[39]. Cardiovascular disease, accidents and violence are the principal causes of death that accounted for the increase in mortality in Russia [3]. Alcohol has been shown to play an important role in injuries and violent deaths in Russia. In one study, fifty per cent of people who died accidentally had a very high blood alcohol level [50], although it is not certain whether the most appropriate reference group was used. Another study showed that deaths from external causes are highest at weekends, when binge drinking is believed to be most common[51]. Other research suggests that alcohol plays a role in suicide[52] and homicide[53], both of which increased during the transition [3;40].

Alcohol has also been proposed as a contributor to deaths from cardiovascular disease, the greatest contributor to the increase in mortality during the transition. Although alcohol consumed regularly in small amounts is known to be cardioprotective[54], binge drinking may lead to cardiomyopathy, which in turn may predispose to sudden death from cardiac arrhythmias[41]. In support of this, as with deaths from external causes, the number of sudden cardiovascular deaths in Russia is greatest on weekend days, coinciding with higher rates of binge drinking [51]. In addition, 26% of individuals diagnosed at autopsy with sudden cardiovascular death had a moderate to high blood alcohol[50], although again the appropriate reference group is not clear. However, review of the records suggests that these deaths were from cardiovascular disease, and not acute alcohol poisoning [50]. Proposed biological mechanisms are that an episode of binge drinking may lead to greater susceptibility to cardiac arrhythmias and higher blood viscosity, and that a pattern of binge drinking affects blood lipids (although evidence for the latter is limited[55]). A combination of these factors may precipitate cardiovascular death [50;55].

As well as increases in deaths from external causes and cardiovascular disease, mortality from alcoholic poisoning increased during the 1990s [41]. Likewise, mortality from cirrhosis increased, and although this a much less common cause of death, it is specifically alcohol related [41].

Although alcohol is likely to play a role in deaths from external causes and possibly cardiovascular disease, the principal causes of the excess mortality in Russia during

the 1990s[3], it is uncertain as to whether alcohol can explain the size of the mortality crisis. There are several reasons for this. The proportion of cardiovascular deaths that could be accounted for by alcohol remains uncertain, as does the role of alcohol in the smaller increase in mortality amongst women. Women consume very much less alcohol than men [56], but the relative increase in mortality during the transition was similar in both sexes [39]. In addition, the widening educational gradient in mortality during the transition was not matched by any gradient in alcohol consumption in the New Russia Barometer study [17], and the increase in the educational mortality gradient was similar in heavy drinkers and moderate drinkers [2].

(b) Smoking and classical CVD risk factors

Smoking is an important cause of death in Russia, where in 1990 it was thought to have accounted for 30% of male deaths [57] . More than fifty per cent of Russian men smoke, and although the prevalence of smoking in women is only 13%, it is increasing [17]. Smoking is more common amongst young people. 73% of people aged between 25 and 34 smoke, compared with only 41% of those aged over 65 [17]. However, smoking is unlikely to explain the rapid fluctuations in mortality of the 1990s, partly because the rates of smoking in Russia have remained generally stable over the last 20 years [58], and partly because the effect of smoking on chronic disease mortality generally occurs over a longer time scale.

A well as high a prevalence of smoking, the MONICA study demonstrated high levels of other conventional risk factors for coronary heart disease (CHD) in Russia, such as high blood pressure and obesity [59]. However, the distribution of blood lipids in MONICA was similar in Russia to many Western countries [59]. In another study, blood lipids and blood pressure did not differ significantly between Archangelsk, Russia and two northern Norwegian centres [60].

Diet is known to influence health, and fat and antioxidant intakes are of particular interest in the causation of cardiovascular disease. Consumption of animal fats and serum cholesterol levels are both known to be associated with coronary heart disease, but there is little difference in their distribution between countries in Eastern and

Western Europe. The MONICA study showed that antioxidant vitamins explained a high proportion of the variation in CHD mortality between countries [61]. Fruit and vegetable consumption is low in Russia, especially during the winter months, and obesity and lack of exercise, also risk factors for CHD, are widespread [17;62]. Diet, obesity and exercise could contribute to deaths from CHD, but they are unlikely to contribute towards the rapid fluctuations in mortality, for the same reasons as smoking.

Overall, there is considerable indirect evidence for the role of alcohol in the mortality crisis in Russia, although it is uncertain whether alcohol could have explained the magnitude of the increase in death rates. Smoking and the other cardiovascular risk factors outlined here are likely to be important background cardiovascular risk factors in Russia, but are unlikely cause the short term changes in mortality. In addition, health behaviours provide a potential mechanism through which socioeconomic conditions may influence health, which will be discussed further in Section 2.4.2 (d).

Health care

The health care system in Russia deteriorated after the transition[63]. Since 1991, health care has been seriously affected by financial shortages, and drugs and other treatments are frequently in short supply [64]. Health care changed during the 1990s from a state-financed system to a system of social health insurance with theoretically universal coverage [63;65]. In practice, though, health insurance coverage is incomplete [66], and patients are frequently required to make additional unofficial payments for services.[63]

The literature suggests that a proportion of deaths in Russia and other transition countries may be avoidable through better health care. One estimate, based on data from a study by Forster and Jozan [47] suggested that about 20% of the difference in mortality between Central Europe and the former West Germany could be eliminated if causes of death amenable to medical intervention were avoided [67]. However, this is probably an overestimate, since in practice it is not possible to prevent 100% of deaths. In addition, many of the conditions "amenable to health care" may have a higher incidence in Central Europe than the West, and therefore the excess mortality

may not in fact be due to deficiencies in health care. A more realistic estimate of the proportion of deaths avoidable by better health care is likely to be less than 10% [67]. In Russia, Andreev estimated that life expectancy could be improved by 2.9 years, if health care were of the same standard as in the UK [64], but again the same caveats apply. In addition, improvements in health care are thought to have contributed to the increase in life expectancy seen during the 1990s in the former East Germany, and to a lesser extent in Poland[68].

Deterioration in the health care system is unlikely to account for the rapid increase in mortality from non-communicable disease in Russia for several reasons. Many of the excess deaths in Russia are due to coronary heart disease, which may not be significantly preventable by health care [69;70], especially the care that is currently available. One study estimated that improvements in health care accounted for 42% of the decline in mortality from CHD in the UK between 1981 and 2000 (especially better treatment of hypertension, heart failure and acute myocardial infarction, and secondary prevention) [71]. However, current standard treatments in the UK are unlikely to have been available in Russia in the 1980s, and therefore the mortality crisis of the 1990s is unlikely to be due to a reduction in the availability of such therapy. For the same reason, the increase in life expectancy in Russia in the 1980s is unlikely to be accounted for by improved health care [41]. In addition, deaths from CHD and external causes may be sudden, and therefore not amenable to acute medical care. Finally, deaths from conditions "amenable to health care" are unlikely to affect middle aged adults, the group worst affected by the mortality crisis, specifically, unless access to health care was specifically restricted in that group.

Overall, it is likely that a proportion of deaths in Russia would be preventable by better health care. However, the deterioration in the Russian health care system during the 1990s is unlikely to explain the short-term changes in mortality in Russia during that period.

Environment

Environmental pollution is a major problem in Russia [72], but it is unlikely to have caused the rapid increases in the principal causes of excess mortality seen during the

1990s, external causes and cardiovascular disease. Causes of death related to environmental factors would be expected to affect all sectors of the population, whereas the increase in mortality in Russia was greatest amongst middle aged males [1]. In addition, levels of pollutants have been falling in Russia in the 1990s with the collapse of heavy industry [41]. Deaths from conditions linked to environmental pollution such as respiratory conditions and radiation–induced cancers have not risen during the transition [73]. Available estimates of the effects of environmental exposures are too low to account for a substantial proportion of mortality [74]. Overall environmental factors are unlikely to offer an explanation for the increase in mortality.

2.3.2 Conclusions about the causes of the decline in life expectancy in Russia

Adverse socioeconomic conditions together with rapid social change, and health behaviours (most notably alcohol misuse), provide the most plausible explanations for the 'mortality crisis' of the 1990s in Russia, although much of the evidence is indirect. Smoking certainly contributes to the high mortality rates in Russia in the longer term[57], but it is unlikely to account for the short-term fluctuations, and the same is likely to be true of other cardiovascular risk factors such as diet and exercise. Artefact, environmental factors and health care do not appear to provide adequate explanations.

Within RLMS, the study on which this thesis is based, too few deaths were reported to make it possible to study temporal trends in mortality and their causes. However, studying the role of socioeconomic factors and alcohol as longer-term determinants of mortality may provide indirect clues about their potential contribution to the short-term fluctuations of the mortality crisis.

2.4 Socioeconomic position and health

2.4.1 Overview of the relationship between socioeconomic position and health

General

Lower socioeconomic position is consistently associated with worse health in many countries, and the differences generally take the form of a gradient [75]. The gradient indicates that differences in health do not just exist between rich and poor, but also between different strata that consist of relatively affluent people. Socioeconomic inequalities have been demonstrated in all-cause mortality, mortality from several specific causes, measures of chronic illness, biochemical markers of increased coronary risk, and self-rated health [76-78].

Gradients in self-rated health and mortality have been demonstrated in many populations in relation to several indicators of socioeconomic position, including income, education, occupation, material deprivation and subjective socioeconomic position [76;77 79;80]. Several mechanisms have been proposed for the influence of socioeconomic position on health, for example health behaviours, psychosocial mechanisms, health selection and factors operating across the life course.

International variations have been demonstrated in the socioeconomic gradient in both self-rated health and mortality. Variations in the size of social class differences in self-rated health exist between European countries [81], and even between regions of a single country, Britain [82]. The size of occupational class differences in mortality have also been shown to vary between European countries, with a generally smaller difference in several Scandinavian countries and the Netherlands, a somewhat greater difference in Finland and the greatest difference in France [77]. Variations in the size of the differences were explained partly by socioeconomic variations in deaths from particular causes between countries [77]. A study in the Netherlands has also demonstrated the important influence of socioeconomic differences in mortality from specific causes on occupational class differences in all-cause mortality in an individual country [83].

International differences in the size of the socioeconomic gradient in health, and the influence on the gradient in all-cause mortality of socioeconomic variations in specific causes of death, together suggest that particular underlying mechanisms for the association operate more strongly in certain countries. One example of this is the presence of wide socioeconomic disparities in mortality in France, which were thought to be due to the gradient in alcohol consumption [77]. Several potential mechanisms may influence the association between socioeconomic position and health, and these will be discussed in more detail in Section 2.4.2.

Russia

A few studies have shown an educational gradient in mortality in Russia. Gradients in several causes of death were demonstrated in a study based on census data [3]; an educational gradient in both all-cause mortality and cardiovascular deaths was shown in a study in Novosibirsk, Siberia [84]; and in a cohort from St Petersburg the educational gradient in all-cause mortality increased during the transition [2]. Gradients in self-rated health and in the prevalence of several chronic diseases in Russia have been shown in relation to education [5] and other socioeconomic measures [85;86]. These variables include material circumstances [87], income and subjective social status [86].

The increase in the educational gradient in mortality in Russia during the transition [2;3;11] is thought to have resulted from increases in particular causes of death, such as cardiovascular disease and deaths from external causes [3]. However, the reasons underlying the increase, and in particular the role of alcohol [2], are not fully clear.

2.4.2 Proposed mechanisms for relationship between socioeconomic position and health

The causal mechanisms proposed for the association between socioeconomic position and health fall into several broad categories. These are selection of ill people into low socioeconomic groups; material factors (absolute deprivation); psychosocial

mechanisms (such as social support) which influence health through physiological pathways; health behaviours (such as alcohol and smoking); and unequal exposures to determinants of health across the life course (from early life to adulthood). In the following sections, general evidence for these mechanisms will be described, followed by evidence relating specifically to their influence in Russia.

(a) Selection bias

One proposed mechanism for the influence of socioeconomic position on health is the theory of direct health selection, which states that ill health leads to low socioeconomic position [88].

There is some evidence for this effect. For example, in the Whitehall II study, poor mental health was associated prospectively with low income [89]; Wadsworth demonstrated a prospective association between childhood ill health and occupation; [90] and individuals from the 1958 birth cohort who were in poor health were less likely to move to a higher social class and more likely to move to a lower one [91]. Another study showed that ill-health was more strongly associated with subsequent unemployment amongst manual workers [92].

However, although there is evidence for an effect of health selection on socioeconomic position, each of the studies above indicated that the health selection effect was small in comparison to the magnitude of the prospective association between socioeconomic position and health [89-91].

Indirect health selection is a more complex theory, in which individuals are thought to have particular psychological or psychosocial characteristics that predispose them to attain selection into a higher social class, and also to experience better health [88]. Effects on health may either be due to differences in health behaviours or other risk-taking behaviours, or to poor development of coping skills, demonstrated by poorer psychosocial health in children from disadvantaged backgrounds [93]. However, it could also be argued that these early life influences form part of the adverse exposures

accumulated throughout life [93]. The latter explanation for health inequalities will be described in Section 2.4.2 (e). Health selection has not been well researched in Russia.

(b) Material factors

People in lower socioeconomic groups may experience worse health due to a lack of basic material needs, or to exposure to harmful environmental conditions. An ecological association between GDP and life expectancy partly supports this [94]. However, in more wealthy countries life expectancy is closely correlated with income inequalities, but only weakly with GDP [94]. In the UK, mortality has been shown to be associated with deprivation at area level, measured by the Townsend score (a composite measure which includes items such as overcrowding and car ownership) [75]. However, this was an ecological study and therefore does not indicate associations between deprivation and mortality at an individual level. In addition, overcrowding and lack of a car do not indicate absolute poverty in the same way as a lack of basic household amenities.

The "neo-material" explanation states that mortality is higher in societies in which there are greater inequalities in the accumulation of health-related exposures connected to the material world. Systematic under-investment in the human, health and social infrastructure are thought to be of particular importance, and examples include neighbourhood characteristics and social amenities, which have been shown to be associated with health at an ecological level [95]. The "neo-material" explanation states that differences in the resources of individuals also make some contribution to health inequalities [95].

Evidence for the "neo-material" explanation is limited in several respects, however. Within in the USA, states with higher mortality had a worse public service infrastructure [95]. However, in another study, Sweden had greater social inequalities in health than Germany, despite a more comprehensive public service infrastructure [81]. In addition, "neo-material" exposures embrace a very wide range of factors [96], and evidence for the association with health of the proposed material and "neo-material" exposures is weak. For example, pollution or poor housing do not explain the

association between socioeconomic position and health, and neither do material factors explain the presence of a gradient in health and mortality even amongst more affluent groups in society [75].

Although the mortality pattern in Russia, with relatively low levels of infant mortality, differs from that seen in low-income countries, there is evidence that absolute deprivation exists in post-transition Russia. In 1999 more than 39% of the population were living below the official poverty line, in this instance an absolute measure of poverty, based on household income in relation to the cost of food and basic household items [97]. The poverty line and the proportion living below it, as described previously, are subject to debate. However, the absolute nature of the measure used and supporting evidence from another Russian study where many respondents were going without food and clothes [98] indicate that absolute poverty exists in post-transition Russia and could therefore play a role in the socioeconomic gradient in mortality and ill-health. In addition, rates of particular diseases associated with poverty, such as tuberculosis, have increased during the transition, and are likely to reflect inadequate living conditions[1].

However, there are several reasons why absolute deprivation is unlikely to explain fully the association between socioeconomic position and health in Russia, and these will be discussed in the following section on psychosocial mechanisms.

(c) Psychosocial factors

Psychosocial mechanisms provide a route for the influence of socioeconomic position on health, in which the psychological response to socioeconomic disadvantage is key. Psychosocial factors are thought to influence health directly through physiological mechanisms, in the form of two neuroendocrine pathways, the sympatho-adrenal pathway and the hypothalamo-pituitary axis (HPA). These pathways provide a normal means of response to acute stress, but are thought to become maladaptive in situations of chronic stress, leading to illness [99]. Psychosocial factors may also act indirectly through health behaviours, such as smoking [100].

Several psychosocial mechanisms have been proposed through which socioeconomic position may influence health, and these include status inequalities, social networks and social cohesion, perceived control, and work related factors (job control or effort/reward imbalance) [101].

Psychosocial mechanisms overcome some of the limitations described above in the ability of material factors to explain socioeconomic inequalities in health. At an ecological level, income inequality is a better predictor of life expectancy than GDP in more wealthy societies [94]. Income inequality is thought to be a marker of societal features such as social trust or cohesion, and it is these psychosocial exposures that may influence health and life expectancy[43]. At an individual level, differences in health according to income take the form of a gradient, and differences between the more wealthy strata suggest that the socioeconomic gradient in health result from relative, rather than absolute, deprivation. There is also evidence that psychosocial factors mediate the socioeconomic gradient in health, particularly work-related characteristics such as low job control[102].

The increase in mortality in Russia in the early 1990s coincided with both a rapid increase in income inequalities and a large decline in GDP [44]. Evidence that increasing income inequalities, indicating an underlying loss of social cohesion, may have been at least as important as absolute poverty in the mortality crisis was described earlier (Section 2.3.1). This evidence consisted of a pattern of mortality closer to more wealthy countries [44], and the association of measures of low social cohesion with regional mortality [103].

Further evidence that relative deprivation may be at least as important as absolute deprivation as a cause of mortality in Russia comes from studies at an individual level. Income inequalities in Russia, as in other countries, follow a gradient [86], and the educational gradient in mortality increased during the transition[2;3] (Section 2.3.1).

Of the established psychosocial mechanisms, low perceived control has been shown to be associated with self-rated health in Russia and other former communist countries[87]. While perceived control was not measured in RLMS, it is possible to

study two psychosocial mechanisms within the available data, social support through social networks and job insecurity.

(i) Social networks

Social networks form one aspect of social capital, whose definitions include "networks together with shared norms, values and understandings that facilitate co-operation within or among groups" [104] and "...networks, norms, and trust that enable participants to act together more effectively to pursue shared objectives"[105].

There is considerable evidence that social networks influence health [106], either through a direct effect or by providing social support to buffer the individual against the effects of stressful life events. For example, in the Alameda County study in the US, individuals with better social networks had lower mortality over the following nine years, and the results of that study were supported by findings from several subsequent community studies [106]. A study of US male physicians demonstrated differences in the protective effects of social support against mortality from different causes, whereby social isolation was linked to increased mortality from cardiovascular disease, but not from other causes [107].

In Western societies, higher socioeconomic position is associated with better social networks [75]. However, in post-transition Russia this has been less well researched, although there is some evidence that people in higher socioeconomic groups may have lost some of their former networks during the transition [35] .

There is a limited amount of evidence for the influence of social support on health in the former Communist countries. Rose has shown in Russia that informal social networks are protective of health [34], but this could be due to the material benefits of networks that result from exchanging goods and services [11], as much as from social support. Marriage has a protective effect on health in Eastern Europe, and this is thought to be because of the social support that it provides. One study showed that most of Hungary's increase in mortality during the 1980s was in unmarried people [108], and a similar pattern was found in Poland[109].

(ii) Unemployment

It has been shown in the UK that the anticipation of unemployment or privatisation was associated with adverse psychological outcomes and worsening self-rated health[110;111], and there is more limited evidence of an association with adverse physiological outcomes [111]. In addition, following redundancy, those former civil servants with unsatisfactory jobs had equally poor mental health as those who had become unemployed[75].

In the West, unemployment is associated with increased mortality[112]. Census linked data show higher mortality throughout unemployment, whatever its duration [113]. This suggests that that unemployment predicts poor health, and not merely the selection of people in ill health into unemployment, although there is evidence that chronic ill health predicts unemployment, especially amongst manual workers [92]. Poverty has been shown to be an important mediator of some of the effects of unemployment on health [114]. However, the adverse effect of unemployment on health could also operate through psychosocial mechanisms as a result of loss of status. Regaining employment after a period of unemployment has been shown to improve psychological wellbeing.

In post-transition Russia, unemployment is an important problem, and job insecurity is widespread, as demonstrated by the high frequency of wage arrears, compulsory leave and payment in consumer goods [97]. Before the demise of the Soviet Union, employment was guaranteed by the state, but since 1991, unemployment rates have increased, peaking at 10.8% in November 1998 and remaining at 7.3% in October 2001[97]. Although these figures are not excessively high, wage arrears and compulsory unpaid leave (described as Russia's "hidden unemployment") were also common in the 1990s [97], and the true number of people not in paid employment is likely to be much higher than suggested by the numbers of unemployed. Unemployment itself has particularly affected older individuals, and people in manual work, who at one time expected jobs for life[8], and women in post-transition Russia are more vulnerable than men to unemployment and unpaid leave [115].

The associations between job insecurity, unemployment and health have not been studied well in Russia.

(d) Health behaviours

Behavioural risk factors have been proposed as an explanation for the influence of socioeconomic position on health. The evidence for the adverse effect on health of smoking and excess alcohol consumption is well established [54;116], and there is considerable evidence for a socioeconomic gradient in particular health behaviours, such as smoking and diet, in the UK [117].

There is some evidence that the socioeconomic gradient in mortality is explained by socioeconomic differences in the prevalence of behavioural risk factors. In a study of European countries, the differences in mortality between France and some of the Scandinavian countries were explained by the fact that alcohol consumption is higher in the lower social classes in France [77], and amongst UK civil servants the mortality gradient was partly explained by smoking [117].

Heavy drinking, smoking, poor diet and a lack of exercise are all more common in Russia than in the West [56;58;62]. Structural factors, as well as individual choice, have been proposed as important influences on health behaviours in any society [118]. In Russia, important structural factors include the cultural acceptability of heavy smoking and drinking, readily available cheap alcohol and cigarettes, and limited availability of an affordable healthy diet [8;62]. As in other countries, heavy smoking and drinking are mutually associated in Russia [56].

Whilst smoking and alcohol are clearly associated with mortality in Russia, there is only weak and inconsistent evidence that health behaviours are related to socioeconomic position [33]. A study in Novosibirsk showed that in the 1980s men with a university education drank less alcohol. However, by the mid-1990s, drinking in the total population increased, especially amongst university educated men, leading to a decrease in the gradient in alcohol consumption [84]. Another study, though, showed that women with higher education drank significantly less alcohol [56]. Overall, though,

it appears that there is no great socioeconomic variation in alcohol consumption [56;86], and no consistent association between smoking and socioeconomic position has been demonstrated. One study showed that although smoking is more common amongst materially deprived people in Russia, it did not vary according to education [56].

Similarly, there is little evidence in Russia that smoking and drinking mediate the socioeconomic gradient in health[33] or mortality[2]. Overall, it does not seem likely that health behaviours offer a full explanation for the influence of socioeconomic position on health in Russia.

(e) Life course influences

Life course epidemiology has been defined as "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" [119].

One model of life course epidemiology proposes that risk factors for chronic disease often cluster together because many are related to socioeconomic disadvantage, and that the association between socioeconomic position and health is a result of differential accumulation of adverse experiences throughout life [119]. Such experiences range from early life influences, including birth weight and parental social class, to exposure in adulthood to hazardous employment [119].

RLMS covers a limited period of the adult lives of respondents, and therefore the scope for a comprehensive study of life course influences on health is limited. However, it is possible to study whether exposure to unemployment and insecure employment, as well as a decline in income, differed according to socioeconomic position within the time scale of the study. Although the associations between insecure employment, unemployment and health were discussed in Section (c), relating to psychosocial mechanisms, the life course definition above includes differential socioeconomic exposure to psychosocial hazards [119], and the differential exposure is therefore briefly considered here.

Adverse employment-related experiences have been shown to be more common in lower socioeconomic groups in Western countries. For example, those with little education in low paid manual jobs may be more exposed to the hazards of manual work, and people in lower status occupations have been shown to be more vulnerable to unemployment [92]. In post-transition Russia, there is a limited amount of evidence for the differential accumulation of adverse experiences according to socioeconomic position. A decline in income was more common amongst people in the lowest income centile [6],

Adverse employment-related experiences were important in the adult population in post-transition Russia. Hazards that are potentially related to employment include exposure to physical and chemical hazards, and one Russian study showed that people were prepared to take hazardous jobs if necessary in order to provide a basic income [120]. Other employment-related exposures include job loss, job insecurity and other psychosocial hazards, discussed in Section (c). Insecure employment was widespread in post-transition Russia, and manual workers were particularly vulnerable to unemployment [21].

Evidence that the accumulation of adverse exposures in lower socioeconomic groups influences health in Russia is even more limited. In one case-control study in Udmurtia, Russia, men who died prematurely were more likely to have multiple social disadvantage (such as unemployment, marital breakdown, low education) than healthy controls [121]. Indirect evidence comes from an ecological study where districts with the highest mortality had the highest rates of crime, unemployment and divorce [45], although the socioeconomic distribution of these adverse exposures and deaths amongst individuals is clearly unknown.

2.5 Relationship between different socioeconomic measures and health outcomes

One important reason for studying socioeconomic position and health in Russia is that the association between socioeconomic measures differs from the West, for example education and income are less closely associated in Russia. It also possible to test

whether the associations between different measures of socioeconomic position and health in Russia may be different from those in Western societies, and therefore to examine whether the mutual confounding between different measures of socioeconomic position can be broken using data from Russia.

Several Western studies have compared directly the associations between different measures of socioeconomic position and health. Amongst studies that used mortality as an outcome, two British studies showed that occupation predicted mortality particularly strongly. In the Whitehall study of British civil servants, occupational grade predicted mortality independently of education[78]. Another British study noted that all-cause mortality was predicted more strongly by occupation than by education[80]. In contrast, two other studies showed a more important role for measures of financial wellbeing. A study in Germany showed that income, education and occupation all influenced mortality, but the effects of education and occupation were explained by income [122]. A study in the US noted that household income and wealth were more important predictors of mortality than occupation, which in turn predicted mortality more strongly than education[123].

Amongst studies that used self-rated health as an outcome, a Finnish study showed that income was the strongest determinant of health [79]. In that study, inequalities in self-rated health by income were only partly explained by occupation and education [79], but differences in self-rated health by occupation were largely explained by education and differences by occupation were explained by education [79]. In contrast, in the USA, Miech showed that education was strongly associated with self-rated health, and explained much of the association between the latter and occupation [124]. Different again were findings in Norway, in which longstanding limiting illness was predicted by occupation, but not by education[125].

Although occupational class inequalities in self-rated health were similar in Sweden and Britain, a higher proportion of the inequalities in Britain were explained by income. In this study, a higher proportion of British respondents in manual occupations had a low income [126]. This inconsistency could either be because of the material effects on health of a low income in the manual class in Britain, or because

low income was a marker of a third variable that influenced self-rated health. It could also simply be due to the closer correlation between income and occupation in Britain.

Overall, the literature demonstrates considerable inconsistencies in the associations between different socioeconomic measures and health in the West. It is hard to understand fully these inconsistencies. Some differences could be related to measurement of the variables. Valkonen suggested that education was the most reliable measure for cross-national comparisons [127]. Both that study [127] and a study by Kunst [76] showed that the size of the effect of education on mortality was similar in several countries, even though the total population effect varied.

Findings from a British study suggest that the direction of the association between socioeconomic measures could play an important role in determining the association[128]. In that study, education, income and occupation were all associated with measures of psychosocial health, the effect of education on health acting through occupation and income only became apparent when the temporal relationships between the variables were accounted for using structural equation modelling [128].

There have been few direct comparisons of the associations between different measures of socioeconomic position and health in Russia. One unpublished study showed that income was more strongly associated with self-rated health than education [86]. It will therefore be interesting to use the extensive data in RLMS to study the association between socioeconomic position and health in a country where relationships between these measures are likely differ from those in the West.

2.6 Self-rated health and its association with mortality

Self-rated health and mortality are two key health measures recorded in the Russia Longitudinal Monitoring Survey that will be the principal outcomes studied in this thesis.

Self-rated health has been shown to predict mortality consistently in many countries[129]. There is evidence that self rated health forms a continuum in which degrees of worsening health are associated with a progressive increase in mortality [130], more chronic disease and worse health behaviours [131]. This suggests that self-rated health has good construct validity [131]. Self-rated health also shows good test-retest reliability [129] and generally consistent reporting, even with minor changes in the wording of the questions. This facilitates comparisons between different studies [129].

Self-rated health is most commonly measured on a 5-point scale (very good, good, average, poor or very poor). The "norm" (or most common value) of self-rated health varies between countries, for example in Lithuania it is "poor", although in the UK it is "good" [129]. The "norm" is thought to be partly culturally determined. In India, for example, areas with the highest mortality are not those where self-rated health is worst [132]. Despite this variation in the "norm", however, within-population differences in mortality between the groups with the best and worst health are surprisingly consistent between studies [129].

Few studies have compared the association between self-rated health and mortality in different subgroups of the population. However, a Swedish study showed that self-rated health predicted mortality more weakly with increasing age, and older people reported better health than younger people with a similar risk of mortality [133]. The ability of self-rated health to predict mortality was also lower in males and in people with hypertension [133].

The same study showed that the association between self-rated health and mortality did not vary in strength according to education or income[133]. This suggests that people from different social strata report and understand self-rated health in a similar manner,

and that socioeconomic inequalities in self-rated health are therefore likely to predict socioeconomic inequalities in mortality and objective health outcomes [133]. Based on this assumption, self-rated health has been widely used as a surrogate for mortality and other health outcomes in epidemiological research.

Idler and Benyamini proposed several mechanisms for the relationship between self-rated health and mortality[129]. First, self-rated health may be a more accurate and inclusive measure of health than are objective measures of disease. For example self-rated health may include a wider array of illnesses, some of which are not yet clinically apparent, and may reflect a human judgement about the severity of illness and an awareness of any family history of disease or longevity. Second, self-rated health may measure a trajectory, or pathway, in health. Third, self-rated health may predict health-related behaviours, for example smoking, drinking or adherence to preventive health care advice and programmes. Fourth, self-rated health may reflect either internal (within person) resources or external resources, such as psychosocial wellbeing or socioeconomic conditions, which could attenuate a decline in health.

In summary the mechanisms for the influence of self-rated health on mortality are that it acts either as a summary of objective health measures such as underlying disease, a measure of internal or external resources, or an influence on behaviours that influence longevity.

One study showed that poor self-rated health was predicted by chronic disease, but particularly good self-rated was predicted more strongly by psychosocial and socioeconomic variables [130]. However, other authors have shown that chronic disease predicted self-rated health consistently across the spectrum from good to poor [131]. In contrast, Mackenbach showed that although several established psychosocial mechanisms were associated with self-rated health, these variables did not explain the association between self-rated health and mortality [134].

Although self-rated health has been studied as an outcome in Russia, I am not aware of any studies of the association between self-rated health and mortality in that country.

2.7 Conclusions and implications for data analysis

Russia has undergone profound social and economic change during the last 20 years. Since the start of the transition, many people have faced considerable financial loss, unemployment and material hardship. At the same time, however, a few people have become wealthy. Consequently, income inequalities have widened greatly.

Life expectancy declined dramatically in Russia during the transition. Within this overall decline, life expectancy has fluctuated in line with the social and economic changes, and it appears that the two are connected. There is ongoing debate as to the relative contribution to the decline of social stress and behavioural risk factors, particularly heavy alcohol consumption.

Differences in social structure between Russia and the West mean that there are differences in the relationships between different measures of socioeconomic position, especially as a result of the relatively low-income returns to education in Russia.

In spite of these differences, though, a socioeconomic gradient in health exists in Russia, as in many other countries. Education is the socioeconomic measure most strongly and consistently associated with mortality and self-rated health in Russia, and the educational gradient in mortality actually widened during the transition [2;3].

Several mechanisms have been proposed for the association between socioeconomic position and health, including health behaviours, psychosocial mechanisms, material factors and factors operating across the life course. There is some evidence in Russia to support several of these mechanisms.

The role of material deprivation is supported by the widespread presence of absolute poverty in Russia, although this is unlikely to provide a full explanation for the socioeconomic differences in health. A role for psychosocial mechanisms is supported by rapidly widening income inequalities in Russia accompanied by changes in life expectancy [44], the presence of a gradient in health [135] unexplained by traditional risk factors, the association of lack of social support with poor health, and higher mortality

amongst unmarried people. Social support and trust are lacking, social networks have been disrupted, and there is ongoing social instability and uncertainty.

A role for behavioural risk factors is supported by the widespread presence of heavy drinking and smoking, although the evidence for the socioeconomic patterning of these behaviours in Russia is weak [56], and their role in explaining the socioeconomic gradient in health may therefore be limited.

Several adverse experiences in people's lives during the transition are related to low socioeconomic position. Unemployment and insecure employment are more common amongst people who were previously in manual occupations, and within the widespread downward social mobility, the greatest decreases in income were amongst those who were already worst off[6]. Marital breakdown is common. Some of these experiences, including unemployment and marital status, have been shown to cluster in people from more deprived backgrounds and to influence health in Russia.

However, research into the socioeconomic causes of ill health in Russia is limited in several respects. Many studies so far have been at ecological level, based on routine and aggregate data. The few individual level studies are often cross-sectional, and health outcomes are often based on self-report rather than on objective measures of disease. There are very few prospective studies with repeated data collection, which is essential in establishing the causal direction of the association between socioeconomic position and health. Not all studies of health and socioeconomic position in Russia have taken into account the country's social structure and economy, and this means that the measures of socioeconomic position used have not always been appropriate. In this respect, studies of Russian social structure by sociologists and economists have made a valuable contribution to the literature.

Findings from this literature review will be used to guide some of the practical aspects of the research in this thesis, particularly the measurement of socioeconomic variables and covariates. These will be discussed further in the relevant sections of the methods chapter.

3 Aims and objectives

I defined several aims for this project, and linked to these, specific objectives, and these are listed below. Many of these build on the findings from the literature review.

3.1 Aims

My aims were to investigate:

- The relationships between different measures of socioeconomic position in Russia
- The measures of socioeconomic position that were most strongly associated with self-rated health and mortality
- To what extent the socioeconomic gradient in health was explained by other variables (health behaviours, material factors, social networks, satisfaction and optimism).
- The role of self-rated health in the association between socioeconomic measures and mortality
- Whether the associations between socioeconomic variables and health could be causal

3.2 Objectives

My specific objectives were to:

- Validate the mortality data
- Analyse the distribution of and associations between different measures of socioeconomic position
- Measure the distribution in the population of variables which might explain the association between socioeconomic position and health (e.g. demographic factors, measures of deprivation, and variables related to employment, health behaviours and psychosocial measures in the study population), and their distribution in relation to socioeconomic position.

- Measure the associations between different measures of socioeconomic position and health
- Investigate whether any of the proposed explanatory variables in fact explain the relationships between socioeconomic position and health.
- Examine the associations between socioeconomic position, self-rated health at different times during the study, and mortality

4 Methods

In this chapter I describe the methods used to achieve the aims and objectives set out in the previous chapter. I first describe the dataset and its adaptation for the analyses. I then describe the socioeconomic, health, demographic and other variables in the dataset, and include a detailed description of the validation of the mortality data. Finally, I outline the strategy for the data analysis and the statistical techniques used.

4.1 The data (Russia Longitudinal Monitoring Survey)

This thesis is based on secondary analysis of data from the Russia Longitudinal Monitoring Survey (RLMS), a unique panel study of socioeconomic conditions and health in Russia since the mid-1990s. A cohort of over 4,000 households, and the individuals within them, was followed, and information was recorded at individual, household and community levels. Some households and individuals left during the course of the study and were 'replenished' by new households. The data are in the public domain.

Table 4.1 Dates of the second phase of RLMS (Russia Longitudinal Monitoring Survey)

Round	Dates (month and year)
5	11/94-12/94
6	10/95-12/95
7	10/96-12/96
8	10/98-1/99
9	9/00-12/00
10	9/01-12/01
11	9/02-12/02

RLMS was designed by Russian and American academics. A comprehensive range of socioeconomic measures was recorded, as well as several health outcomes. Many of these measures were sensitive to the Russian cultural context, for example patterns of employment, income from the informal economy, and borrowing and lending from others. RLMS is co-ordinated by the University of North Carolina at Chapel Hill, and is funded by the National Institutes of Health (NIH).

The second phase of RLMS, on which this thesis is based, started in 1994 and is ongoing, and so far there have been 7 rounds (numbered Round 5 to Round 11), whose dates are shown in Table 4.1. The earlier first phase (Rounds 1 to 4) took place between 1992 and 1994, after which there was a change in collaborators due to concerns about sampling and data quality, and a different population was used for the second phase of the study.

Figure 4.1 Samping sites in Phase 2 of RLMS

4.1.1 Study methodology of RLMS

The study sample in the second phase comes from 38 population centres sampled from different parts of the Russian Federation (Figure 4.1). Russia's administrative system is complex, but in essence it consists of large administrative districts known as either raions, krugs or independent republics, subdivided into smaller administrative divisions that are generally known as oblasts. The exceptions to this are the main cities of Moscow and St Petersburg, which are described as 'metropolitan areas'.

The sampling procedure was as follows. 1850 raions (or equivalent) containing over 95% of the Russian population were used as primary sampling units, 178 raions having been excluded either because they were very remote or were experiencing armed conflict. Three large population centres (equivalent to a raion), Moscow district, Moscow Oblast and St Petersburg Oblast, were selected automatically. The remaining raions were divided into 35 strata according to geographical and socioeconomic conditions and ethnic mix. One raion was selected from each stratum.

Raions were selected using a PPS (probability proportional to size) method so that the sampling probability within each stratum was in proportion to the population size of the raion. Using the PPS method, the population centres (raions) were formed into a cumulative population. A random start point was selected and sampling occurred at regular intervals, which were set at a size that would allow the desired number of raions to be selected. Each raion in which the sample point fell was selected for inclusion in the study.

Within each PSU a proportion of the target sample size was allocated to its urban population, and the remainder to its rural population. Different methods were used to select second stage units (SSUs) within urban and rural areas. Rural households had a higher response rate than urban households and the investigators planned oversampling to compensate for this difference.

In rural parts of the PSUs, all the villages were listed and ordered in proportion to their size and ethnic composition. A village formed an SSU (second stage unit). Where villages were very small, 3 or 4 were combined to form a single unit. The PPS (probability proportional to size) method was again used to select villages. 10 households were selected systematically from each selected village using official village household lists, which were considered by the RLMS researchers to be reliable.

Within the urban area of each PSU, the second stage units (SSUs) consisted in most cases of 1989 census enumeration districts. In the few urban areas without census enumeration districts, 1994 microcensus enumeration districts, voting districts or residential postal zones were used. Where SSUs were census districts (which are of

approximately equal size), one district was selected systematically. Where non-census districts formed SSUs, one district was again selected systematically, but PPS was used to compensate for the variation in size. Within each SSU, 10 households were selected from a list of households. This list of households was developed by the RLMS investigators for each urban area selected, since few reliable official lists of households (as opposed to dwellings) existed. The list was adapted from a list of dwellings, and accounted for apartments known to be shared by more than one household, and enterprise dormitories. The first household was randomly selected, and the remaining households were selected at regular intervals.

Interviewers visited each dwelling up to 3 times to attempt to obtain an interview. Households at each dwelling were identified, defined by the investigators as "a group of people who live together in a given domicile, and who share common income and expenditures". Households also included unmarried children aged 18 or below who were temporarily living elsewhere. If more than one household was found at the dwelling, one was selected using a procedure defined by the research team.

The target number of households for each round was 4,000. In Round 5 (the first round of the second phase), 4,718 households were selected to allow for non-response.

In each round there were three types of questionnaire. A household questionnaire was administered to the most knowledgeable and willing adult. An individual adult questionnaire was administered to as many adults in the household as possible. Separate children's questionnaires were completed on behalf of each child by the adults in the household.

In subsequent rounds (Rounds 6 to 11) the interviewers returned to each dwelling from Round 5, even if the household had refused to participate previously. The response rate in Round 5 was 84%, and in Round 6 was 80%. Only 6% of the households that had participated in Round 5 moved away from their dwellings before Round 6, and 200 households who had refused to participate in Round 5 participated in Round 6. In Rounds 5 and 6, individual questionnaires were obtained from over 97% of individuals on the household rosters.

The investigators stated that the distribution of household size in the sample compared well to the figures in the 1989 census, after accounting for the exclusion of people living in institutions. The multivariate distribution of the sample by sex, age and urban-rural residence compared fairly well with that of the 1989 census.

Despite the richness of the dataset, relatively few papers using RLMS data have been published to date [http://www.cpc.unc.edu/projects/rlms/papers.html]. The published papers are generally based on cross-sectional data analyses, and have not examined associations between socioeconomic and other factors and health prospectively amongst individuals.

4.1.2 Response rates and sample attrition over time

The response rate in Round 5 (the first round of Phase 2) varied according to region. Apart from Moscow and St Petersburg the response rate was between 84% and 93%, but in St Petersburg it was 67% and in Moscow 57%. The low response rates in the two principal cities were anticipated, and the number of households sampled in these areas increased accordingly. Reasons for non-response included vacant properties, inability to contact household members, and refusal to complete the questionnaire.

According to the RLMS investigators, the greatest losses during the study were amongst households in Moscow and St Petersburg, and in households headed by a male aged 18-59 [7]. There was also a smaller loss of single person households. However, losses to the study between Rounds 5 and 7 did not greatly alter the proportion of working adults in the sample. Households in Round 5 that left their dwellings or declined to participate in Rounds 6 and 7 had higher median incomes and expenditures than the remaining households. The RLMS investigators went on to analyse a 'panel' of individuals, and showed that those with higher incomes were more likely to leave [7].

The investigators stated that interviewer training in this survey was much more thorough than in many other Russian surveys, and a description of the process

suggested that the training process was rigorous [7]. Interviewers underwent several hours' training with video, role-play, self-completion of the questionnaires, practice interviews, written tests and an examination. Data were entered by double entry using the SPSS programme. The data were then cleaned, together with extra cleaning where interviewers had incorrectly used inconsistent identification numbers for individuals in the same household in different rounds [7].

4.1.3 Creating the final dataset

I used data from Rounds 5 to 11 from Phase 2 (1994-2002) in the final analysis. The RLMS datasets from which the information was taken are listed in Table 4.2. These datasets are described at: http://www.cpc.unc.edu/projects/rlms/data/stats.html.

Table 4.2 Datasets from RLMS (Rounds 5 to 11) used in this analysis

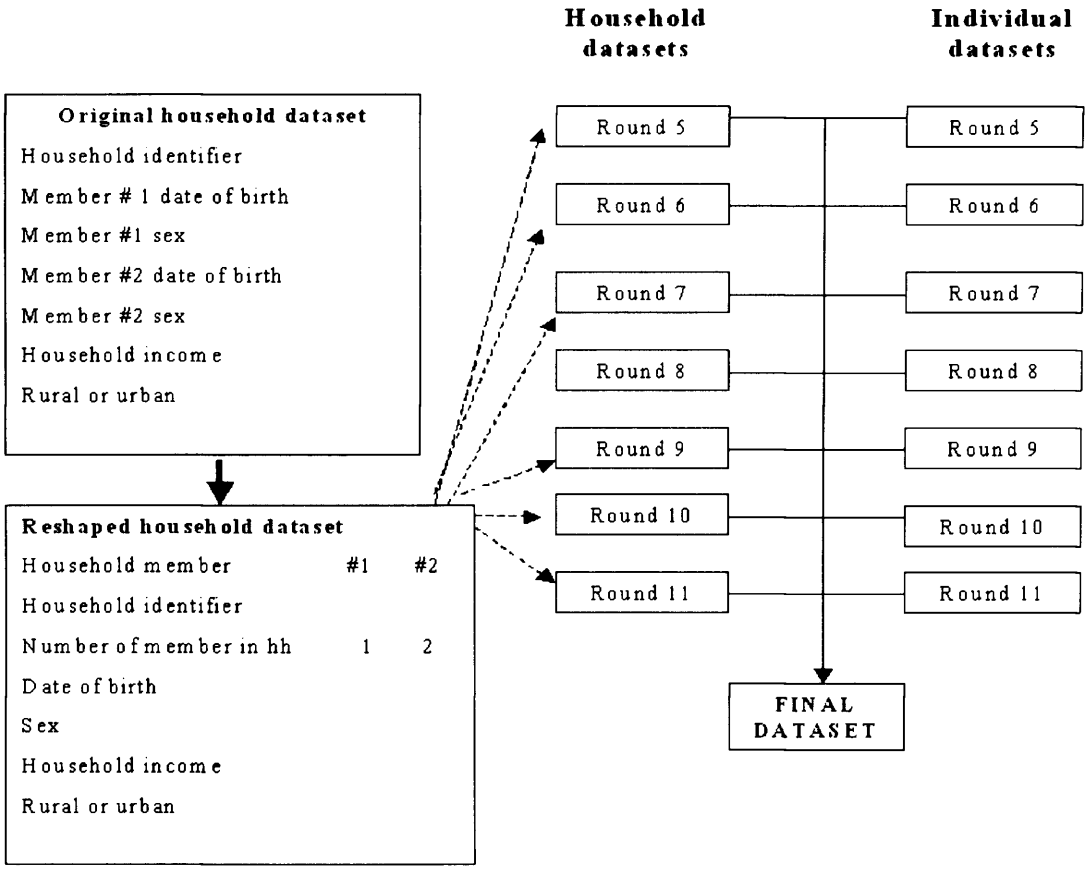
Household data	Individual data
• Roster data (including deaths, other exits from the household, age, date of birth)* • Expenditure data • Income	• Income, education age and date of birth • Employment data • Anthropometry and health data
Constructed economic variables (household)	**Constructed health-related variables (individual)**
• Household assets • Demographic composition • Household expenditures • Household income • Household poverty line • Labour force participation	• Medical problems • Alcohol consumption • Smoking

*In Round 11, only the roster dataset was used, to ascertain deaths and losses to the study of respondents from earlier rounds

I merged the household and individual datasets, since both contained information required for the data analysis, using the following process, which is described diagrammatically in Figure 4.2. In the household datasets, the household was the unit for which information was recorded, although individuals within the household were

listed with their gender, date of birth and identifying number. For each round, I transformed (or 'reshaped') the household dataset so that the unit for which information was recorded was the individual respondent rather than the household. Each individual in the reshaped dataset had a separate identifying number, date of birth and gender, and information about his or her household. I then merged the household and individual datasets for each round, and the combined dataset contained information for each participant himself as an individual and his household. I finally merged the combined datasets from each round (Rounds 5 to 11). I excluded any individuals whose date of birth or gender were either missing or did not match in different rounds, or individuals who appeared to be duplicates (more than one member of the same household with the same date of birth and gender).

Figure 4.2 Process for merging data from individual rounds of RLMS to produce a final dataset



4.1.4 Time in the study

I included in the analysis all individuals entering at any point between Rounds 5 (1994) and 10 (2001), in order to maximise the number of respondents. I used data from Round 11 (2002) merely to provide information about deaths and exits from the study for participants from earlier rounds.

Since it was not possible to define the exact date of entry or exit from the study, I allocated them as follows. The date of entry was taken as the mid-point of the survey period for that round (each survey period lasted approximately 2 months - Table 4.1). The exit date was set as the date halfway between the mid-points of the survey schedule of the last round where the individual participated, and of the following round. In this following round some individuals were declared absent by another household member and a reason given (such as death or moving away). Other individuals or households simply disappeared from the study.

In the Cox proportional hazards analyses I left-censored the data for the time before the individual entered the study and right-censored it from the allocated date of exit from the study, or until the date of Round 11 (the final round for which data were available), for those who remained in the study.

4.2 Socioeconomic (predictor) variables

In this section I describe in more detail the objective and subjective measures of socioeconomic position (predictor variables) used in the final data analysis.

4.2.1 Objective socioeconomic measures

Education

Education is the most widely used measure of socioeconomic position in Russian studies to date [2;3]. The education system in Russia differs from that in the UK and other Western countries. There are three types of secondary education, either general education, general education with a technical component, or technical education

alone. Each type of secondary education leads to a certificate. There are two types of higher education in Russia, the first of which is a university education. The second is specialist higher education, which may take place at a variety of institutions including medical school, music college, art school or higher technical school. In RLMS, the number of years of education were recorded, as well as the type of secondary and higher education, and whether certificates or degrees were awarded. Researchers have tended to simplify the complex education system in a variety of ways, which can make comparisons between studies difficult.

I divided education into 3 categories, primary or incomplete secondary education (less than ten years education or no certificate of secondary or technical education); complete secondary education (with or without technical education) with certificate; or complete higher education (with certificate). This was a simplification of the Russian education system, but ensured that numbers in the individual categories were adequate for data analysis, and the categories used were broadly similar to those used in several other studies.

Income

Measurement of income in Russia is complicated by fluctuation, non-monetary income, currency changes and delays in the payment of wages, and the unwillingness of some high earners to disclose the full extent of their incomes[136].

In RLMS, household and individual incomes were measured in roubles. Incomes in each round were standardised to the value of the 1992 Russian rouble by the investigators, because of frequent currency devaluations during this period.

(a) Household income

Household income in the month preceding the interview was measured in roubles per month. This comprehensive measure included income from all sources such as earnings (monetary and non-monetary), benefits, selling goods and loans and donations from friends, family and other sources. To estimate the household income

for each household member, I divided the total household income by the square root of the number of people resident. This well-established method was initially used by Atkinson[137] to overcome the fact that in larger households some living expenses were likely to be shared. I then divided the household income per person into quintiles.

(b) Individual income

Individual income in the month prior to the interview was also measured in roubles per month. Individual income came from employment (monetary and non-monetary) and from other sources, such as selling home-grown foods. I adjusted individual income to the value of the 1992 rouble, using the same conversion factor as that used by the RLMS researchers for household income and expenditure, and then divided individual income into quintiles. I used a separate category for people with no individual income.

Household expenditure

Household expenditure has been used as an alternative to income in Russia. It is believed by some researchers to be a more accurate measure of household financial wellbeing since it overcomes difficulties in income measurement such as wage arrears and payment in goods [13]. It has not yet been used in studies of health.

Household expenditure was measured in RLMS in roubles per month, again standardised to the value of the 1992 rouble. This measure included all food, household and luxury items purchased, bill payments, money lent and donations. To measure household expenditure per person, I divided the total household expenditure by the square root of the number of residents (in the same way as household income per person). I then divided household expenditure per person into quintiles.

Current occupation

Occupation has not been widely used as a measure of socioeconomic position in epidemiological studies in Russia, a country where there is no meaningful formal

social or occupational classification scale. Its measurement may be complicated by unstable employment, multiple jobs and the rapidly changing employment structure.

Respondents stated their main occupation in their own words, and their secondary occupation if they one. Occupations were coded by the RLMS investigators using the four-digit International Standard Classification of Occupations: ISCO-88 (Geneva: International Labour Office, 1990).

I collapsed the 10 classes of the ISCO classification into 5 categories, omitting the very few individuals who were in the armed forces. The five categories were: higher professionals or managers (legislators, officials or senior managers); technicians or associate professionals; clerical or service workers; skilled manual workers (skilled agricultural workers, craftsmen or skilled tradesmen); and semi- or unskilled manual workers (Table 4.3). Approximately 5% of respondents had more than one job, and for these individuals I used the higher of their 2 occupational classes.

Table 4.3 Classification of employment

Classification in this analysis	ILO code
1. Higher professionals or managers	1 Legislators, senior managers, officials 2 Professionals
2. Technicians or associate professionals	3 Technicians and associate professionals
3. Clerical or service workers	4 Clerks 5 Service workers and market workers
4. Skilled manual	6 Skilled agricultural and fishery workers 7 Craft and related trades
5. Unskilled	8 Plant and machine operators and assemblers 9 Elementary (unskilled) occupations
(omitted)	0 Army

4.2.2 Subjective measures of social position

Subjective socioeconomic position, based on self-report, has been shown in Britain to reflect objective measures (occupation, education and household income), and predicts self-rated and objective measures of health, even after adjusting for objective measures of socioeconomic position [32]. In Russia its association with health is somewhat weaker [86]. Using subjective social status to study self-rated health can lead to cross-contamination, since both measures are based on self-report [32].

In RLMS, respondents were to rate their perceived position in society in relation to (a) economic position, (b) power, and (c) respect using a 9-point scale. The questions were as follows: (a) "Imagine a 9-step ladder where on the bottom, the first step, stand the poorest people, and on the highest step, the ninth, stand the rich. On which step are you today?"; (b) "Imagine a 9-step ladder where on the bottom, the first step, stand the people who are completely without rights, and on the highest step, the ninth, stand those who have a lot of power. On which step are you today?"; (c) "Imagine a 9-step ladder where on the lowest step are people who are absolutely not respected, and on the highest step stand those who are very respected. On which step of the ladder are you?"

I divided each variable (subjective economic status, power, or respect) into 3 categories, which approximately represented tertiles of the study population. I also combined the 3 variables into a single scale. Factor analysis showed that the 3 variables loaded onto a single factor (Eigenvalue 1.75) with loadings of 0.82, 0.61 and 0.84 respectively. For the combined measure of subjective social status, based on a 27 point scale, I used 4 categories, due to the wider spread of responses. The 4 categories approximately represented quartiles of the sample.

4.3 Covariates

In this section I describe the potential covariates which I used when studying the relationships between socioeconomic position and health.

Several potential confounders or mediators for the relationship between socioeconomic position and health emerged from the literature review, that is they were related to health and also possibly to socioeconomic position. These will be studied, where possible, within the available data. Such potential explanatory variables included alcohol consumption (frequency and binge drinking), smoking, social networks, unemployment, marital status, geographical area and material factors.

4.3.1 Demographic variables

Basic demographic measures in this study were age, gender, marital status and place of residence.

Marital status

I divided marital status into single (never married), married or cohabiting, divorced and widowed. I used a single category for married and cohabiting, since in some study rounds these categories were separate, and in others they were combined into one category.

Urban or rural residence

Respondents were defined as coming from an urban area, a rural area or a PGT (a "village of the city type", most of which were "secret cities" in Soviet times, for example garrisons for military installations or research or manufacturing centres of secondary importance). I dichotomised this variable into urban (urban or PGT) and rural, since there were very few respondents from PGTs.

Geographical location

The 38 geographical locations were grouped by the investigators into 8 main regions. I summarised these further into four areas for the purposes of simplifying the data analysis: Metropolitan (Moscow and St Petersburg Central); Central, Ural, North, North West (all in Central and North Russia); Volga and the North Caucasus (all in

South West Russia); and Siberia and the Far East. I chose the latter three divisions based on approximate geographical area, and the metropolitan area to take into account the likely differences in wealth of these principal cities.

4.3.2 Measures of material wellbeing

Consumer goods

In RLMS, respondents were asked whether they owned 5 luxury household consumer goods (colour television, video recorder, car, washing machine, dacha). I combined ownership of these goods into a single variable measuring the number of luxury consumer goods owned by the household, with values from 0 to 5. Factor analysis had shown that ownership of these goods loaded onto a single factor (Eigenvalue 1.81), and after rotation, the loadings were 0.67, 0.61, 0.66, 0.51 and 0.53 respectively. This justified combining them into a single variable.

Selling consumer goods

Respondents were asked whether their household had sold consumer goods for food or clothes. These goods were a washing machine, a refrigerator, a TV, a VCR, a sound system, a car, a tractor, a garage, a house, land and household furnishings. I dichotomised this variable into zero (no consumer goods sold) and one (one or more goods sold).

Household amenities

I created a single scale of the number of household amenities from 0 to 5. These amenities, recorded separately by the investigators, were central heating, central water supply, running hot water, centrally supplied gas and central sewerage. Factor analysis showed that the five amenities had loaded onto a single factor (Eigenvalue 3.27), and after rotation, the loadings were 0.86, 0.65, 0.70, 0.51 and 0.87 respectively. This, again, justified combining them into a single variable.

Living space per person

Living space per person (m^2) was measured by dividing the size in square metres of the part of the dwelling belonging to their household (many homes were shared) by the number of occupants to create a variable of living space per person. This variable was then divided into quintiles.

4.3.3 Health behaviours and risk factors

Behavioural risk factors such as smoking and drinking are widespread in Russia and are likely to be important influences on the relationship between social position and health.

Alcohol

Alcohol intake was measured in two ways:

(a) Frequency

Respondents were asked whether they drank alcohol, and if so they were asked about the frequency of their alcohol intake during the previous month. The investigators divided frequency of alcohol consumption into daily, 4-6 times a week, 2-3 times a week, once a week, 2-3 times a month, once in the last month and no alcohol in the last month. Due to small numbers in individual categories I collapsed frequency of intake into the following categories: none in the last month, once in the last month, 2-3 times per month, once a week and more than once a week.

(b) Binge drinking

Respondents were asked whether they had consumed beer, wine, fortified wine, vodka, home-distilled spirits or any other spirits in the last 30 days. For each type of drink, respondents were asked how much they usually consumed on each occasion in grammes, the measure normally used in Russia. I converted these quantities into grammes of pure alcohol using the conversion factors in Table 4.4 below.

Table 4.4 Conversion of grammes of alcoholic drinks into grammes of pure alcohol

Alcoholic drink	Conversion factor from amount of beverage (g) to amount of pure alcohol (g)	Equivalent amount to 80g pure alcohol (definition of binge drinking used here)
Beer	0.04	2000ml
Dry wine or sparkling wine	0.11	750ml
Fortified wine	0.16	500ml
Home distilled spirit	0.32	250ml
Vodka	0.32	250ml
Other spirit	0.32	250ml

I defined binge drinking as usually consuming the equivalent to 80g or more of pure alcohol of any single type of drink per occasion. I divided respondents into 3 categories: binge drinkers, people who drank alcohol but did not binge drink; and non-drinkers. My definition related to a single type of drink. If more than one type of alcohol was consumed it was not clear whether this was on the same occasion, and this definition of binge drinking may therefore have underestimated the true number of binge drinkers.

Smoking

I defined smokers as either current smokers, or people who did not smoke currently (the latter group consisted of both ex-smokers and never-smokers).

4.3.4 Satisfaction, optimism and networks

Life satisfaction

Life satisfaction was ascertained by asking "to what extent are you satisfied with your life in general at the present time?". Responses were graded on a 5-point scale: fully satisfied, rather satisfied, both yes and no, less than satisfied, and not at all satisfied.

Optimism

Respondents' optimism about their household financial situation was measured using the question "Do you think that in the next 12 months your family will live better than today, or worse?". Again the responses were graded on a 5-point scale: much better, somewhat better, no change, somewhat worse or much worse.

Social networks

I combined several responses to measure whether individuals lent to and borrowed from family and friends. The variable had 4 categories of borrowing or lending: family only, friends only, family and friends, or neither. This measure reflected the social and economic functions of social networks in Russia described in the literature review[11] (Section 2.6.4), and appeared to be the best available measure of networks of family and friends within these data.

4.3.5 Labour market variables

Unemployment, wage arrears, payment in goods (instead of money) and compulsory unpaid leave were recorded in working respondents, since all were widespread in post-transition Russia.

Unemployment

Three measures of unemployment were recorded in RLMS. The first was based on self-report, and the second based on whether the respondent reported that he or she was officially registered as unemployed. The third measure was a variable constructed (by the RLMS team) as to whether the individual met the US Bureau of Labour Statistics (BLS) definition of unemployment. People met the BLS definition if they had not got a job and had actively sought employment in the last month by applying to a state agency or through other sources. These measures gave very different unemployment rates (Table 4.5).

I used self-reported unemployment in further analyses for several reasons. The registered official unemployment rate was very low, and both the registered and BLS definitions of unemployment measured access to benefits and might therefore be a less reliable measure of actual unemployment than a self-report. However, using a self-report could have led to over-reporting of unemployment.

Table 4.5 Rates of unemployment in RLMS using different measures

Measure	% unemployed at entry		
	All	Male	Female
Self-reported	10.6	8.4	9.4
BLS definition	5.6	6.3	6.0
Government registered	2.0	2.7	2.3

Wage arrears

Employed individuals were asked "At the present time does your place of work owe you any money which for some reason they didn't pay you on time?". If the answer was yes, they were then asked "For how many months has the enterprise not paid this money to you?". I collapsed the responses into 3 categories: wage arrears of less than 3 months duration; arrears of 3 months or more; or no arrears.

Payment in goods

Employed respondents were asked "Have you received in the last 30 days goods from this or goods from another enterprise in lieu of payment for your labour?". The response was dichotomised into yes or no.

Compulsory leave

Employed respondents were again asked "In the last 12 months has the administration sent you on compulsory unpaid leave?". If the answer was yes, respondents were also asked "How many calendar days, without a break, did this leave last or has it lasted?". I divided responses into 3 categories: 30 days or less; more than 30 days; or no compulsory leave.

4.4 Health outcomes

4.4.1 Self-rated health

Answers to the question "how would you evaluate your health?" were graded on a 5-point scale, as in many other studies[129]: very good; good; average, poor; or very poor. Self-rated health may be used as a continuous or a dichotomous outcome measure in studies, and I performed some further tests to decide which to use.

Table 4.6 Distribution of self-rated health at entry

Self-rated health	Male	Female	All
Very good	162 (3.2)	67 (1.1)	229 (2.0)
Good	1801 (35.2)	1236 (20.1)	3037 (27.0)
Average	2575 (50.3)	3596 (58.5)	6171 (54.8)
Poor	498 (9.7)	1038 (16.9)	1536 (13.6)
Very poor	82 (1.6)	215 (3.5)	297 (2.6)
Number of respondents	*5118*	*6152*	*11270*

In this sample, more than 50% of both male and female respondents rated their health as "average". Eleven per cent of men and 22% of women described their health as

poor or very poor. Few people placed themselves in the categories at the extreme ends of the scale (Table 4.6).

I tested the association between self-rated health and mortality (Table 4.7). In men there was a clear mortality gradient between all five categories of self-rated health, in which worse health was associated with higher mortality. In women there was a mortality gradient between average, poor and very poor health. However, too few women reported very good health to make a comparison, and women who reported good health had higher mortality than those reporting average health. This association was not easy to explain, although the p value of 0.02 for this relationship means that there is a one in fifty possibility that it could have arisen by chance.

Table 4.7 Relationship between self-rated health as a continuous variable and mortality

	Cox proportional hazards ratio for death during the study (95% confidence interval)	
	Male	**Female**
Self-rated health at entry		
Very good	0.62 (0.23-1.68)	-
Good	0.84 (0.64-1.11)	**1.73 (1.08-2.77)**
Average	1	1
Poor	**1.52 (1.20-1.93)**	**1.66 (1.29-2.14)**
Very poor	**2.40 (1.66-3.46)**	**2.49 (1.77-3.48)**
P for trend	*<0.001*	*<0.001*

I dichotomised self-rated health into very good, good or average versus poor or very poor. This was for several reasons. First, this provided a negative health outcome that was present in a substantial minority of subjects. Second, the small numbers with self-rated health in the highest and lowest categories (between 1% and 3 % of respondents) limited the usefulness of the five-point scale as a continuous outcome measure. Third, the relationship between self-rated health and mortality in women did not follow a clear gradient between all five categories.

4.4.2 Mortality

Although studying mortality was not one of the original objectives of RLMS, deaths were recorded, based on the report of a household member. In each round (except the first), the main respondent was asked whether the household members in the previous round still lived there, and whether those who were no longer resident had moved away or died.

Table 4.8 Numbers of deaths in each round

Round	R6	R7	R8	R9	R10	R11	Total
Year	1995	1996	1997-8	1999-2000	2001	2002	1995-2002
Number of deaths	61	98	197	190	94	142	782

No information about the date of death was given. (In Rounds 10 and 11 there was also a question about the cause of death). Seven hundred and eighty-two deaths were recorded in individuals included in the final data analysis (Table 4.8).

(i) 'Validation' of mortality data

The term validation is used here to mean a broad assessment of the mortality data to ensure that the death rates were plausible, and that the mortality data behaved as expected in further analyses. Validation is not used here in its strictest sense, which would mean, for example, revisiting households to check individual records and compare them with official records of death certification.

I used two approaches to 'validate' the mortality data to see whether the deaths recorded in this study population were likely to be representative of deaths in the general Russian population, both in number and in distribution. This was to identify possible under-reporting of deaths in the study.

First I pooled data from each round and compared the death rate in each age group with Russian national mortality rates for the same age group. Second, I investigated whether variables known to be associated with mortality in other Russian studies predicted mortality in a similar way in RLMS.

(a) Mortality rates

I pooled the deaths during the study period (1994-2002) dividing them into sex and age bands (shown in Figure 4.3 and Figure 4.4). I calculated the total (pooled) population for each age band by combining the population from each year within the study period (including the years 1997 and 1999 when there was no survey round). From there I calculated a pooled mortality rate for each age band. I compared this pooled mortality rate from RLMS with the average national mortality rate for study period within the same age groups (Figure 4.3 and Figure 4.4). I calculated two mortality rates from RLMS, one which included and one which excluded single person households, a group in which deaths were likely to be under-reported (see also Section 4.6).

Death rates by age band and sex in RLMS were broadly similar to those in national data, although there were some differences. The greatest differences were among men aged 50-54 where the death rate was lower in RLMS than national data; and in men aged 55-59 and women aged 60-64, where the death rate was again higher in RLMS. Excluding single person households increased the mortality rate amongst older people so that in older men the mortality rates became closer to national rates, and in women aged 60 and over they exceeded national rates. Excluding single person households had a much smaller effect on death rates in younger people.

Figure 4.3 RLMS and national mortality in Russian adult males (1994-2002)

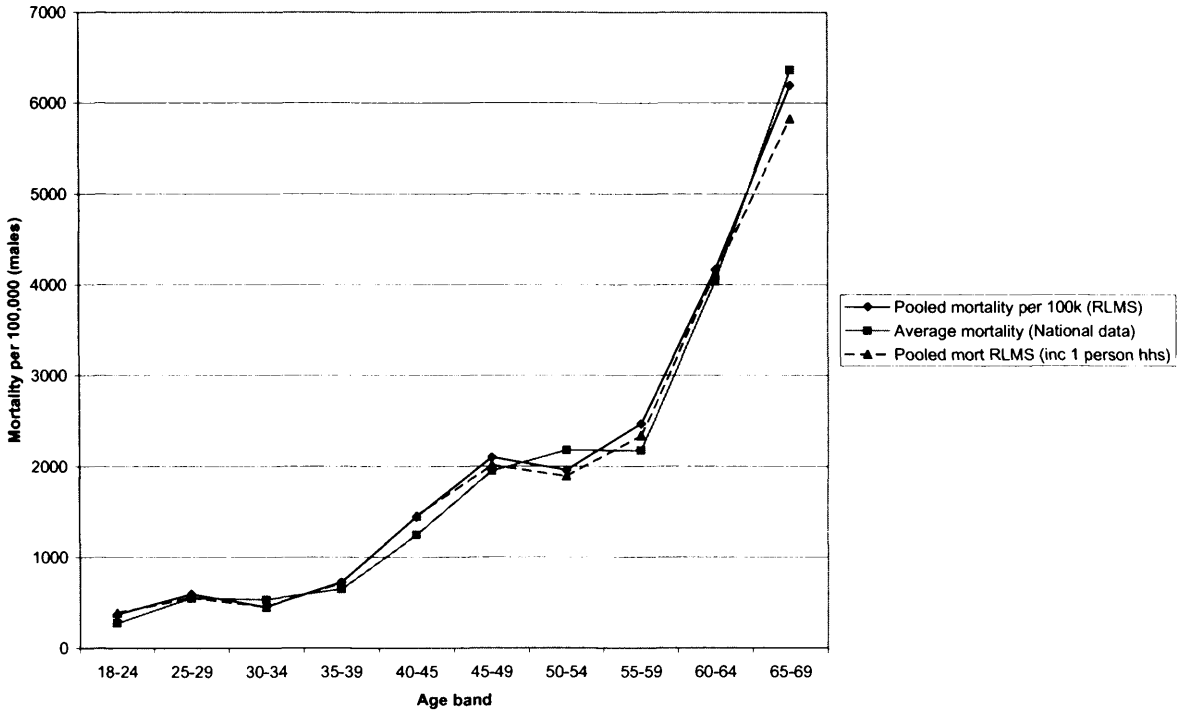
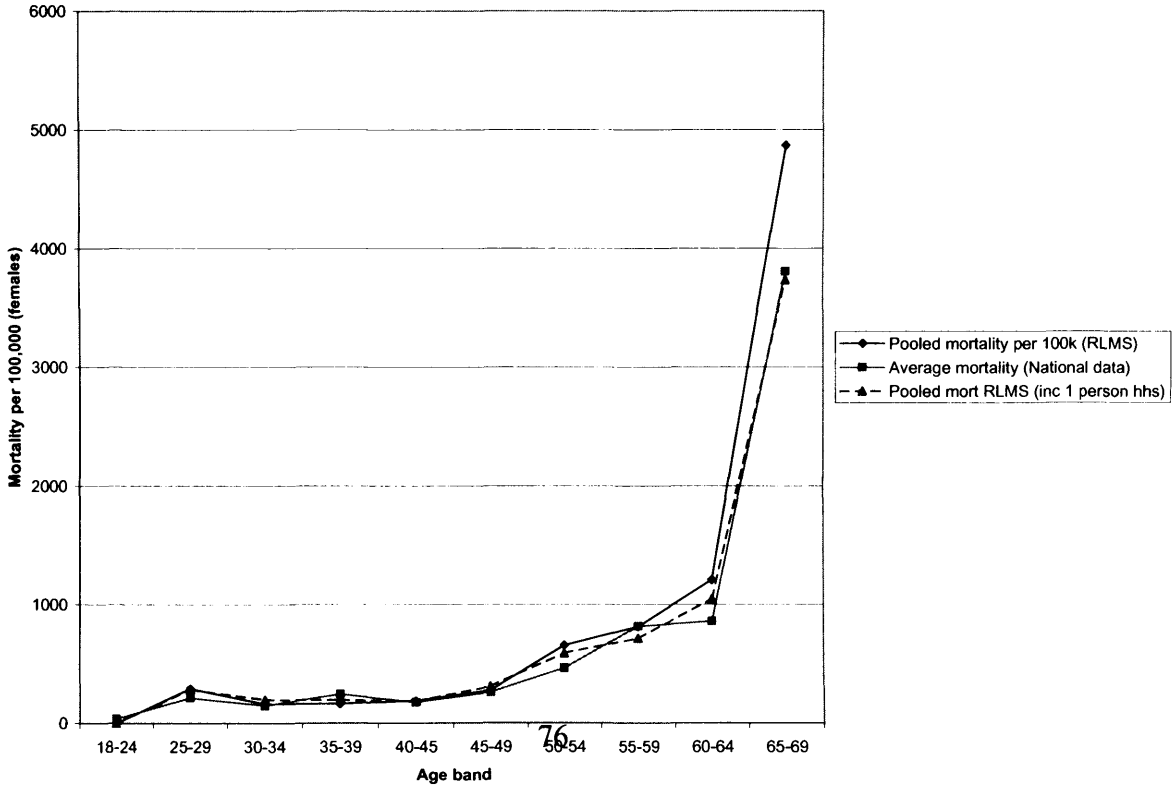


Figure 4.4 RLMS and national mortality in Russian adult females (1994-2002)



(b) Mortality differences by known risk factors

Several variables have been previously shown to be associated with mortality in Russia. These include education, smoking and self-rated health. As an additional means of validating the mortality data, I therefore tested the risks of mortality according to education, smoking and self-rated health in RLMS, using Cox proportional hazards analysis, and compared the results with the other Russian studies.

Table 4.9 Cox proportional hazards ratio for death in relation to education, smoking, self-rated health and household size

	Cox regression hazard ratio (95% confidence intervals) for death during the study – age adjusted	
	Males	**Females**
Education		
Primary or incomplete 2ry	1.68 (1.29-2.19)	1.26 (0.90-1.78)
Complete 2ry	1	1
Higher	0.73 (0.57-0.93)	0.40 (0.28-0.59)
Current smoking		
Non-smoker	1	1
Smoker	1.85 (1.53-2.25)	3.04 (1.92-4.82)
Self-rated health		
Very good/good/average		
Poor/very poor	1.61 (1.30-1.99)	1.64 (1.30-2.07)
Number in household (at entry)		
Three or more	1	1
Two	0.89 (0.72-1.10)	0.59 (0.47-0.74)
One	0.25 (0.11-0.55)	0.11 (0.06-0.19)

These analyses showed that in RLMS, poor or very poor self-rated health, current smoking, and lower education were each associated with significantly higher mortality in both sexes (Table 4.9). The association between education and mortality was in line with the findings in two other studies[2;3], and the association between smoking and mortality was in line with a study based on sibling data [138]. The association between self-rated health and mortality was generally consistent with the

results of 27 studies in a number of different countries reviewed by Idler and Benyamini [129], in which the odds of mortality in group with the worst health compared with the best (typically there were 5 categories) were between 1.5 and 3. In these data, the relative difference in mortality between the best and worst groups in men was approximately 4-fold. These comparisons in are described in more detail in Chapter 5.

(ii) Household size

I also compared mortality according to household size to ascertain any under-reporting of deaths. Women who lived alone had only one tenth of the reported mortality of those living in households consisting of 3 or more people, and in men living alone this figure was one quarter (Table 4.9). Women living in two-person households also had significantly lower mortality than women living in 3-person households, but not as low as those who lived alone. The low mortality in single person households was consistent with findings in a sibling study in Russia[138].

The low risk of mortality amongst individuals living alone suggested that deaths in this group could have been under-reported. This is plausible, since there would be no-one else in the household to report the death in the next round, unless either a subsequent occupant knew of the former householder's death, or additional occupants had joined the household during the study period.

Eight hundred respondents (approximately 6% of the total study population) lived alone. Sixty per cent of single-person households consisted of a woman of retirement age, and a further 9% of a man of retirement age. People living alone were older, had a lower mean household income per person, and a higher percentage had poor self-rated health than other respondents. Single-person households therefore consisted of individuals who theoretically had a higher risk of dying than other respondents (Table 4.10). Therefore deaths in single-person households were likely to have been under-reported. I will describe further how I dealt with this issue in Section 4.6.

Table 4.10 Characteristics of individuals living in households with numbers of occupants

	Number (%) of respondents		
	Number in household		
	One	Two	Three or more
Head of household (where stated)			
Working age m - <60	133 (16.6)	1413 (53.2)	7221 (91.8)
Working age f - <55	114 (14.3)	354 (13.3)	535 (6.8)
Retirement age m – ≥60	71 (8.9)	798 (30.0)	107 (1.4)
Retirement age f – ≥55	482 (60.3)	92 (3.5)	7 (0.1)
Mean age (standard dev.)	59.4 (16.5)	50.6 (17.8)	39.4 (15.7)
Mean household income per person (divided by square root household size) - roubles/month	3534	4569.2	4918.5
No (%) with poor/v. poor self-rated health	303 (38.3)	690 (26.3)	1002 (13.0)
No (%) female	596 (74.5)	1494 (56.2)	4175 (53.1)

(iii) Conclusions

In summary, the pooled mortality rates by age band and sex were broadly comparable with national mortality rates based on official data. Excluding one- or two-person households from the analysis increased the mortality rates in this age group. The Cox proportional hazards ratios for mortality by smoking, education and self-rated health in RLMS were broadly similar to findings in other studies.

Overall I concluded that the deaths reported in RLMS, with the exception of deaths in single person households, were likely to be sufficiently representative of deaths in the population to be used in analysis of the determinants of mortality. The under-reporting of deaths in people living alone is considered further in Section 4.6.1.

4.5 Losses to the study

A considerable number of respondents left the study before Round 11, the last round of contact (Table 4.11). There were two categories of exits from the study, in addition to the reported deaths. The first category consisted of people who left without explanation (for example when the whole household was lost to follow up), and people in the second category were reported as having left by another household member.

Table 4.11 Numbers of individuals leaving RLMS

Category	Number (%) of subjects		
	One person households	Other households	All households
Left study without explanation	355 (44.4)	2,901 (25.3)	3,256 (26.5)
Left study with explanation (report of family member)	9 (1.1)	1,613 (14.0)	1,622 (13.2)
Died (report of family member)	19 (2.4)	782 (6.8)	801 (6.5)
In study at final round (Round 11)	417 (52.1)	6,186 (53.9)	6,603 (53.8)
Total in study (including one person households)	800	11,482	12,282

I compared the socioeconomic, demographic and health characteristics of people who left the study with and without explanation with those who remained, using Cox proportional hazards analysis (Table 4.12).

Low education, decreasing age, primary or incomplete secondary education, being divorced or widowed (compared to being married), living in an urban area, and living in Moscow and St Petersburg were all associated with leaving the study prematurely, either with or without explanation.

People who were unmarried were more likely to be reported as having left by another household member, but not to leave unreported. People in the highest quintile for household income per person were more likely to leave without explanation. Men and women who lived alone and men in two person households were significantly more likely to have left without explanation than those who remained, but were less likely to be reported as having left by a household member. Poor self–rated health was not associated with leaving the study without explanation in the general population, but it was in a subgroup of men aged over 60.

People who left the study therefore appeared to constitute several broad categories. The first consisted of young, wealthy, urban dwellers; the second of individuals who had experienced family breakdown; and the third of people who lived alone who were often older, and who either left to join another household, or simply died unreported. The characteristics of people who left RLMS were different from those in a British study, where loss of contact was predicted most strongly by deprivation and less education [139].

Table 4.12 Cox proportional hazards analysis for leaving the study without or with explanation (age adjusted)

	Cox proportional hazards ratio for leaving the study (95% confidence interval)			
	Leaving *without* Explanation		Leaving *with* explanation	
	Male	Female	Male	Female
Female sex	-	0.96 (0.90-1.03)	-	**0.65 (0.59-0.71)**
10 year increase in age	0.98 (0.95-1.01)	0.99 (0.97-1.02)	**0.57 (0.54-0.60)**	**0.65 (0.62-0.68)**
Number in household				
1	**2.58 (2.11-3.15)**	**1.63 (1.40-1.90)**	**0.05 (0.01-0.35)**	**0.18 (0.09-0.36)**
2	**1.21 (1.06-1.37)**	1.10 (0.97-1.23)	**0.63 (0.51-0.79)**	**0.57 (0.45-0.71)**
3 or more	1	1	1	1
Education				
Primary or incomplete secondary	**1.41 (1.21-1.64)**	**1.44 (1.25-1.67)**	**1.53 (1.27-1.85)**	**1.97 (1.60-2.44)**
Complete secondary	1	1	1	1
Higher	**1.27 (1.12-1.43)**	0.99 (0.88-1.12)	0.98 (0.84-1.14)	**0.76 (0.65-0.89)**
Household income per person – quintile				
1 (lowest)	1.10 (0.93-1.31)	1.07 (0.92-1.24)	0.96 (0.77-1.18)	0.90 (0.71-1.14)
2	0.88 (0.74-1.06)	0.91 (0.77-1.07)	0.99 (0.80-1.23)	0.98 (0.77-1.25)
3	1	1	1	1
4	1.04 (0.88-1.24)	1.10 (0.94-1.29)	0.98 (0.79-1.21)	1.17 (0.93-1.48)
5 (highest)	**1.64 (1.40-1.92)**	**1.42 (1.22-1.65)**	1.02 (0.83-1.26)	1.22 (0.96-1.53)
Marital status				
Married or cohabiting	1	1	1	1
Never married	1.10 (0.94-1.29)	1.11 (0.96-1.30)	**1.19 (1.01-1.41)**	**1.95 (1.63-2.33)**
Divorced, not remarried	**1.36 (1.12-1.64)**	**1.21 (1.04-1.39)**	**2.12 (1.68-2.66)**	**1.43 (1.13-1.81)**
Widowed	**1.49 (1.12-1.97)**	**1.20 (1.04-1.38)**	**3.03 (1.87-4.89)**	**2.54 (1.96-3.28)**
Urban or rural				
Urban	1	1	1	1
Rural	**0.36 (0.30-0.42)**	**0.38 (0.32-0.44)**	0.96 (0.82-1.11)	1.12 (0.96-1.32)
Region				
Central, Ural, North, North West	1	1	1	1
Metropolitan (Moscow, St Petersburg)	**2.81 (2.46-3.21)**	**2.80 (2.50-3.15)**	0.91 (0.71-1.16)	**0.73 (0.55-0.97)**
Volga, North Caucasus	**0.80 (0.70-0.93)**	**0.87 (0.77-0.99)**	0.89 (0.76-1.04)	1.12 (0.95-1.31)
Siberia and Far East	**1.29 (1.12-1.49)**	**1.34 (1.17-1.52)**	1.01 (0.84-1.20)	1.13 (0.94-1.37)
Self-rated health				
All ages				
Very good/good/average	1	1	1	1
Poor/very poor	1.10 (0.93-1.29)	1.07 (0.95-1.20)	0.98 (0.74-1.31)	**1.25 (1.01-1.54)**
People aged 60 and over				
Very good/good/average	1	1	1	1
Poor/very poor	**1.38 (1.05-1.83)**	1.09 (0.90-1.31)	0.60 (0.25-1.47)	1.22 (0.82-1.80)
People aged under 60				
Very good/good/average	1	1	1	1
Poor/very poor	0.92 (0.73-1.15)	1.02 (0.87-1.20)	1.02 (0.75-1.38)	1.06 (0.80-1.40)

The losses to the study have implications for the interpretation of the results of the data analysis. These will be considered further in the discussion chapter.

4.6 Inclusion of individuals in the final data analysis

In this section I describe how I developed the criteria for including individuals in the final data analysis, and then describe the criteria themselves.

4.6.1 Single person households - Sensitivity analysis

The probable under-reporting of deaths in single-person households was likely to have had an effect on the Cox proportional hazards ratios for mortality. There were three possible ways of dealing with this, including single person households and either adjusting or not adjusting for household size, or excluding single person households altogether.

In order to select the most appropriate method I performed a sensitivity analysis, in which I compared the risks of mortality by education, smoking, income and marital status using four different statistical models, separately in men and women;

- **Model 1** - Including single person households, age adjusted
- **Model 2** - Including single person households, adjusted for age and household size
- **Model 3** - Including single person households, age adjusted, assuming that everyone aged over 50 who lived alone and who left the study without explanation had died.
- **Model 4** - Excluding single person households.

The results are shown in Table 4.13. There were differences between the models in the case of some variables.

Differences in the risks of mortality were greatest between Model 1 (age adjusted) and Model 3 (assuming unreported deaths in selected one-person households), especially in the case of men and women in the lowest household income quintile, amongst unmarried (single, divorced or widowed) compared with married people, and in women with an incomplete secondary education. This indicated that in these groups the mortality risk was very sensitive to unreported deaths. The greatest sensitivity to

unreported deaths was in relation to marital status, probably because unmarried people often live alone.

Table 4.13 Sensitivity analyses for risks of mortality based on different assumptions for respondents living alone (Cox proportional hazards ratio, age adjusted)

	Males				Females			
	Including all 1 person households			Omitting all 1 person households	Including all 1 person households			Omitting all 1 person households
	Model 1 Age adjusted	Model 2 Adjusted for household size	Model 3 Assuming 1 person households aged over 50 who left w/o explanation died	Model 4	Model 1 Age adjusted	Model 2 Adjusted for household size	Model 3 Assuming 1 person households aged over 50 who left w/o explanation died	Model 4
EDUCATION								
Primary or incomplete 2ry	**1.68 (1.29-2.19)**	**1.72 (1.31-2.25)**	**1.69 (1.31-2.17)**	**1.65 (1.28-2.14)**	1.26 (0.90-1.78)	1.31 (0.91-1.89)	**1.54 (1.15-2.07)**	1.36 (0.95-1.94)
Complete 2ry	1	1	1	1	1	1	1	1
Higher	**0.73 (0.57-0.93)**	**0.70 (0.55-0.91)**	**0.71 (0.56-0.90)**	**0.72 (0.56-0.92)**	**0.40 (0.28-0.59)**	**0.42 (0.29-0.61)**	**0.50 (0.37-0.68)**	**0.43 (0.30-0.64)**
HH INCOME QUINTILE PER PERSON								
1 (lowest)	1.27 (0.96-1.70)	**1.36 (1.02-1.81)**	**1.49 (1.14-1.94)**	**1.41 (1.05-1.88)**	0.75 (0.55-1.01)	1.20 (0.89-1.62)	**1.48 (1.17-1.88)**	1.19 (0.86-1.65)
2	0.95 (0.72-1.25)	0.95 (0.72-1.25)	1.06 (0.82-1.38)	0.98 (0.73-1.30)	0.80 (0.59-1.10)	0.91 (0.66-1.24)	1.10 (0.85-1.43)	0.94 (0.67-1.30)
3	1	1	1	1	1	1	1	1
4	0.92 (0.69-1.24)	0.90 (0.67-1.21)	0.89 (0.67-1.19)	0.89 (0.66-1.21)	1.02 (0.75-1.38)	0.88 (0.64-1.20)	0.96 (0.72-1.26)	1.00 (0.72-1.39)
5 (highest)	1.08 (0.80-1.45)	1.07 (0.79-1.44)	1.06 (0.80-1.42)	1.12 (0.83-1.52)	0.74 (0.50-1.09)	**0.65 (0.44-0.96)**	0.77 (0.55-1.08)	0.75 (0.50-1.13)
CURRENT SMOKING								
Non-smoker	1	1	1	1	1	1	1	1
Smoker	**1.85 (1.53-2.25)**	**1.90 (1.56-2.32)**	**1.80 (1.50-2.16)**	**1.92 (1.58-2.34)**	**3.04 (1.92-4.82)**	**3.00 (1.84-4.89)**	**2.42 (1.64-3.56)**	**2.77 (1.68-4.56)**
MARITAL STATUS								
Married	1	1	1	1	1	1	1	1
Single	1.47 (0.98-2.20)	**1.76 (1.15-2.69)**	**1.64 (1.12-2.41)**	**1.68 (1.12-2.53)**	0.76 (0.41-1.38)	0.96 (0.52-1.77)	**1.65 (1.07-2.53)**	0.98 (0.52-1.84)
Divorced	**1.69 (1.20-2.37)**	**2.32 (1.63-3.31)**	**2.69 (2.03-3.56)**	**2.30 (1.62-3.26)**	0.65 (0.37-1.13)	0.84 (0.47-1.51)	**2.09 (1.49-2.92)**	0.92 (0.51-1.64)
Widowed	0.90 (0.61-1.34)	1.07 (0.70-1.65)	**1.62 (1.19-2.20)**	1.16 (0.77-1.75)	1.01 (0.77-1.33)	1.26 (0.93-1.70)	**2.03 (1.59-2.58)**	**1.45 (1.10-1.91)**

The results for Model 2 (adjusting for household size) and Model 4 (excluding single-person households) were broadly similar, and both differed from Model 1. In Model 1, the relative risk for mortality was lower in comparison to Modals 2 and 4 for the lowest income quintile, and for people who were unmarried (single, widowed or divorced). This meant that some adjustment needed for household size was needed, either by using Model 2 or Model 4.

There were 2 differences between Models 2 and 4. Household income quintile in women was more strongly associated with mortality in Model 4, and this indicated

possible over-adjustment for household size in Model 2, since household income per person also took household size into account. The mortality risk for widows compared with married women was higher in the Model 4 compared with Model 2. This was probably because many people living alone were widows, and may have died unreported. Because of these two differences in mortality between Model 2 and Model 4, and to eliminate any possible statistical interaction between household size and the predictor variables, I chose Model 4, thus excluding single person households from the final data analysis.

4.6.2 Other individuals excluded from the final data analysis

I excluded a further 3,123 individuals from the final data analysis either because their date of birth, gender or both did not match in different study rounds. This is likely to indicate either that the data had not merged correctly, or that household members had had been given incorrect identifying numbers, a problem recognised by the investigators. It is hard to draw any conclusions about whether these individuals were representative of the rest of the study population. I also eliminated several duplicate observations based on family and site identifiers, date of birth and gender.

4.6.3 Criteria for including individuals in the final data analysis

I defined the final criteria for inclusion of subjects in the final data analysis as follows:

- Aged 18 and over
- Adult questionnaire completed
- Living in a household consisting of at least 2 people
- Matching gender and date of birth in each dataset for each study round in which the subject participated.
- Not a duplicate (defined as more than one individual in the same household with matching date of birth and gender)

4.6.4 Number of subjects eligible for inclusion in the final analysis

Nearly 60% of individuals who participated in RLMS at any time were eligible for inclusion in the final data analysis (Table 4.14). A further 4,987 (24.5%) participants were excluded because they were aged under 18, and the remainder were excluded either because they lived alone (3%) or because of incorrectly merged data. Subjects eligible for inclusion in the final data analysis came from 5,054 households, approximately 76% of all the households in RLMS. A further 10% of households were excluded from the final data analysis because they consisted of one person, and the remainder because each of its occupants was affected by incorrect merging of the data.

Table 4.14 Individuals included in the final data analysis

	Number	%
Total individuals	20,392	100%
Individuals included in final analysis	11,482	56.3%
Individuals excluded:		
Aged under 18	4,987	24.5%
Single person households	800	3.9%
Incorrect merging, duplicates	3,123	15.3%

4.7 Data analysis and analytic strategy

In this section I describe the strategy for data analysis that I used to meet the aims of this project, and also the techniques that I used to achieve the strategy. These aims, described in full in Chapter 3, were to study the socioeconomic gradients in health through identifying the socioeconomic variables that were most strongly associated with self-rated health and mortality, to identify determinants of the gradients, and to interpret the gradients further.

4.7.1 General description of the sample

I described the numbers of respondents in different rounds. I described the demographic composition of the population, including age and sex, I compared the age and sex structure of the study population with routine Russian data. I also

described the prevalence of different socioeconomic variables in different calendar years of the study.

4.7.2 Predictor variables (measures of socioeconomic position)

I described the distribution of the measures of socioeconomic position (education, income, expenditure, occupation and subjective social status) in the population. I also measured the correlations between these measures of socioeconomic position.

I followed a similar analytic strategy for both outcomes of interest, self-rated health at entry and mortality. I analysed data for men and women separately, since rates of mortality and poor health as well as other features such as rates of smoking and alcohol, differed considerably between the sexes.

I first used univariate (age adjusted) analyses to measure the associations between measures of socioeconomic position and health separately in men and women, and also used a model that adjusted for the other socioeconomic measures (education and income). From there I selected the measures of socioeconomic position to include in further analyses.

Where mortality was the outcome I used Cox proportional hazards analysis. Where self-rated health was the outcome I used logistic regression with the outcome as poor or very poor (versus good or average) health.

4.7.3 Covariates

I grouped the potential covariates into the following categories.

- Demographic factors (age, sex, marital status, geographical location)
- Material factors (e.g. consumer goods, household amenities)
- Health behaviours and risk factors (drinking, smoking, obesity)
- Satisfaction measures (life satisfaction and optimism about household finances)

- Social networks (lending and borrowing)
- Labour market factors (e.g. unemployment, wage arrears) [in the employed population]

For each group of variables I followed a broadly similar pattern of analysis. First I created a series of descriptive tables of the distribution of the variables in the study population, and another series of tables of their distribution in relation to socioeconomic position. I also measured the correlations between the ordinal categorical covariates and measures of socioeconomic position.

I then performed univariate analysis to measure the relationships between the covariates and self-rated health or mortality. This was partly to identify potential confounding and mediating variables, and to inform the construction of multivariate models. I also used a multivariate model that included education and income, to see whether these potential covariates influenced health independently of socioeconomic position.

Based on these analyses, I selected covariates that were associated with socioeconomic position and either self-rated health or mortality to use in multivariate analyses.

4.7.4 Multivariate analyses of the associations between socioeconomic position, self-rated health and mortality

Following this, I performed multivariate analyses of the relationships between socioeconomic position and self-rated health and mortality, using several models which included different covariates. The construction of these models in described in more detail in Chapter 5.

4.7.5 Analyses in the employed population

For variables such as occupation and those related to the labour market (such as wage arrears), that were only present in employed respondents, I followed a similar approach but with some minor differences. I measured and compared the strengths of associations between occupation, income and education and the two health outcomes in the employed population, and tested whether these associations were explained by labour market variables. The results of these analyses are given in Chapter 6.

4.7.6 Principal components analysis

Finally, I used principal components analysis to identify components which summarised some of the common underlying variance between socioeconomic measures, and investigated the associations between these components and self-rated health and mortality. The results of those analyses are shown in Chapter 7.

4.8 General aspects of data analysis

In this section I describe several more general aspects of the data analysis.

4.8.1 Statistical computer programme

I performed all the data analyses using the STATA statistical programme[140].

4.8.2 Missing data

In the descriptive tables in Chapter 5, I state the number of responses on which the analyses were based. In the case of several variables, there was a proportion of missing responses, although in general this proportion was fairly small.

In the case of the socioeconomic (predictor) variables, approximately 6% of respondents had income data that were missing, but only a tiny proportion had missing education data. I tested to see whether the respondents with missing income data differed in any way from the rest of the population, and found that these respondents had a similar educational and occupational level to the rest of the population.

In the case of the covariates, the proportion of missing data was generally very small, for example information about alcohol and smoking was only missing in 1% of respondents. I did not impute missing values for the covariates since these were few in number.

4.8.3 Power and sample size

Clearly I was not able to influence the sampling techniques or sample size in RLMS. However, it was important to determine whether the sample size gave sufficient power to detect statistically significant differences in self-rated health or mortality, should such differences exist.

The number of individuals eligible for inclusion in the final data analysis is given in Table 4.15, along with the percentage of deaths and the percentage of people with poor self rated health. The same figures are given for the employed population.

These figures were used as the basis for the power calculations in Table 4.16. It can be seen that the proportion of deaths was generally lower in women, especially employed women.

Table 4.15 Study population and proportion of outcomes of interest (self-rated health and mortality)

	Male	Female
Total population		
Number	5,238	6,244
Deaths (%)	452 (8%)	330 (5%)
Poor self-rated health (%)	580 (11%)	1253 (20%)
Employed population		
Number	3,498	3,274
Deaths (%)	193 (5%)	38 (1%)
Poor self-rated health (%)	190 (5%)	349 (11%)

Table 4.16 Power calculations

	Total study population					
	Male			**Female**		
Odds ratio	**1.3**	**1.5**	**2.0**	**1.3**	**1.5**	**2.0**
Mortality	**Risk 8%**			**Risk 5%**		
	Power			*Power*		
% exposed						
10	31	79	>90	22	57	>90
25	68	>90	>90	49	>90	>90
50	89	>90	>90	64	>90	>90
Self-rated health	**Risk 11%**			**Risk 22%**		
	Power			*Power*		
% exposed						
10	44	>90	>90	>90	>90	>90
25	>90	>90	>90	>90	>90	>90
50	>90	>90	>90	>90	>90	>90
	Employed population					
	Male			**Female**		
Odds ratio	**1.3**	**1.5**	**2.0**	**1.3**	**1.5**	**2.0**
Mortality	**Risk 5%**			**Risk 1%**		
	Power			*Power*		
% exposed						
10	12	32	>90	2	5	16
25	28	70	>90	5	12	37
50	36	90	>90	6	16	52
Self-rated health	**Risk 5%**			**Risk 11%**		
	Power			*Power*		
% exposed						
10	12	32	>90	27	71	>90
25	28	70	>90	61	>90	>90
50	36	90	>90	79	>90	>90

The power calculations take into account the sample sizes and the proportion of the events of interest (death or poor self-rated health) in each group (shown in Table 4.16). They also take into account the desired confidence interval (set at 95%) and the sizes of the exposed and unexposed groups. Calculations are given for the power to detect a significant difference in relation to 3 relative risks: 1.3, 1.5 and 2.0.

The power to detect a difference in poor self-rated health was much greater in women than in men, since a much higher proportion of women reported poor health. In women, the power to detect differences in self-rated health was much higher than for mortality, but in men the power to detect both events in the general population was similar. Broadly speaking in the general population, significant differences in mortality according to education and income and should be detectable in men at an odds ratio of 1.4 and in women of 1.6. For self-rated health these figures are around 1.4 and 1.25 respectively.

Amongst the much smaller employed population there was a much lower proportion of deaths, especially amongst women, meaning the power to detect differences in mortality was weaker. The mortality rate in employed women was only 1%, which means that it would be difficult to detect a significant difference should one exist.

5 Results of the analyses in the total study population

I have divided the main results chapter into several sections. The first is a general description of the survey sample, and is followed by an overview of the changes in social and economic conditions and health that took place during the course of the survey.

The next section describes the distribution of self-rated health at entry and its association with subsequent mortality, both of which are the principal "outcome" measures. Then follows a description of the distribution of the measures of socioeconomic position, the main independent ("exposure") variables in this study, and their associations with self-rated health and mortality.

In the next section I describe the distribution of variables that may potentially confound or mediate the associations between socioeconomic position and self-rated health or mortality. Finally I examine the associations between selected measures of socioeconomic position, self-rated health and mortality, controlling for the potential explanatory variables, thus assessing the extent to which the relationship was mediated or modified.

In each section, I first describe the results, and finish the section with a discussion of the findings, although the broader discussion is left until the final chapter.

5.1 General description of the study sample in the final analysis

11,482 subjects were included in the final data analysis, of whom 46% were male and 54% were female (Table 5.1). These individuals met the eligibility criteria described previously: age 18 or above; resident in a household of 2 or more people; matching gender and date of birth in each dataset for the rounds in which they participated; not a duplicate (based on date of birth, sex and household identifier).

During the course of the study, whole households (and the individuals within them) left, and new households were recruited to replace them. In addition, individuals within a household might leave the study whilst other household members continued to participate.

Table 5.1 Individuals included in the final data analysis

	Total	Male	Female
Individuals eligible for inclusion in final data analysis	11,482	5,238 (45.6%)	6,244 (54.4%)

The number of individual respondents entering and leaving the study at different times is shown in Table 5.2. More than half the respondents entered in Round 5, the first round of this second phase of RLMS. The greatest number of respondents who left the study did so between Rounds 5 and 6, which was also the time during which the smallest number of deaths was reported. These facts taken together suggest that some deaths between Rounds 5 and 6 may not have been recorded.

Table 5.2 Number of individuals in the final analysis, and rounds of entry and exit (RLMS)

Round	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Total**
Year	**1994**	**1995**	**1996**	**1998**	**2000**	**2001**	**2002**	
Entered the study	6705	933	707	881	967	1289	-	*11482*
Exited the study before round either with or without explanation (not deaths)	-	1435	776	661	632	441	569	4514
Deaths before round		61	98	197	190	94	142	782
Number of individuals in each round	6705	6142	5975	5998	6143	6897	6186	-

5.1.1 Follow up period

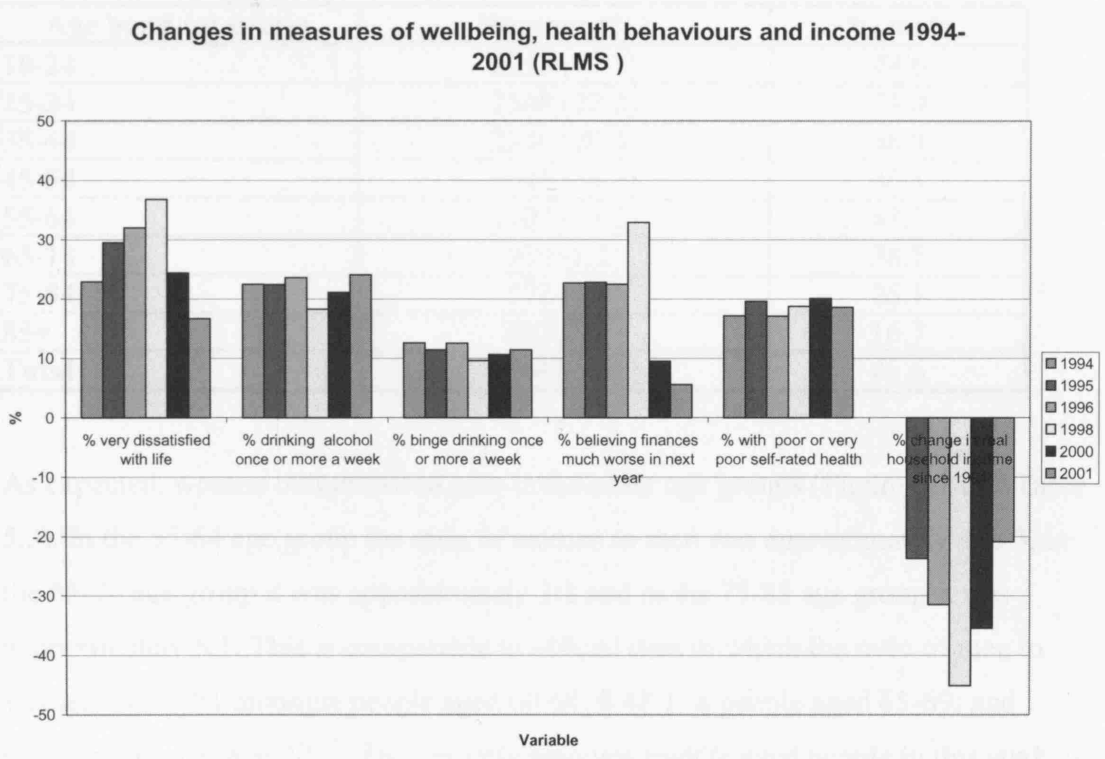
The mean follow up time for the total study population, based on the estimated dates of entry and exit defined in Section 4.1.4, was 4.2 years (median 4 years, range 0.5 – 8 years; standard deviation 3.11). The differences in characteristics between people who left the study and those who remained were described in Section 4.4.2.

5.1.2 Changes during the study period

In most analyses I used baseline information obtained from individuals at the time they entered RLMS, in order to follow people who joined the study in different calendar years. This meant that that a greater total number of respondents could be included than by only studying individuals who entered in one particular year.

However, to gain an overview of the some of the experiences of the participants during the study I also examined the overall prevalence and trends in certain factors in individual calendar years (Figure 5.1).The study period (1994-2002) covered a period of major economic and social instability in Russia. In particular, the 'rouble crisis' of 1998 affected savings, jobs and businesses.

Figure 5.1 Changes in measures of wellbeing, health behaviours and income 1994-2001 (RLMS)



There were major changes in median real household income (adjusted to the value of the 1992 rouble) during the study (Figure 5.1). The proportion of respondents who were very dissatisfied with life, or who believed their household's financial situation would become much worse in the coming year fluctuated in line with the changes in

income. Levels of satisfaction and optimism were at their lowest in 1998, the year of the 'rouble crisis' and also in which the decrease in median household income was greatest. However, during this period there was little change in the prevalence of poor self-rated health and of weekly alcohol consumption.

5.1.3 Demographic description of the population

Age and sex

The age and sex structure of the study population is shown in Table 5.3 and Figure 5.2, using age at entry measured in years.

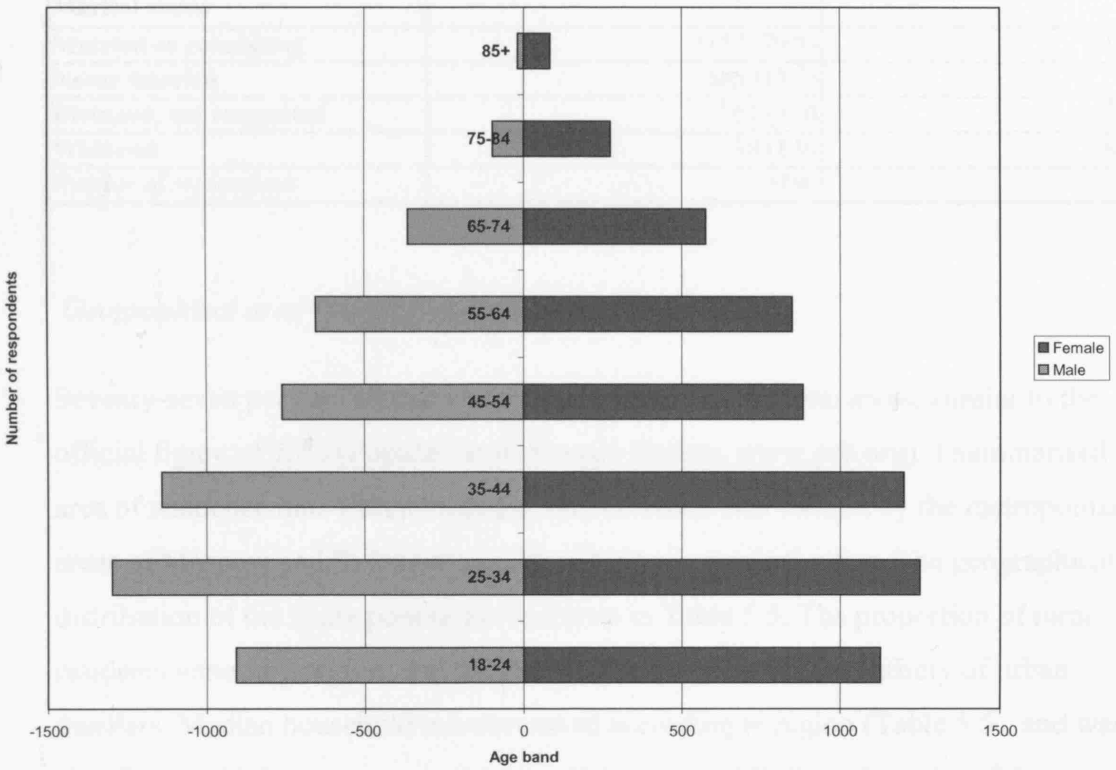
Table 5.3 Age and sex distribution of the study population

Age band (at entry)	Number (%)	% male
18-24	2033 (17.7)	44.6
25-34	2548 (22.2)	51.0
35-44	2340 (20.4)	48.8
45-54	1645 (14.3)	46.3
55-64	1503 (13.1)	43.5
65-74	939 (8.2)	38.7
75-84	372 (3.2)	26.1
85+	102 (0.9)	16.7
Total	11482 (100)	45.6

As expected, women outnumbered men in the older age groups (Figure 5.2 and Table 5.3). In the 55-64 age group the ratio of women to men was approximately 4 to 3, in the 65-74 age group it was approximately 3:2 and in the 75-85 age group it was approximately 5:1. This is comparable to official data in which the ratio of men to women was 0.7:1 amongst people aged 60-64; 0.48:1 in people aged 65-69; and 0.32:1 in people over 70 [21]. The sex ratio amongst middle aged people in this study is also comparable with a ratio of 0.84 men to women aged 45-64 in 1995 routine Russian data (in the same year the ratio in the UK in this age group was 0.98) [44]. Routine census data from the UK showed that amongst people aged 55-64, 65-74 and 75-84, the proportion of males was 49%, 47% and 37.5% respectively [141]. The

proportion of men in the older age groups is clearly much higher in the UK than in Russia.

Figure 5.2 Age and sex distribution in RLMS



Marital status

Marital status was divided into married or cohabiting; never married; divorced (not remarried) or widowed. Nearly 80% of the males and over 65% of the females included in the final analysis were married or cohabiting (Table 5.4). A much higher proportion of females (13.5%) than males (1.9%) was widowed. The proportion of widows of both sexes increased with age: 19.4% of women aged 55-64; 40.6% of women aged 65-74; and 76% of women aged 75-84 were widowed. The respective figures in men were only 3.4%, 7.1% and 19.5%. One third of women with an incomplete secondary education were widowed, compared with only 10% of women with a higher education. It should be noted that single-person households were

excluded from this analysis, and therefore the number of widows, and to a lesser extent single and divorced people, is likely to have been underestimated.

Table 5.4 Distribution of marital status

	No (%) of respondents	
	Male	**Female**
Marital status		
Married or cohabiting	4152 (79.9)	4147 (66.9)
Never married	685 (13.2)	615 (9.9)
Divorced, not remarried	261 (5.0)	592 (9.6)
Widowed	98 (1.9)	844 (13.6)
Number of respondents	*5196*	*6198*

Geographical area

Seventy-seven per cent of this study population lived in urban areas, similar to the official figure of 73% (Population Reference Bureau, www.prb.org). I summarised area of residence into 4 broad regions, one of which was formed by the metropolitan areas of Moscow and St Petersburg, Russia's two principal cities. The geographical distribution of the study population is shown in Table 5.5. The proportion of rural residents varied by region, and the metropolitan area consisted entirely of urban dwellers. Median household income varied according to region (Table 5.5), and was significantly higher amongst residents of Moscow and St Petersburg (confidence intervals not shown). Median household income was also greater in urban residents (6449 roubles per month) than rural residents (5575 roubles per month), a difference which was statistically significant (confidence intervals again not shown).

Table 5.5 Distribution of respondents by geographical area

Geographical area	**Number (%)**	**% Rural**	**Median household income (roubles/month)**
Central, Ural, North, North West	4161 (36.2)	20.8	6045
Metropolitan (Moscow, St Petersburg)	1882 (16.4)	0	8761
Volga and the North Caucasus	3353 (29.2)	33.6	5319
Siberia and the Far East	2086 (18.2)	22.9	7032
Total number of respondents	*11482*		

5.2 Distribution of indicators of socioeconomic position

In this section I describe the distribution of the subjective and objective measures of socioeconomic position used in this study.

5.2.1 Objective measures of socioeconomic position

Education

The study population was generally well educated. Half the women and 40% of the men had completed higher education (university or technical education beyond the age of 18) (Table 5.6). A further 40% of males and 27% of females had completed secondary education.

Table 5.6 Distribution of educational attainment in the study sample

Education	Male	Female	All
Primary and incomplete secondary	1051 (20.1)	1213 (19.5)	2264 (19.8)
Complete secondary +/- technical	2083 (39.8)	1747 (28.0)	3830 (33.4)
Higher	2095 (40.1)	3272 (52.5)	5367 (46.8)
Number of respondents	*5229*	*6232*	*11461*

Income

Median household and individual incomes fluctuated widely between rounds, even after adjustment to the value of the 1992 rouble, and were lowest in 1998 (Table 5.7, Figure 5.1).

In the case of both household and individual incomes, the mean was considerably higher than the median, a sign of a skewed income distribution where the incomes of a high proportion of respondents were below the mean. Approximately 20% of both male and female respondents reported no individual income in the month prior to entering the study. The wage income of men represented on average just under half the household income, and in women about 40% (full data not shown).

Table 5.7 Mean and median household and individual incomes in each round (adjusted to value of 1992 rouble)

Round and year	Household income (roubles per month)			Individual income (roubles per month)		
	Mean	Std. Dev.	Median	Mean	Std. Dev.	Median
Round 5 (1994)	9876.4	20521.4	6948.8	3002.0	4946.7	1761.6
Round 6 (1995)	7166.1	6678.5	5279.0	2271.6	3767.6	1329.0
Round 7 (1996)	6839.6	8131.5	4761.9	2247.9	4116.7	1297.4
Round 8 (1998)	5430.1	19010.8	3763.9	1564.0	2902.5	996.9
Round 9 (2000)	6175.2	7842.5	4409.5	2042.6	3023.5	1239.3
Round 10 (2001)	7429.9	8093.3	5433.1	2738.5	5307.2	1691.2

Occupation

There were 3,498 men and 3,274 women with an occupation recorded at the time they entered the study, constituting just under sixty percent of the total study population. The majority of employed men were in skilled, semi-skilled or unskilled occupations (Table 5.8). In women a higher proportion of employed respondents were in professional and clerical or service occupations. Nearly all respondents in professional occupations had completed a higher education, but so had nearly a third of skilled and unskilled manual workers.

Table 5.8 Distribution of occupation, and associated income and education

	Male			Female		
Occupational class	**Number (%) of respondents**	**Median monthly income (roubles)**	**% with higher education**	**Number (%) of respondents**	**Median monthly income (roubles)**	**% with higher education**
Higher professional/managerial	609 (17.4)	4877	93.1	837 (25.6)	2708	95.4
Technician/associate professional	258 (7.4)	4110	75.7	774 (23.6)	1762	77.3
Clerical/service workers	220 (6.3)	3068	49.0	806 (24.6)	1976	46.6
Skilled agricultural/crafts/trades	1065 (30.5)	2496	32.3	205 (6.3)	1762	29.1
Semi and unskilled manual	1346 (38.5)	2202	21.6	652 (19.9)	1468	29.7
Total employed population	*3498 (100)*	*2834*	*42.2*	*3274 (100)*	*1951*	*61.4*

5.2.2 Subjective measures of social position

Three different dimensions of subjective social status (power, economic and respect) were recorded, each using a 9-point scale. I combined these 3 measures to produce an additional composite measure of subjective social status (see Section 4.2.2 for details of questions).

The distribution of subjective economic status, power and respect was skewed in men (Figure 5.3 and Table 5.9) and similarly in women (figure not shown). More than a quarter of respondents placed themselves in category 1, the lowest out of 9, for subjective power, and the median category was 3. For subjective economic status, eleven percent placed themselves in the lowest category (1), and the median category was 4. The median category for subjective respect was slightly higher at 6, and 35% placed themselves in the top three of the 9 categories.

Figure 5.3 Subjective social status (economic, power and respect) in males

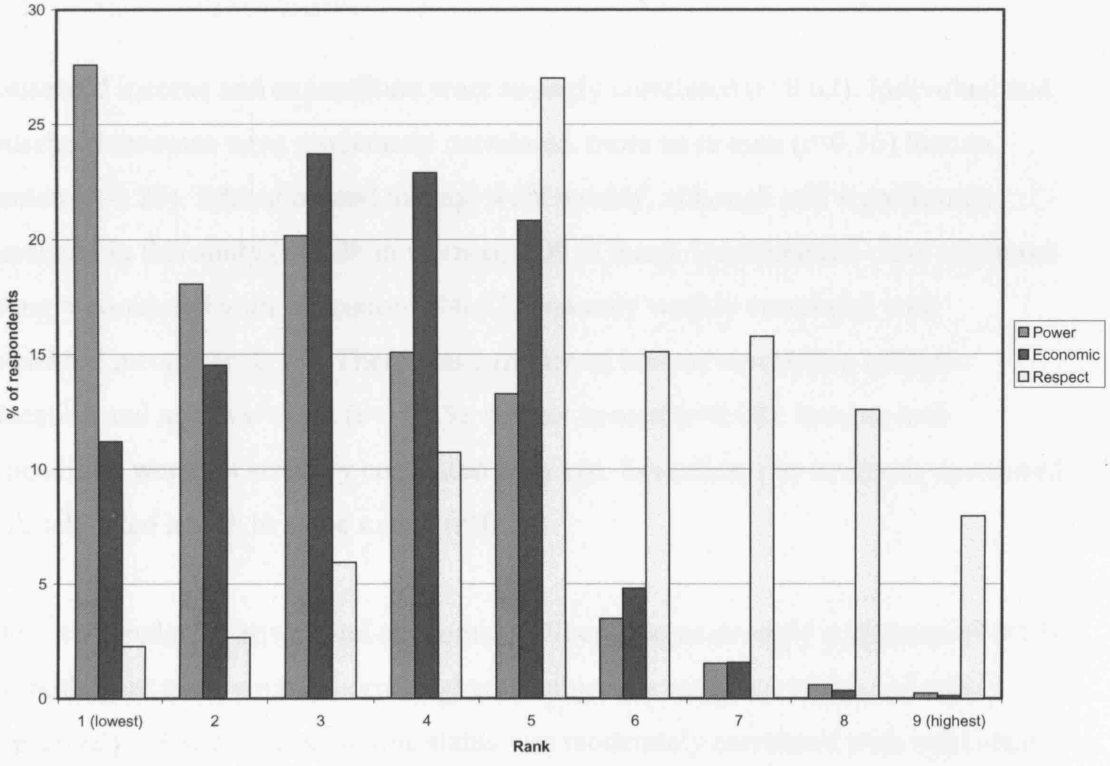


Table 5.9 Means and standard errors for subjective social status (economic, power and respect - 9 point scales)

	All				Male				Female			
	No of obs.	Mean	Std. Dev	Medi an	No of obs	Mean	Std. Dev	Medi an	No of obs	Mean	Std. Dev	Medi an
Respect	10949	5.8	1.9	6	5019	5.7	1.9	6	5930	5.8	1.9	6
Power	6044	2.8	1.6	3	11288	3.5	1.5	3	5100	3.0	1.7	3
Economic	11288	3.5	1.5	4	5153	3.6	1.5	4	6135	3.4	1.5	3
Power, respect and economic (single combined 9 point scale)	10761	4.1	1.3	4	4927	4.1	1.3	4	5834	4.0	1.2	4

5.2.3 Correlations between socioeconomic and other variables

Table 5.10 shows the correlations between the principal socioeconomic variables, selected measures of material wellbeing, satisfaction and self-rated health. Each variable was coded low to high (i.e. the highest value represented the most socioeconomic advantage, or the best health or greatest satisfaction). This analysis was based on both sexes combined, since preliminary analysis had shown similar correlations in both sexes (results not shown). The very few instances where the correlations differed between men and women are described in the text.

Household income and expenditure were strongly correlated (r=0.62). Individual and household incomes were moderately correlated, more so in men (r=0.36) than in women (r=0.28). Education and income were weakly, although still significantly, correlated in this study (r=0.08 in women, 0.09 in men). Occupational class was most strongly correlated with education (r=0.52), but only weakly correlated with household income (r=0.13). There was a moderate inverse correlation between education and age in women (r= -0.25), but not in men (r=0.08). Income and expenditure were not strongly correlated with age. Education was inversely correlated with self-rated health to some extent (r=0.14).

Subjective ranks for power and economic wellbeing were strongly correlated (r=0.55), and both were more weakly correlated with subjective respect (r=0.26 and r=0.29 respectively). Subjective economic status was moderately correlated with individual income (r=0.17) although more weakly with household income (r=0.10). However,

subjective economic status was more closely correlated with the other measures of subjective social position (power and respect) and with satisfaction (r=0.38).

Perceived power, economic status and respect were closely correlated with each other, and also with life satisfaction and optimism. In contrast, life satisfaction and optimism about the household economic situation were relatively weakly correlated with individual and household income and with education, although these associations were formally statistically significant.

An individual's number of household consumer goods was correlated with household income per person (r=0.15), but was more strongly correlated with expenditure (r=0.20), education (r=0.21), occupation (r=0.16) and subjective economic rank (r=0.22). However the number of consumer goods was only relatively weakly, although still significantly, associated with life satisfaction (r=0.10) and subjective power and economic status (r=0.14) (Table 5.10).

In RLMS, the number of household amenities was modestly correlated with the number of consumer goods (r=0.20) and with education (r=0.17), but only weakly with household income (r=0.09). Living space per person was not correlated with number of household goods or household amenities or any of the socioeconomic variables. Living space per person was correlated with increasing age (r=0.24), though.

Age was strongly inversely correlated with self-rated health (5 point scale, where 5 indicated the best health) (r= -0.50). Increasing age was also inversely correlated with optimism (r= -0.28) and subjective power (r= -0.19) and economic status (r= -0.19).

Self-rated health was moderately correlated with subjective power and economic status (r=0.21 each), and also with education (r=0.2 in men, but only 0.13 in women). It was also moderately correlated with optimism (r=0.23) and life satisfaction (r=0.18). Self-rated health was much more weakly, although still highly significantly, correlated with household income and expenditure quintiles. Living space per person was inversely correlated with self-rated health (r= -0.12). All the correlations described in the text above were highly statistically significant ($p<0.01$).

Table 5.10 Correlations between socioeconomic and material variables and self-rated health at entry (both sexes)

	Household income/sqrt hh size	Household expend./sqrt hh size	Individual income	Education	Occupational class	Subjective economic status	Subjective respect	Subjective power	No. consumer goods	No. household amenities	Living space per person/m^2	Life satisfaction	Optimism	Self-rated health	10 year age band
Household income/sqrt hh size	1														
Household expend./sqrt hh size	0.62**	1													
Individual income	0.31**	0.23**	1												
Education	0.08**	0.08**	0.13**	1											
Occupational class	0.13**	0.11**	0.13**	0.52**	1										
Subjective economic status	0.10**	0.13**	0.17**	0.15**	0.11**	1									
Subjective respect	0.05**	0.05**	0.09**	0.12**	0.11**	0.29**	1								
Subjective power	0.06**	0.07**	0.11**	0.14**	0.15**	0.55**	0.26**	1							
No. consumer goods	0.15**	0.20**	0.14**	0.21**	0.16**	0.22**	0.10**	0.14**	1						
No household amenities	0.09**	0.10**	0.18**	0.17**	0.17**	0.11**	0.12**	0.06**	0.20**	1					
Living space per person/m^2	0.03**	0.03**	0.03*	0.03**	0.14**	0.01	0.00	-0.02**	0.03*	-0.01	1				
Life satisfaction	0.10**	0.11**	0.14**	0.08**	0.10**	0.38**	0.20**	0.30**	0.16**	0.09**	0.04**	1			
Optimism	0.08**	0.09**	0.11**	0.08**	0.07**	0.34**	0.14**	0.29**	0.08**	0.11**	-0.07**	0.34**	1		
Self-rated health	0.02*	0.02*	0.07**	0.14**	-0.01	0.21**	0.07**	0.22**	0.10**	0.06**	-0.12**	0.18**	0.23**	1	
10 year age band	-0.01	-0.04**	-0.03**	-0.18**	0.02	-0.19**	-0.05**	-0.19**	-0.07**	-0.07**	0.24**	-0.09**	-0.28**	-0.50**	1

*p<0.05 ** p<0.01 All variable values run low to high

- N.B. Occupational class 1. Higher prof/manag 2. Technic/assoc prof 3. Clerk/service workers 4. Skilled agr/craft/trade 5. Semi and unskilled manual
- Household amenities (central heating, water, gas and sewerage and hot water)
- All variables coded low-high (i.e. a high value represents the highest status, best health etc.)

5.2.4 Discussion of the distribution of measures of socioeconomic position

The distribution of education in this sample was similar to that in a 1986 cohort of St Petersburg men, 40% of whom had a university education [2]. However, the proportion of people with a university education was much higher than in national census data from the 1990s [3]. Education and age were inversely correlated in women but not in men, which suggests that women in the older cohorts may have had fewer opportunities to complete a formal education than younger women. This may be explained by the history of the Russian educational system, in which women's educational opportunities were very limited at one time, but have gradually caught up with those of men since the Second World War [142].

Reported median incomes varied considerably between years, and these may have been influenced by wage arrears amongst employed respondents, which peaked at 60% in 1998 (the year of the 'rouble crisis'). Wage arrears and compulsory leave may also explain why a high proportion of respondents reported no individual income in the month before entry. However, other individuals may not have been in paid employment, or could have been in unofficial employment for which income was not recorded. Relationships between socioeconomic position, experiences in the labour market and health are considered further in Chapter 6. Household and individual incomes were more strongly correlated in men than in women, and this is likely to be because men earn, on average, a greater proportion of the household income (Table 5.7).

Although there was evidence of a trend in income in relation to occupation (Table 5.8), both education and occupation were relatively weakly correlated with income. This was not surprising since the financial returns to education, which are usually through income earned from employment, are known to be less in Russia than in the West [25].

The strong correlation between education and occupation is consistent with the finding that nearly all respondents in professional jobs had a higher education (Table

5.8). However, a high proportion of university educated people were in semi- and unskilled occupations. This could indicate either that people were taking jobs for which they were overqualified because of a shortage of suitable employment (the rate of self-reported unemployment was high at 10%). Alternatively, however, it could suggest that a proportion of well educated people were choosing unskilled jobs which might pay higher wages than certain professional jobs in state organisations [29]. It could also call in to question the validity of the education data, but downward occupational social mobility in Russia is well-recognised [22], and nearly all professionals and managers had a higher education, so overall the validity of the education data is likely to be acceptable. Occupation will be studied in more detail in Chapter 6, which relates to the employed population.

The distribution of subjective social status, especially power and economic status, was very skewed, and this suggests that a few respondents perceive themselves as wealthy, successful and important, but that a far higher number perceive themselves as poor, powerless and of little value to society. In the New Russia Barometer, a general question about subjective social status (also measured on a 9-point scale) showed a somewhat skewed distribution with a median of 6 [86], close to the distribution of subjective respect in this study. However, the distribution of subjective power and economic status was much more skewed in RLMS.

Subjective economic status was moderately correlated with income, which suggests that the former is based partly on an interpretation of objective socioeconomic measures[32]. However, subjective economic status was more closely correlated with subjective power and respect, and each of these measures of subjective social position was closely correlated with satisfaction and optimism. There may be two possible reasons for this. First, these variables could represent a general sense of positive self-worth and attitude to life, and second, there may be cross-contamination between these measures, which are all based on self-report. Overall, subjective economic status appeared to be more strongly influenced by general satisfaction than objective financial situation.

5.3 Distribution of health outcomes

The two principal health outcomes in this study were death (based on the report of a family member) and self-rated health (dichotomised into very good/good/average or poor/very poor). In this section I describe the distribution of these two health measures in the study population, and the association between them.

5.3.1 Deaths

Of the 782 deaths in this study that could be linked with individual baseline data. 452 (58%) of the deaths were in males and 330 (42%) in females. The median ages at death were 61 in men and 75 in women, and the mean ages at death were 59 and 73 respectively. These ages are close to the average life expectancy in the Russian population [39]. The process of obtaining and validating the mortality data was described in detail in Section 4.4.2.

5.3.2. Self-rated health

More than half the study population (50% of men and 58% of women) described their health as "average", the middle category of a five-point scale (Table 5.11). Eleven percent of men and over 20% of women in this study described their health as "poor" or "very poor" at the time they entered the study, and more men than women described their health as "good". Only a very small proportion of respondents placed themselves in the highest and lowest of the 5 categories.

Table 5.11 Self-rated health at entry

Self-rated health	Male (%)	Female (%)	All (%)
Very good	162 (3.2)	67 (1.1)	229 (2.0)
Good	1801 (35.2)	1236 (20.1)	3037 (27.0)
Average	2575 (50.3)	3596 (58.5)	6171 (54.8)
Poor	498 (9.7)	1038 (16.9)	1536 (13.6)
Very poor	82 (1.6)	215 (3.5)	297 (2.6)
Number of respondents	*5118*	*6152*	*11270*

Changes over time

In general, self-rated health (based on a 5-point scale) was strongly and significantly correlated in different study rounds, although the correlations became weaker the greater the time between measurements (Table 5.12). These correlations were slightly stronger in men than in women (data not shown).

Table 5.12 Correlations between self-rated health (5-point scale) in different study rounds

	Entry	1 round after entry	2 rounds after entry	3 rounds after entry
Entry	1			
1 round after entry	0.59**	1		
2 rounds after entry	0.56**	0.60**	1	
3 rounds after entry	0.51**	0.53**	0.60**	1

**p<0.001

Correlations

Correlations between self-rated health and measures of socioeconomic position were described in detail in Section 5.4.3 and Table 5.10. In summary, self-rated health (as a continuous variable, measured on a 5 point scale) was strongly inversely correlated with age, and was moderately positively correlated with subjective power and economic position, and with education (the latter more strongly in men than women). Self-rated health was more weakly correlated with household income and expenditure quintiles, and was also moderately correlated with optimism and satisfaction.

Temporal variations

The prevalence of poor or very poor self-rated health in individual years did not very greatly during the study period (Figure 5.1, page 94).

Self-rated health at entry and mortality

As stated in Section 4.4.1 I dichotomised self-rated health into poor or very poor versus very good, good or average health for the purposes of most of the analyses. Poor or very poor self-rated health at entry was significantly associated with mortality in both sexes in the total study population (age adjusted odds ratios 1.69 in men and

1.74 in women in the age adjusted model). This association was independent of the effects of health behaviours, life satisfaction, optimism, socioeconomic status and material conditions. The odds ratios were almost unchanged between the age adjusted and multivariate models (Table 5.13). The models used are similar to those used in multivariate analyses later in the chapter (Section 5.8).

Table 5.13 The association between self-rated health at entry and mortality (Cox proportional hazards analysis)

	Cox proportional hazards ratio (95% confidence interval) for death during study					
	(1) Age	(2) Age, alcohol and smoking	(3) Age, satisfaction, optimism, rank,	(4) Age, income, education	(5) = (4) plus geographic and material factors	(6) = (2) to (5) combined
Self-rated health						
Male						
Very good/good/average	1	1	1	1	1	1
Poor/very poor	1.69 (1.36-2.10)	1.65 (1.33-2.05)	1.68 (1.33-2.12)	1.59 (1.27-2.00)	1.62 (1.22-2.15)	1.61 (1.18-2.19)
Female						
Very good/good/average	1	1	1	1	1	1
Poor/very poor	1.74 (1.38-2.20)	1.69 (1.34-2.14)	1.62 (1.24-2.11)	1.70 (1.33-2.19)	1.85 (1.38-2.48)	1.79 (1.28-2.48)

Income and education: Education (3 cats), household income quintile per person, **Material:** Number of consumer goods, number of household amenities, household sold consumer goods for clothes/food **Sociodemographic factors:** marital status, district in Russia **Smoking and alcohol:** alcohol frequency , current smoking **Life satisfaction and optimism:** 5 point scales
N.B. 1. All models adjust for age at entry and cluster by household

Self-rated health in later rounds and mortality

In the main analyses, I studied self-rated health at entry. This was so that more respondents could be included, and because it would facilitate comparisons with other cross-sectional studies of the determinants of self-rated health in Russia and Eastern Europe. In those analyses, poor self-rated health at entry was associated with higher mortality than good or average health.

Examining self-rated health in subsequent study rounds showed that the association with mortality was stronger for self-rated health at 2 years than at entry. In addition, the association between self-rated health at 2 years and mortality was not explained by self-rated health at entry (Table 5.14).

I then examined the effect of a change in self-rated health over the first two years in the study on subsequent mortality (Table 5.14). People whose health deteriorated from good or average at entry to poor or very poor at 2 years had significantly higher

mortality than respondents whose health did not deteriorate. However the increased risk of mortality in people whose health deteriorated was similar in those whose health was poor or very poor both at entry and at 2 years.

Table 5.14 Associations between self-rated health at entry, self-rated health at 2 years and subsequent mortality

	Cox proportional hazards analysis for death in study, adjusted for age at entry (95% confidence interval)	
	Male	**Female**
Self-rated health at entry		
Good/average	1	1
Poor/very poor	**1.69 (1.36-2.10)**	**1.74 (1.38-2.20)**
Self-rated health 2 years after entry		
Good/average	1	1
Poor/very poor	**2.32 (1.75-3.09)**	**2.06 (1.48-2.87)**
Self-rated health 2 years after entry (adj for self-rated health at entry)		
Good/average	1	1
Poor/very poor	**2.17 (1.59-2.97)**	**1.84 (1.28-2.64)**
Self-rated health at entry (adj for self-rated health at 2 yrs)		
Good/average	1	1
Poor/very poor	1.14 (0.83-1.56)	1.20 (0.87-1.65)
Change in self-rated health (good or poor) from entry to 2 years		
No deterioration (good/av at 2 yrs)	1	1
Improvement (poor to good/av)	1.22 (0.73-2.05)	1.37 (0.78-2.38)
Deterioration (good/av to poor)	**2.25 (1.56-3.24)**	**1.99 (1.29-3.06)**
Poor throughout	**2.45 (1.73-3.49)**	**2.24 (1.52-3.32)**

Self-rated health in the final round of contact

I then measured the association between self-rated health in a respondent's last round in the study, showing that poor self-rated health in this round was also significantly associated with mortality, independent of self-rated health at entry (Table 5.15).

Table 5.15 Association between self-rated health in the last round of contact and subsequent mortality

	Cox proportional hazards analysis for death in study, adjusted for age at entry (95% confidence interval)	
	Male	**Female**
Self-rated health in last round of contact		
Good/average	1	1
Poor/very poor	**2.06 (1.63-2.61)**	**2.19 (1.61-2.97)**
Self-rated health in last round of contact (adjusted for self-rated health at entry)		
Good/average	1	1
Poor/very poor	**1.80 (1.41-2.31)**	**1.91 (1.40-2.61)**

Following this I examined the distribution of self-rated health in the study population in the final round of contact (Table 5.16). As expected, a much higher proportion of respondents who subsequently died reported poor health than amongst those who did not. However, more than 40% of the men who died reported average health and 12% reported good or very good health in the preceding round. The corresponding figures in women were 25% and 3 %.

Table 5.16 Self-rated health in round before leaving the study according to whether respondents subsequently died

	Self-rated health in final study round - number (%)	
	Died during study	**Did not die**
Male		
Very good	1 (0.3)	85 (2.1)
Good	42 (11.8)	1298 (32.4)
Average	146 (41.0)	2134 (53.3)
Poor	109 (30.6)	425 (10.6)
Very poor	58 (16.3)	65 (1.6)
Female		
Very good	0 (0.0)	51 (1.0)
Good	8 (3.0)	964 (18.5)
Average	66 (25.0)	3167 (60.8)
Poor	105 (39.8)	875 (16.8)
Very poor	85 (32.2)	153 (2.9)

Discussion

The proportion of respondents with "average" self-rated health was similar to that in the 1996 New Russia Barometer survey, in which it was 45% in men and 49% in women [17]. However, in the NRB a slightly higher proportion of respondents, 17% of men and 29% of women, reported their health as "poor" or very "poor" than in

RLMS. The "norm", or most common value, for self-rated health in these 2 Russian surveys of "average" was worse than in many other countries. Typically it is "good" in English speaking countries, and "fair" in Spain, although in one Lithuanian study it was "poor"[129]. This international variation may indicate that the report of self-rated health, or at least its norm, is influenced by culture, rather than actual disease, since within India, the regions with the worst self-rated health are not those with the highest mortality [132].

The lack of fluctuation in the prevalence of poor self-rated health in different years during the study period was surprising given the profound socioeconomic changes and the fluctuations in mean incomes and in satisfaction and optimism over this time.

This strong, independent association between self-rated health and mortality is consistent with findings in many studies in different countries [129], as discussed in Chapter 4. Five out of seven studies showed that the relationship between self-rated health and mortality was stronger in men than women, [129] in contrast with RLMS where the association was slightly stronger in women. It is interesting that despite the international variations in the distribution of self-rated health, the risk of mortality in the worst compared to the best health groups were relatively consistent.

It is also interesting that the most common value for self-rated health was worse than in many Western countries, but the relationships between self-rated health and mortality were similar to those found elsewhere.

The finding that self-rated health was more closely associated with mortality nearer to the time of death was similar to that in another study [129]. Somewhat surprisingly, half of the men who subsequently died had reported good or average health in the preceding round. This could indicate a relatively short final illness or sudden death. This is supported by results from another study in Russia that reported high numbers of sudden deaths [143], as well as by the rapid fluctuations in mortality in Russia that followed the economic crises of the 1990s [1].

In theory, the closer association between self-rated health and mortality when the former was measured at 2 years rather than at entry would make self-rated health at 2

years a better outcome to study as a surrogate for mortality. However, I believed that the advantages of using self-rated health at entry were sufficient to use this as an outcome. These advantages were that more respondents could be included, and that it allowed direct comparisons with a number of other cross-sectional studies in Russia.

5.4 Association between socioeconomic position, self-rated health and mortality

In this section I describe the associations between objective and subjective measures of socioeconomic position and self-rated health at entry and mortality. My main aim at this stage was to describe the relationships, rather than explain the associations. However, to identify the strongest socioeconomic predictors of mortality and self-rated health, it was important to test whether the associations were explained by other socioeconomic variables.

I therefore used two models. The first was adjusted for age, and the second for age and other measures of socioeconomic position. The results of these analyses formed the basis for the selection of variables to use in more detailed analyses of the relationships between socioeconomic position and health and the mediators of these relationships.

5.4.1 Objective measures of socioeconomic position

In this section I first describe the relationships between household and individual income quintile, household expenditure quintile and education, and self-rated health and mortality in the general (whole study) population. The association between occupation, other socioeconomic variables and health in the employed population will be discussed in Section 6.

Education

There was a statistically significant gradient in self-rated health in relation to education in both men and women, even after adjusting for income, where people

with less education were more likely to report poor health (Table 5.17). The mortality gradient in relation to education was also significant and independent of income, and was much stronger than the gradient in self-rated health (Table 5.18). Men and women with a university education had significantly lower mortality than those with a complete secondary education. Men and women with primary or incomplete secondary education had higher mortality than those with a complete secondary education, but this difference was only statistically significant in men.

Income

The measures of income used here were household income per person (the total household income divided by the square root of the number of household members[137]) and individual income. There was a significant trend in poor self-rated health in relation to household and individual income quintiles, where people in the lower quintiles reported worse health, even after adjusting for age and education (Table 5.17).

The differences in poor self-rated health in relation to household income were greatest between the lowest three quintiles, but were weak and non-significant amongst the higher quintiles. Men and women in the lowest household income quintile had a significantly higher risk of poor self-rated health than those in the middle quintile, an association that was not explained by education.

However, in relation to individual income, differences in self-rated health were strongest and most significant amongst the higher quintiles. Differences in self-rated health were non-significant amongst the lowest 3 individual income quintiles. Men and women in the highest individual income quintile were significantly less likely to report poor health than people in the middle quintile, and these associations were only weakly explained by education.

There was a non-significant gradient in mortality in relation to household income quintile in both sexes, although men in the lowest quintile had significantly higher

mortality than those in the middle quintile. These differences were largely explained by education.

There was a significant mortality gradient in relation to individual income in men and women in the age adjusted model, and men in the highest individual income quintile had significantly lower mortality than men in the middle quintile. These differences were partly explained by education (Table 5.18). Women in the highest individual income quintile experienced half the mortality of those in the middle quintile, and although this difference was non-significant, it was only weakly explained by education. Respondents who reported no individual income in the previous month had slightly better health outcomes than the people in the lowest individual income quintile.

Expenditure quintile

The associations between household expenditure quintile per person (total household expenditure divided by the number of household members), self-rated health and mortality were similar in direction, but weaker, than the relationships between household income quintile and self-rated health and mortality (Table 5.17). There was a significant mortality gradient in relation to household expenditure, but this gradient was almost entirely explained by education (Table 5.18)).

Table 5.17 Association between self-rated health at entry and measures of socioeconomic position in the general population (logistic regression analysis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)			
	Male		Female	
	(1) Age	(2) Age, income, education	(1) Age	(2) Age, income, education
Education				
Primary/incomplete secondary	**1.33 (1.00-1.77)**	1.30 (0.97-1.75)	1.24 (0.98-1.56)	1.19 (0.93-1.51)
Complete secondary	1	1	1	1
Higher	0.79 (0.61-1.03)	0.81 (0.61-1.06)	0.95 (0.78-1.15)	0.96 (0.79-1.18)
Continuous	**0.77 (0.69-0.87)**	**0.79 (0.70-0.89)**	**0.88 (0.81-0.97)**	0.91 (0.82-1.00)
Household income per person (household income/ square root no. in household)				
1 (lowest quintile)	**1.64 (1.21-2.22)**	**1.54 (1.14-2.09)**	**1.34 (1.06-1.70)**	**1.30 (1.02-1.66)**
2	**1.21 (0.90-1.63)**	1.17 (0.86-1.58)	1.20 (0.96-1.51)	1.19 (0.94-1.51)
3	1	1	1	1
4	**1.06 (0.79-1.44)**	1.09 (0.81-1.48)	0.99 (0.78-1.26)	1.03 (0.80-1.33)
5 (highest quintile)	**0.68 (0.49-0.95)**	0.71 (0.51-1.00)	0.87 (0.67-1.11)	0.93 (0.71-1.20)
Change per quintile	**0.83 (0.77-0.89)**	**0.85 (0.80-0.92)**	**0.90 (0.85-0.95)**	**0.92 (0.87-0.98)**
Individual income				
No individual income	0.94 (0.67-1.32)	0.96 (0.68-1.37)	1.11 (0.86-1.44)	1.14 (0.86-1.49)
1 (lowest quintile)	1.18 (0.81-1.74)	1.20 (0.81-1.78)	1.24 (0.99-1.55)	1.24 (0.97-1.58)
2	0.89 (0.65-1.22)	0.90 (0.64-1.26)	1.15 (0.93-1.42)	1.18 (0.94-1.47)
3	1	1	1	1
4	0.87 (0.65-1.17)	0.95 (0.69-1.30)	**0.65 (0.50-0.86)**	**0.68 (0.50-0.91)**
5 (highest quintile)	**0.55 (0.40-0.75)**	**0.70 (0.50-0.97)**	**0.72 (0.54-0.96)**	0.82 (0.61-1.11)
Change per quintile	**0.90 (0.86-0.95)**	**0.94 (0.89-1.00)**	**0.89 (0.85-0.93)**	**0.90 (0.86-0.95)**
Household expenditure per person (household expend/ square root no. in household)				
1 (lowest quintile)	1.30 (0.98-1.72)	1.31 (0.96-1.78)	1.15 (0.91-1.46)	1.14 (0.90-1.46)
2	0.97 (0.72-1.30)	0.95 (0.69-1.31)	1.11 (0.88-1.41)	1.10 (0.86-1.41)
3	1	1	1	1
4	0.96 (0.71-1.29)	0.93 (0.67-1.30)	1.06 (0.84-1.34)	1.12 (0.88-1.43)
5 (highest quintile)	1.03 (0.76-1.38)	0.91 (0.65-1.27)	0.91 (0.71-1.16)	0.92 (0.71-1.19)
Change per quintile	0.95 (0.89-1.02)	**0.92 (0.86-0.99)**	0.95 (0.90-1.00)	0.96 (0.91-1.02)

Income and education education (3 cats), household income per person (household income/ square root no. in household) quintile

N.B. 1. All models adjust for age at entry and cluster by household; 2. All models adjust only for variables other than predictor variable

Table 5.18 Association between mortality and measures of socioeconomic position in the general population (Cox proportional hazards analysis)

	Hazard ratio (95% confidence interval) for death during study)			
	Male		Female	
	(1) Age	(2) Age, income, education	(1) Age	(2) Age, income, education
Education				
Primary/incomplete secondary	**1.65 (1.28-2.14)**	**1.64 (1.25-2.14)**	1.36 (0.95-1.94)	1.39 (0.96-2.02)
Complete secondary	1	1	1	1
Higher	**0.72 (0.56-0.92)**	**0.69 (0.53-0.89)**	**0.43 (0.30-0.64)**	**0.43 (0.29-0.64)**
Continuous	**0.66 (0.59-0.74)**	**0.65 (0.58-0.73)**	**0.57 (0.50-0.65)**	**0.56 (0.49-0.64)**
Household income per person (household income/ square root no. in household)				
1 (lowest quintile)	**1.41 (1.05-1.88)**	1.29 (0.96-1.72)	1.19 (0.86-1.65)	1.03 (0.76-1.40)
2	0.98 (0.73-1.30)	0.93 (0.70-1.23)	0.94 (0.67-1.30)	0.77 (0.56-1.05)
3	1	1	1	1
4	0.89 (0.66-1.21)	0.97 (0.72-1.31)	1.00 (0.72-1.39)	0.96 (0.71-1.31)
5 (highest quintile)	1.12 (0.83-1.52)	1.20 (0.89-1.63)	0.75 (0.50-1.13)	0.80 (0.55-1.18)
Change per quintile	0.94 (0.88-1.02)	0.99 (0.92-1.06)	0.93 (0.85-1.01)	0.98 (0.91-1.06)
Individual income				
No individual income	1.08 (0.78-1.50)	1.07 (0.77-1.48)	1.22 (0.82-1.81)	1.14 (0.74-1.76)
1 (lowest quintile)	1.37 (0.98-1.92)	1.37 (0.97-1.94)	1.06 (0.77-1.45)	0.99 (0.70-1.40)
2	0.94 (0.69-1.26)	0.92 (0.68-1.26)	0.93 (0.72-1.20)	0.91 (0.68-1.20)
3	1	1	1	1
4	0.79 (0.59-1.05)	0.87 (0.64-1.17)	0.63 (0.37-1.06)	0.69 (0.40-1.19)
5 (highest quintile)	**0.71 (0.52-0.98)**	0.85 (0.61-1.18)	0.50 (0.25-1.03)	0.57 (0.26-1.25)
Change per quintile	**0.91 (0.86-0.96)**	0.94 (0.89-1.00)	**0.88 (0.81-0.97)**	0.92 (0.83-1.02)
Household expenditure per person (household expend/ square root no. in household)				
1 (lowest quintile)	**1.45 (1.07-1.95)**	1.21 (0.91-1.60)	0.88 (0.65-1.18)	0.85 (0.63-1.15)
2	1.10 (0.81-1.49)	0.90 (0.67-1.21)	0.80 (0.59-1.08)	0.73 (0.54-0.99)
3	1	1	1	1
4	0.92 (0.67-1.26)	0.98 (0.73-1.32)	0.73 (0.52-1.03)	0.74 (0.53-1.02)
5 (highest quintile)	0.87 (0.64-1.20)	1.03 (0.76-1.40)	0.74 (0.52-1.06)	0.71 (0.49-1.03)
Change per quintile	**0.89 (0.83-0.95)**	0.97 (0.91-1.04)	0.96 (0.89-1.04)	0.97 (0.90-1.05)

Income and education: Education (3 cats), household income per person (household income/ square root no. in household) quintile

N.B. 1. All models adjust for age at entry and cluster by household; 2. All models adjust only for variables other than predictor variable

5.4.2 Subjective social status

Four measures of subjective social status were studied here, power, economic status and respect (each measured on a 9-point scale), as well as a composite of all 3 variables. Each was measured at the time the subject entered the study. The measurement of these variables is described in greater detail in Section 4.2.2. The distribution of subjective social status is shown in Figure 5.3.

Subjective power and subjective economic status at entry were strongly associated with self-rated health, even after adjusting for education and income. In particular those in the lowest categories in both measures experienced the worst self-rated health. However, subjective respect was not significantly associated with self-rated health (Table 5.19). The composite measure of subjective social status (power, economic and respect) was strongly and significantly associated with self-rated health in both sexes, even after adjusting for education and income.

There was a significant mortality gradient in relation to subjective economic status at entry in both sexes, which was partly explained by education and income. The mortality gradient in relation to subjective power was non-significant in both sexes. Subjective respect was significantly associated with mortality in men, although the association was again partly explained by income and education.

Table 5.19 Association between self-rated health at entry and subjective social status (regression analysis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)			
	Male		Female	
	(1) Age	(2) Age, income, education	(1) Age	(2) Age, income, education
Subjective economic status				
1-2 (lowest)	**1.60 (1.30-1.98)**	**1.56 (1.23-1.97)**	**2.02 (1.72-2.37)**	**1.91 (1.60-2.28)**
3-4	1	1	1	1
5-9 (highest)	**0.71 (0.55-0.91)**	0.79 (0.60-1.05)	0.83 (0.69-1.02)	0.80 (0.64-1.00)
Continuous across 3 categories	**0.66 (0.58-0.75)**	**0.70 (0.61-0.81)**	**0.62 (0.56-0.68)**	**0.63 (0.56-0.70)**
Subjective power				
1-2 (lowest)	**1.78 (1.42-2.22)**	**1.71 (1.34-2.17)**	**1.72 (1.46-2.02)**	**1.67 (1.40-2.00)**
3-4	1	1	1	1
5-9 (highest)	0.89 (0.65-1.22)	1.02 (0.72-1.44)	0.96 (0.75-1.22)	1.03 (0.78-1.36)
Continuous across 3 categories	**0.67 (0.58-0.77)**	**0.71 (0.61-0.82)**	**0.69 (0.62-0.77)**	**0.72 (0.64-0.81)**
Subjective respect				
1-4 (lowest)	1.18 (0.93-1.49)	1.22 (0.95-1.58)	1.15 (0.95-1.39)	1.10 (0.90-1.35)
5-6	1	1	1	1
7-9 (highest)	0.88 (0.70-1.11)	0.99 (0.77-1.27)	0.88 (0.74-1.04)	0.88 (0.73-1.06)
Continuous across 3 categories	**0.87 (0.77-0.98)**	0.90 (0.79-1.03)	**0.87 (0.79-0.96)**	**0.89 (0.81-0.99)**
Combined measure of subjective social status (power, economic and respect) - 24 point scale				
0-4 (lowest)	**1.69 (1.29-2.22)**	**1.66 (1.24-2.23)**	**1.55 (1.25-1.91)**	**1.47 (1.18-1.85)**
5-9	1	1	1	1
10-14	**0.79 (0.63-0.99)**	0.86 (0.67-1.10)	**0.65 (0.55-0.77)**	**0.67 (0.56-0.81)**
15-24 (highest)	**0.47 (0.30-0.74)**	0.65 (0.40-1.05)	**0.69 (0.49-0.96)**	**0.58 (0.39-0.87)**
Continuous across 4 categories	**0.69 (0.61-0.78)**	**0.75 (0.65-0.86)**	**0.69 (0.63-0.77)**	**0.69 (0.62-0.77)**

Income and education: Education (3 cats), household income per person (household income/ square root no. in household) quintile **N.B. All models adjust for age at entry and cluster by household**

Subjective respect was not associated with mortality in women (Table 5.20). There was a significant mortality gradient in the composite measure of subjective social status in both sexes which was explained by education and income in men, but not women.

Table 5.20 Association between mortality and subjective social status (Cox proportional hazards analysis)

	Cox proportional hazards ratio for death during study (95% confidence interval)			
	Male		Female	
	(1) Age	(2) Age, income, education	(1) Age	(2) Age, income, education
Subjective economic status				
1-2 (lowest)	1.02 (0.83-1.25)	0.92 (0.73-1.15)	**1.30 (1.03-1.63)**	1.21 (0.94-1.57)
3-4	1	1	1	1
5-9 (highest)	**0.72 (0.56-0.92)**	0.80 (0.62-1.03)	0.89 (0.65-1.21)	0.91 (0.64-1.30)
Continuous across 3 categories	**0.86 (0.76-0.97)**	0.94 (0.82-1.08)	**0.81 (0.70-0.94)**	0.84 (0.71-1.00)
Subjective power				
1-2 (lowest)	0.95 (0.78-1.17)	0.86 (0.69-1.06)	1.23 (0.98-1.56)	1.19 (0.90-1.57)
3-4	1	1	1	1
5-9 (highest)	**0.68 (0.50-0.92)**	0.73 (0.53-1.00)	1.22 (0.82-1.79)	1.42 (0.92-2.18)
Continuous across 3 categories	0.89 (0.79-1.01)	0.97 (0.84-1.10)	0.93 (0.78-1.10)	0.98 (0.82-1.18)
Subjective respect				
1-4 (lowest)	1.23 (0.99-1.54)	1.11 (0.87-1.40)	1.18 (0.91-1.53)	1.21 (0.91-1.61)
5-6	1	1	1	1
7-9 (highest)	0.94 (0.75-1.17)	0.94 (0.74-1.19)	0.89 (0.67-1.17)	0.95 (0.70-1.29)
Continuous across 3 categories	**0.87 (0.77-0.98)**	0.92 (0.81-1.05)	0.87 (0.75-1.00)	0.87 (0.75-1.02)
Combined measure of subjective social status (power, economic and respect) - 24 point scale				
0-4 (lowest)	1.09 (0.83-1.42)	0.89 (0.66-1.19)	**1.33 (1.01-1.74)**	**1.38 (1.03-1.86)**
5-9	1	1	1	1
10-14	0.88 (0.71-1.09)	0.95 (0.75-1.19)	0.80 (0.60-1.05)	0.84 (0.61-1.14)
15-24 (highest)	0.66 (0.43-1.02)	0.73 (0.47-1.15)	0.67 (0.34-1.35)	0.84 (0.41-1.72)
Continuous across 4 categories	**0.87 (0.78-0.98)**	0.97 (0.85-1.10)	**0.78 (0.67-0.91)**	**0.82 (0.69-0.97)**

Income and education education (3 cats), household income per person (household income/ square root no. in household) – quintile. **N.B. All models adjust for age at entry and cluster by household**

5.4.4 Discussion

Objective measures

The strong and significant association between education and mortality was consistent with findings in other Russian studies[2;3;138;144]. The differences in mortality between individual educational categories in RLMS were slightly larger than those found by Shkolnikov, who showed a 1.7 fold difference in men and 1.45 fold difference in women in mortality between lower educational groups (primary and secondary) and

higher educational groups (specialist secondary and university) using census data [3]. However the educational categories differed slightly between studies, making direct comparisons difficult. A study which measured mortality indirectly using widowhood data showed a significant mortality gradient in relation to spouse's education, where university educated people were 0.57 times as likely to die as individuals with only a primary education[145].

In this study the differences in mortality according to education were similar in both sexes, but other studies have shown differences between men and women. Shkolnikov noted a wider educational differential in mortality in men than in women [3]. In contrast, in a Siberian cohort of adults aged 25-64, there was more than two-fold difference in all-cause mortality between primary and university educated women, but a slightly less than two fold difference in men [84].

The association between education and self-rated health seen in RLMS has also been shown in other studies. However, the protective effect of a university education in comparison to a primary or incomplete secondary education was weaker in these data (odds of poor self-rated health 0.56 in men and 0.76 in women), than in another study (odds 0.36 and 0.46 respectively)[17].

Individual and household incomes were each more strongly associated with self-rated health than with mortality. The association between income and self-rated health was weaker here than in the New Russia Barometer, in which the age adjusted odds ratios for poor self-rated health per household income quintile per person were 0.64 (0.54-0.75) in men and 0.76 (0.67-0.88) in women[17] . This could have been due to differences between the studies in the way in which income was measured, although in both datasets income per person was calculated by dividing by the square root of the number of household members. It could also in theory be due to the fact that people entered RLMS in different years, when changes in socioeconomic conditions meant that real incomes were different, so that the quintiles represented different levels of real income (Table 5.7). However, adjusting for year of entry had little effect on the odds ratios for self-rated health and mortality (data not shown), so the temporal effects on the results are likely to have been very minor.

The gradients in the associations between household income, individual income and self-rated health varied in size within their distribution. In the case of household income, the differences in the odds of self-rated health and mortality were greater between the lower income quintiles than the higher quintiles. In contrast, in the case of individual income, differences in the odds of self-rated health, and to a lesser degree mortality, were greater between the upper quintiles than the lower quintiles. Individual income was more closely correlated with satisfaction and optimism than household income, and satisfaction and optimism were strongly correlated with self-rated health (Table 5.10). It is possible that the stronger relationship between self-rated health and individual rather than household income, especially among the highest quintiles may be due to the satisfaction produced by a higher income. It is also possible that the particularly high mortality amongst people in the lowest household income quintile could be due to material deprivation. A high proportion of people in the lowest income quintile were living below the regional poverty level, whereas this proportion was much smaller in the higher quintiles. Associations between both household and individual incomes and mortality were explained by education, especially household income.

People who had no individual income experienced better self-rated health and lower mortality than those in the lowest income quintile. It is possible that there were differences between the two groups. For example people with no individual income may not have been working either because they could not find work or because they did not need to work, or they may have been employed but were not paid in the last month due to wage arrears.

Mortality and self-rated health were more weakly associated with household expenditure than with household income. There were two reasons why this finding was unexpected. Firstly, household income and expenditure were strongly correlated, and the associations would therefore be expected to be similar. Secondly, household expenditure is considered by some researchers to be a more reliable measure of financial wellbeing than income in Russia [136], because income is likely to fluctuate (e.g. through wage arrears) and is frequently non-monetary (for example bartering or exchanging favours). Possible explanations for the relatively weak association between expenditure and health are that households may change their monthly

expenditure in line with income fluctuations, and that expenditure, as well as income, may be non-monetary. Another reason why expenditure was more weakly associated with health could be that expenditure was less stable during the study period. Only 34% of respondents were in the same household expenditure quintile in the second round as at entry, compared with 49% in the same income quintile.

Subjective social status

Subjective power and subjective economic status were both strongly associated with self-rated health, independently of education and income. This is likely to be because both self-rated health and subjective social status are measures of satisfaction, evidenced by the correlation between subjective social status, self-rated health and satisfaction.

Perceived respect was more weakly correlated with self-rated health than the other two subjective measures of social status, although the association was still significant. Perceived respect was also less strongly correlated with satisfaction and optimism. Subjective power and economic ranks were closely correlated, but both were more weakly correlated with perceived respect than with each other. Perceived respect also had a higher mean and median in the population than subjective power and economic status (Figure 5.3). These differences taken together suggest that respect measures a different aspect of subjective social status than the other two variables, and this may explain why its associations with health differ from those of subjective economic status and subjective power. However, perceived respect was not correlated with objective socioeconomic or other measures (Table 5.10), and so there was no further information available in these data about the basis of respect.

Subjective social status was generally less strongly associated with mortality than with self-rated health. Subjective economic status was significantly associated with mortality in both sexes, but this association was partly explained by education and income. This, taken together with the correlation between income and subjective economic status, could indicate that the association between subjective economic

status and mortality occurred because it was related to objective socioeconomic measures that were associated with mortality

The composite measure of economic, power and respect status was strongly associated with self-rated health, independently of education and income. This measure was associated with mortality in men, although education and income explained the association. However, in women this association was stronger, and was independent of education and income. It is possible that this composite included aspects of objective status which were part of subjects' assessment of their subjective status, and that it was these objective aspects that were strongly associated with mortality. It is also possible that women base their assessment of subjective social position on different factors from men [86].

Further multivariate analyses of the associations between socioeconomic position and health are to be found in Section 5.8, but in the next section the selection of potential covariates for these models is described.

5.5 Variables that may mediate or modify the relationships between socioeconomic position and self-rated health or mortality

From the extensive RLMS dataset, I selected a number of variables that might potentially explain the associations between socioeconomic position and health. These included demographic variables, health behaviours, psychosocial measures, social networks and measures of material wellbeing.

In this section I describe the distribution of these variables in the study population. I then describe their relationship with socioeconomic position, and with self-rated health and mortality. My selection criteria for the inclusion of variables in multivariate analyses of the associations between socioeconomic position and health were that they were associated with both socioeconomic position and health, and I also describe the selection process and its results.

5.5.1 Demographic factors

The factors that I considered were age, sex, marital status and geography. The distribution of these variables was noted in Section 5.3, including their distribution in relation to socioeconomic position. Key findings were that that widowhood was more common amongst people with lower education and that people living outside Moscow and St Petersburg had lower median incomes. The associations between demographic variables and health outcomes are presented here.

Age

Unsurprisingly, increasing age was associated with poor self-rated health and mortality in both sexes after adjusting for all factors, an association that is reassuring in relation to the quality of the mortality data (Table 5.21 and Table 5.22).

Table 5.21 Association between self-rated health and age, marital status and geographical area (logistic regression analysis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)			
	Male		Female	
	(1) Age	(2) Age, income, education	(1) Age	(2) Age, income, education
Age at entry				
Continuous - per unit (year) change	**1.07 (1.07-1.08)**	**1.08 (1.07-1.08)**	**1.07 (1.07-1.07)**	**1.07 (1.06-1.07)**
Marital status				
Married or cohabiting	1	1	1	1
Never married	**1.84 (1.24-2.74)**	**1.72 (1.11-2.66)**	1.02 (0.72-1.45)	0.99 (0.70-1.42)
Divorced, not remarried	1.13 (0.72-1.78)	1.08 (0.68-1.74)	1.24 (0.97-1.58)	1.27 (0.98-1.66)
Widowed	0.81 (0.49-1.32)	0.79 (0.45-1.38)	0.99 (0.81-1.21)	0.94 (0.76-1.18)
Geographical area (summarised)				
Central, Ural, North, North West	1	1	1	1
Metropolitan (Moscow, St Petersburg)	**0.74 (0.55-0.99)**	0.89 (0.60-1.30)	**0.76 (0.62-0.94)**	0.85 (0.65-1.11)
Volga, North Caucasus	0.92 (0.73-1.15)	0.92 (0.72-1.18)	0.94 (0.79-1.13)	0.91 (0.76-1.10)
Siberia and Far East	0.91 (0.69-1.18)	0.95 (0.71-1.27)	1.05 (0.85-1.29)	1.04 (0.84-1.29)
Urban or rural				
Urban	1	1	1	1
Rural	1.23 (0.99-1.53)	1.09 (0.86-1.37)	**1.23 (1.04-1.46)**	1.15 (0.97-1.38)

Income and education education (3 cats), household income per person (household income/ square root no. in household) quintile **N.B. All models adjust for age at entry and cluster by household**

Table 5.22 Association between mortality and age, marital status and geographical area (Cox proportional hazards analysis)

	Cox proportional hazards ratio for death during study (95% confidence interval)			
	Male		Female	
	(1) Age	(2) Age, income, education	(1) Age	(2) Age, income, education
Age at entry				
Continuous - per unit (year) change	**1.06 (1.05-1.06)**	**1.05 (1.05-1.06)**	**1.10 (1.09-1.10)**	**1.09 (1.08-1.10)**
Marital status				
Married or cohabiting	1	1	1	1
Never married	**1.68 (1.12-2.53)**	1.50 (0.98-2.30)	0.98 (0.52-1.84)	0.85 (0.44-1.64)
Divorced, not remarried	**2.30 (1.62-3.26)**	**2.10 (1.47-3.01)**	0.92 (0.51-1.64)	0.77 (0.41-1.43)
Widowed	1.16 (0.77-1.75)	0.99 (0.63-1.55)	**1.45 (1.10-1.91)**	1.27 (0.94-1.71)
Geographical area (summarised)				
Central, Ural, North, North West	1	1	1	1
Metropolitan (Moscow, St Petersburg)	0.73 (0.51-1.05)	0.95 (0.63-1.43)	0.71 (0.48-1.06)	0.86 (0.56-1.33)
Volga, North Caucasus	1.06 (0.86-1.30)	1.04 (0.83-1.29)	0.95 (0.75-1.21)	0.95 (0.73-1.23)
Siberia and Far East	**0.73 (0.56-0.96)**	**0.68 (0.51-0.91)**	0.98 (0.74-1.29)	0.98 (0.71-1.34)
Urban or rural				
Urban	1	1	1	1
Rural	1.18 (0.97-1.45)	1.05 (0.85-1.29)	0.92 (0.73-1.14)	0.84 (0.66-1.08)

Income and education education (3 cats), household income per person (household income/ square root no. in household) quintile **N.B. All models adjust for age at entry and cluster by household**

Marital status

Single men were significantly more likely than married men to report poor health, independently of income and education. Divorce and widowhood in men, and differences in marital status in women, were not significantly associated with poor self-rated health (Table 5.21).

Divorced men, and to a lesser extent single men, had significantly higher mortality than married men, and these association were largely independent of education and income. Amongst women, widows had significantly higher mortality than married women, an effect only partly explained by income and education. Divorced and single women had non-significantly lower mortality than married women (Table 5.22).

Interpretation of these associations is limited by the fact that one-person households were excluded from the study. However, the results of the sensitivity analyses (Section 4.6.1) showed an association between divorce and singleness and mortality in men in all the models, suggesting that these differences were likely to be genuine.

Geographical area

Men and women who lived in St Petersburg and Moscow were significantly less likely to report poor health than those in the Central and North and North West areas, although this was partly explained by income and education. Differences in self-rated health between the three areas outside the main cities were not statistically significant. There were differences in mortality between some of the geographical areas. Men and women in Moscow and St Petersburg, had lower mortality than those in the Central area, and these relationships were explained by income and education. Differences between the other 3 areas were generally smaller, except that men in Siberia and the Far East had significantly lower mortality than those in the Central area, an association that was not explained by education and income (Table 5.21).

People living in rural areas were more likely to report poor health than urban dwellers, and this difference was significant amongst women. This association was partly

explained by income and education in both sexes (Table 5.21). Men in urban areas had non-significantly higher mortality than rural residents, a difference that was also explained by income and education. However, rural or urban residence was not associated with mortality in women (Table 5.22).

5.5.2 Health behaviour related risk factors in the population

Smoking and alcohol are common and important behavioural risk factors in Russia. RLMS collected data on current smoking status, as well as frequency of alcohol consumption during the last month, divided into none, once, two or three times, weekly, more than weekly. Binge drinking was measured, defined as the consumption of an average of the equivalent of at least 80g of pure alcohol on each occasion. The measurement of these variables is described in more detail in Section 4.3.3.

a. Distribution

(i) Smoking

62% of men and nearly 13% of women were current smokers (Table 5.23). Smoking was more common amongst men with less education and men in lower status occupations, although it was not related to income (Table 5.24). In women, however, smoking was more common in the higher income quintiles, and in the middle educational and occupational groups (Table 5.25).

(ii) Alcohol consumption

73% of men and 47% of women reported consuming alcohol at least once in the past month, and 19% of men and 3.5% of women reported drinking alcohol more than once a week (Table 5.23). 43% of men and 9% of women reported binge drinking, defined as consuming the equivalent of at least 80g of alcohol per occasion, during the last month (Table 5.23). A quarter of the men in this sample reported binge drinking at least once a week.

Table 5.23 Distribution of smoking and alcohol consumption (men and women)

	No (%) of respondents		
	Male	**Female**	**All**
Smoking			
Never smoked	1001 (19.5)	4878 (79.1)	5879 (52.0)
Current smoker	3202 (62.0)	822 (13.0)	4024 (36.0)
Ex smoker	935 (18.2)	468 (7.6)	1403 (12.4)
Number of respondents	*5138*	*6168*	*11306*
Frequency of alcohol intake			
No alcohol	1372 (27.0)	3289 (53.0)	4661 (41.0)
Once in last month	645 (12.0)	1164 (19.0)	1809 (16.0)
2-3 times in last month	1203 (23.3)	1086 (17.5)	2289 (20.1)
Once a week	981 (19.0)	452 (7.3)	1433 (12.6)
More than once a week	965 (18.7)	214 (3.5)	1179 (10.4)
Number of respondents	*5166*	*6205*	*11371*
Binge drinking (entry)			
No alcohol	1323 (25.8)	3204 (52.0)	4527 (40.1)
Drinker, no bingeing	1587 (30.9)	2389 (38.7)	3976 (35.2)
Binge drinker	2221 (43.3)	575 (9.3)	2796 (24.8)
Number of respondents	*5131*	*6168*	*11299*
Frequency of binge drinking (>80g per occasion)			
No alcohol	1323 (25.8)	3204 (51.9)	4527 (40.1)
Once in last month	285 (5.6)	146 (2.4)	431 (3.8)
2-3 times a month	673 (13.1)	227 (3.7)	900 (8.0)
Once a week	622 (12.1)	129 (2.1)	751 (6.6)
More than once a week	641 (12.5)	73 (1.2)	714 (6.3)
Alcohol, no bingeing	1587 (30.9)	2389 (38.7)	3976 (35.2)
Number of respondents	*5131*	*6168*	*11299*

Consuming alcohol more than once a week was more common amongst men in the higher income quintiles, but frequency of alcohol consumption did not vary greatly by occupation (Table 5.24). In women, drinking once a week or more was more common in the higher socioeconomic groups, in relation to education, job and income (Table 5.25).

Frequent drinking and binge drinking varied according to socioeconomic position in both sexes (Table 5.24 and Table 5.25). Binge drinking was more common amongst young and middle-aged men, and more common in manual workers than professionals, although the prevalence of binge drinking did not vary greatly by income or education.

Amongst women, binge drinking was more common in the youngest age groups and those with higher household incomes (Table 5.24 and Table 5.25).

Consumption of smaller quantities (less than the equivalent of 80g) of alcohol at a time was more common amongst both men and women in the higher educational, income and occupational groups. In nearly all of the socioeconomic groups the proportion of moderate drinkers was higher amongst women than men. The highest proportion of non-drinkers was amongst the lowest income quintiles.

Table 5.24 Distribution of smoking and alcohol consumption in relation to socioeconomic position in men

	Smoking	Drinking pattern		Drinking frequency
	Number (%) of current smokers	Binge drinker	Other (non-binge) drinker	Once a week or more
10 year age band	590 (66.5)	367 (41.4)	261 (29.4)	277 (31.0)
20-24	912 (71.5)	622 (48.9)	361 (28.4)	473 (36.9)
25-34	758 (67.7)	542 (48.5)	343 (30.7)	480 (42.6)
35-44	462 (62.2)	351 (47.3)	236 (31.8)	370 (49.5)
45-54	327 (50.8)	229 (35.6)	236 (36.7)	251 (38.9)
55-64	136 (37.9)	96 (26.8)	116 (32.4)	81 (22.5)
65-74	17 (18.1)	13 (13.8)	31 (33.0)	13 (13.7)
75-84	0 (0.0)	1 (6.7)	3 (20.0)	1 (6.3)
85+	3202	*2221*	*1587*	*1946*
P for trend	*<0.001*	*<0.001*	*0.004*	*0.40*
Education				
Primary/incomplete secondary	684 (21.4)	443 (20.0)	266 (16.8)	348 (17.9)
Complete secondary	1453 (45.5)	979 (44.1)	559 (35.3)	807 (41.6)
Higher	1059 (33.1)	797 (35.9)	758 (47.9)	787 (40.5)
No. of observations.	*3196*	*2219*	*1583*	*1942*
P for trend	*<0.001*	*0.09*	*<0.001*	*0.14*
Household income quintile				
1 (lowest)	515 (70.5)	332 (45.5)	165 (22.6)	226 (30.6)
2	563 (59.5)	407 (43.1)	285 (30.2)	333 (35.0)
3	614 (60.4)	427 (42.1)	326 (32.2)	367.(36.0)
4	654 (62.9)	446 (42.9)	339 (32.6)	422 (40.2)
5 (highest)	707 (62.0)	495 (43.5)	396 (34.8)	492 (43.0)
No. of observations..	*3053*	2107	1511	*1840*
P for trend	*0.04*	*0.53*	*<0.001*	*<0.001*
Occupation				
Higher prof./managerial	275 (45.8)	223 (37.2)	277 (46.2)	253 (42.1)
Tech/assoc. prof.	146 (57.3)	114 (44.7)	85 (33.3)	112 (43.8)
Clerical/service	138 (63.3)	79 (36.2)	87 (39.9)	88 (40.2)
Skilled agr/ craft/trade	737 (70.3)	518 (49.6)	319 (30.5)	457 (43.4)
Semi- and unskilled manual	934 (70.3)	661 (49.9)	351 (26.5)	522 (39.1)
No. of observations..	*2230*	*1595*	*1119*	*1432*
P for trend	*<0.001*	*<0.001*	*<0.001*	*0.21*

Table 5.25 Distribution of smoking and alcohol consumption in relation to socioeconomic position in women

	Smoking	Drinking pattern		Frequency of alcohol intake
	Number of current smokers (%)	Binge drinker (%)	Other (non-binge) drinker (%)	Once a week or more (%)
10 year age band				
20-24	226 (20.5)	139 (12.6)	435 (39.5)	152 (13.7)
25-34	276 (22.3)	168 (13.6)	575 (46.4)	188 (15.1)
35-44	162 (13.7)	129 (10.9)	569 (47.9)	138 (11.6)
45-54	115 (13.2)	83 (9.5)	393 (45.0)	110 (12.6)
55-64	31 (3.7)	34 (4.1)	262 (31.2)	59 (7.0)
65-74	6 (1.1)	15 (2.6)	109 (19.1)	9 (1.6)
75-84	5 (1.8)	6 (2.2)	38 (13.9)	7 (2.6)
85+	1 (1.2)	1 (1.2)	8 (9.9)	3 (3.5)
P for trend	822	*575*	*2389*	*666*
Education	*<0.001*	*<0.001*	*<0.001*	*<0.001*
Primary/incomplete secondary				
Complete secondary	110 (13.4)	69 (12.0)	299 (12.5)	84 (12.6)
Higher	343 (41.7)	227 (39.5)	662 (27.7)	203 (30.5)
No. of observations.	369 (44.9)	279 (48.5)	1426 (59.7)	378 (56.8)
P for trend	*822*	*575*	*2387*	*665*
Household income quintile	*0.63*	*0.27*	*<0.001*	*<0.001*
1 (lowest)				
2	108 (12.0)	84 (9.3)	270 (29.8)	73.0 (8.0)
3	127 (10.6)	102 (8.5)	377 (31.3)	89 (7.4)
4	133 (11.4)	89 (7.7)	459 (39.4)	110 (9.4)
5 (highest)	167 (14.1)	117 (9.9)	500 (42.2)	122 (10.2)
No. of observations..	204 (16.3)	135 (10.8)	595 (47.5)	205 (16.3)
P for trend	*739*	*527*	*2201*	*599*
Occupation	*<0.001*	*0.07*	*<0.001*	*<0.001*
Higher prof./managerial				
Tech/assoc. prof.	118 (14.2)	80 (9.6)	453 (54.3)	126 (15.1)
Clerical/service	104 (13.5)	83 (10.8)	381 (49.7)	105 (13.7)
Skilled agr/ craft/trade	167 (21.0)	100 (12.6)	375 (47.1)	125 (15.6)
Semi- and unskilled manual	33 (16.2)	27 (13.2)	104 (51.0)	21.0 (10.3)
No. of observations..	82 (12.7)	71 (11.0)	238 (36.8)	63 (9.7)
P for trend	*504*	*361*	*1551*	*440*
P for trend	*0.94*	*0.24*	*<0.001*	*0.003*

b. Association with health

In measuring the association between health behaviours and self-rated health and mortality, I used three models. The first was adjusted for age, and the second for age, income and education. A third, additional model adjusted for frequency of alcohol consumption, binge drinking and smoking and age. I used the third model to ascertain whether quantity or frequency of alcohol of consumption had a greater effect on

health, and also to differentiate the effects of smoking and alcohol on health, since people who drink are generally more likely to smoke [56].

(i) Smoking

Smoking was not associated with self-rated health (Table 5.26), but was significantly associated with mortality in both sexes, as was noted previously in the validation of the mortality data (Section 4.4.2). The association between smoking and mortality was independent of education and income (Table 5.27). The unadjusted mortality was approximately twice as high in current male smokers as in non-smokers, and in women it was nearly three times as high.

(ii) Alcohol frequency

Men and women who did not drink alcohol were significantly more likely to report poor health than men and women who drank once a month (Table 5.26). Men and women who drank alcohol 2-3 times a month or once a week were significantly less likely to report poor health than those who drank only once a month. These associations were not explained by education and income.

Men and women who did not drink alcohol also had significantly higher mortality than those who drank once a month. Men and women who drank alcohol more than once a week had a higher mortality than those who drank once a month, a difference that was significant in men (Table 5.27). The association between frequency of alcohol consumption and mortality was independent of income, education and binge drinking.

Binge drinking

Binge drinking was associated with better self-rated health in men, but not in women (Table 5.26). Binge drinking was associated with significantly higher mortality in women. The association in women was not explained by alcohol frequency, and was

only partly explained by income and education. Binge drinking was not significantly associated with mortality in men (Table 5.27).

Table 5.26 Association between self-rated health at entry and alcohol consumption and smoking in men and women (logistic regression analysis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)		
	(1) Age	(2) Binge drinking, alcohol frequency, age, smoking (drinkers only)	(3) Age, education and income
Male			
Alcohol frequency			
No alcohol	**1.84 (1.38-2.47)**	-	**1.85 (1.35-2.54)**
Once in last month	1	1	1
2-3 times a month	**0.66 (0.47-0.94)**	**0.67 (0.47-0.96)**	0.69 (0.47-1.01)
Once a week	**0.54 (0.37-0.80)**	**0.55 (0.38-0.81)**	**0.47 (0.30-0.71)**
More than once a week	0.83 (0.58-1.17)	0.84 (0.59-1.20)	0.92 (0.64-1.33)
Binge drinking alcohol (>80g per occasion)			
Drinker (non-binge drinker)	1	1	1
Binge drinker	0.88 (0.69-1.13)	0.93 (0.72-1.19)	**0.74 (0.57-0.97)**
Current smoker			
No	1	-	1
Yes	0.98 (0.81-1.19)	-	0.92 (0.74-1.14)
Female			
Alcohol frequency			
No alcohol	**1.42 (1.17-1.71)**	-	**1.26 (1.02-1.56)**
Once in last month	1	1	1
2-3 times a month	**0.75 (0.57-0.98)**	**0.74 (0.56-0.98)**	0.71 (0.52-0.96)
Once a week	**0.63 (0.42-0.94)**	**0.62 (0.41-0.93)**	**0.61 (0.39-0.95)**
More than once a week	0.92 (0.57-1.50)	0.90 (0.55-1.47)	0.88 (0.51-1.51)
Binge drinking alcohol (>80g per occasion)			
Drinker (non-binge drinker)	1	1	1
Binge drinker	1.04 (0.76-1.42)	1.12 (0.81-1.55)	0.94 (0.67-1.32)
Current smoker			
No	1	-	1
Yes	1.17 (0.90-1.50)	-	1.20 (0.89-1.61)

Income and education education (3 cats), household income per person (household income/ square root no. in household) quintile **N.B. All models adjust for age at entry and cluster by household**

Table 5.27 Association between mortality and alcohol consumption and smoking in men and women (Cox proportional hazards analysis)

	Cox proportional hazards ratio for death during study (95% confidence interval)		
	(1) Age	(2) Binge drinking, alcohol frequency, age, smoking (drinkers only)	(3) Age, education, income
Male			
Alcohol frequency			
No alcohol	**1.42 (1.05-1.93)**	-	**1.54 (1.11-2.15)**
Once in last month	1	1	1
2-3 times a month	1.02 (0.72-1.46)	1.02 (0.71-1.48)	1.14 (0.78-1.67)
Once a week	1.10 (0.77-1.56)	1.10 (0.76-1.58)	1.24 (0.85-1.83)
More than once a week	**1.93 (1.41-2.65)**	**1.94 (1.40-2.68)**	**2.19 (1.55-3.10)**
Binge drinking alcohol (>80g per occasion)			
Drinker (non-binge drinker)	1	1	1
Binge drinker	1.04 (0.83-1.30)	0.97 (0.77-1.22)	0.96 (0.76-1.22)
Current smoker			
No	1	-	1
Yes	**1.92 (1.58-2.34)**	-	**1.77 (1.43-2.19)**
Female			
Alcohol frequency			
No alcohol	**2.00 (1.34-3.00)**	-	**1.74 (1.14-2.65)**
Once in last month	1	1	1
2-3 times a month	1.27 (0.71-2.27)	1.18 (0.65-2.16)	1.41 (0.77-2.59)
Once a week	1.08 (0.47-2.52)	0.90 (0.38-2.15)	1.05 (0.43-2.55)
More than once a week	2.46 (0.97-6.24)	2.28 (0.93-5.58)	1.82 (0.78-4.23)
Binge drinking alcohol (>80g per occasion)			
Drinker (non-binge drinker)	1	1	1
Binge drinker	**2.08 (1.13-3.83)**	**2.01 (1.06-3.83)**	1.68 (0.89-3.20)
Current smoker			
No	1	-	1
Yes	**2.77 (1.68-4.56)**	-	**3.29 (1.99-5.46)**

Income and education education (3 cats), household income per person (household income/ square root no. in household) quintile **N.B. All models adjust for age at entry and cluster by household**

5.5.3 Satisfaction and optimism

Life satisfaction, and optimism about the household financial situation over the coming year were both measured using a five-point scale. The variables are described in more detail in Section 4.3.4.

a. Distribution

Levels of satisfaction and optimism were low in both men and women. Approximately 60% of men and women were rather or very dissatisfied with their lives (Table 5.28). Nearly 40% of men and women thought that their economic situation would worsen in the next 12 months, and only 25% of men and 30% of women thought that their economic situation would improve in the next 12 months (Table 5.28). As can be seen in this table, more respondents answered the question on life satisfaction than on optimism.

Table 5.28 Distribution of life satisfaction and optimism about the household economic situation

	Male	Female	All
Life satisfaction			
Very satisfied	254 (4.9)	207 (3.4)	461 (4.1)
Rather satisfied	723 (14.0)	749 (12.1)	1472 (13.0)
Yes and no	1145 (22.0)	1322 (21.4)	2467 (21.7)
Rather dissatisfied	1954 (37.7)	2410 (39.0)	4364 (38.4)
Very dissatisfied	1105 (21.0)	1490 (24.1)	2595 (22.9)
Number of respondents	*5181*	*6178*	*11359*
Belief about household economic situation in next 12 months			
Much better	210 (4.5)	153 (2.8)	363 (3.6)
Somewhat better	922 (20.0)	961 (17.0)	1883 (19.0)
No change	1822 (39.2)	2218 (40.2)	4040 (39.7)
Somewhat worse	848 (18.2)	1112 (20.2)	1960 (19.3)
Much worse	846 (18.2)	1075 (19.5)	1921 (18.9)
Number of respondents	*4648*	*5519*	*10167*

The correlations between life satisfaction and optimism and socioeconomic variables were shown in Table 5.10 and described in detail in Section 5.3.4. In summary,

satisfaction and optimism were closely correlated with each other (0.34), with perceived economic rank (0.38 and 0.34 respectively). Both satisfaction and optimism were only weakly correlated with individual and household income and with education.

Satisfaction and optimism both showed temporal change, fluctuating markedly over time during the 1990s in line with the economic climate. For example in 1998, the year of the rouble crisis, 33% of respondents thought they would be much worse off financially in the next year and 36% were very dissatisfied with their lives. However, by 2001 these percentages had reduced to 6% and 17% respectively (Figure 5.1, page 94).

b. Association with health

Lower life satisfaction and more negative beliefs about the household's economic situation over the next 12 months were both significantly associated with poor self-rated health in men and in women, and these associations were independent of education and income (Table 5.29). In contrast, life satisfaction and optimism were not associated with mortality in either sex (Table 5.30).

Table 5.29 Associations between life satisfaction, optimism and self-rated health (logistic regression analysis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)			
	Male		Female	
	(1) Age	(2) Age, income, education	(1) Age	(2) Age, income, education
Life satisfaction (5 point scale)				
Per unit (continuous – high to low)	**1.40 (1.27-1.54)**	**1.36 (1.22-1.50)**	**1.46 (1.35-1.58)**	**1.48 (1.36-1.61)**
Believes family's economic situation will be better or worse in next 12 months (5 point scale)				
Per unit (continuous – high to low)	**1.30 (1.18-1.44)**	**1.28 (1.15-1.42)**	**1.24 (1.15-1.34)**	**1.24 (1.14-1.34)**

Income and education education (3 cats), household income per person (household income/ square root no. in household) quintile **N.B. All models adjust for age at entry and cluster by household**

Table 5.30 Associations between life satisfaction, optimism and mortality (Cox proportional hazards analysis)

	Cox proportional hazards ratio for death during study (95% confidence interval)			
	Male		Female	
	(1) Age	(2) Age, income, education	(1) Age	(2) Age, income, education
Life satisfaction/dissatisfaction				
Per unit (continuous)	0.99 (0.91-1.08)	0.95 (0.87-1.04)	1.08 (0.98-1.19)	1.06 (0.95-1.18)
Believes family's economic situation will be better or worse in next 12 months				
Per unit (continuous)	1.04 (0.95-1.14)	1.00 (0.91-1.10)	1.02 (0.92-1.14)	1.02 (0.90-1.15)

Income and education education (3 cats), household income per person (household income/ square root no. in household) quintile **N.B. All models adjust for age at entry and cluster by household**

5.5.4. Social networks

The measure of social networks used in this study was whether the individual's household lent or borrowed money to or from family and or friends (Section 4.3.4). In this population sample 43 % of men and women belonged to households that lent or borrowed from family or friends, more commonly from family (Table 5.31).

a. Distribution

A higher percentage of people from higher socioeconomic groups (whether measured by education, income or occupational class) were in households that borrowed and lent to and from family and friends (Table 5.32). A higher proportion of young adults than older people belonged to households that borrowed and lent.

Table 5.31 Distribution of social networks (household borrowing and lending money from family or friends)

Household borrows or lends from family or friends	Number (%) of respondents
Neither	6516 (56.8)
Family only	3220 (28.1)
Friends only	873 (7.6)
Family and friends	863 (7.5)
Number of respondents	*11472*

Table 5.32 Distribution of social networks (lending or borrowing from family or friends) according to socioeconomic position

	Number (%) in households lending/borrowing from friends	Number (%) in households lending/borrowing from family
10 year age band		
20-24	298 (14.7)	849 (41.8)
25-34	417 (16.4)	1028 (40.4)
35-44	423 (18.1)	761 (32.5)
45-54	269 (16.4)	561 (34.1)
55-64	181 (12.1)	485 (32.3)
65-74	88 (9.4)	266 (28.4)
75-84	48 (13.0)	92 (24.9)
85+	12 (11.8)	41 (40.2)
No of obs	*1736*	*4083*
P for trend	*<0.001*	*<0.001*
Education		
Primary or incomplete secondary	225 (13.0)	708 (17.4)
Complete secondary	549 (31.7)	1375 (33.7)
Higher	959 (55.3)	1993 (48.9)
No of obs	*1733*	*4076*
P value (age adjusted)	*<0.001*	*<0.001*
Household income quintile		
1 (lowest)	132 (8.0)	445 (26.8)
2	221 (10.2)	720 (33.1)
3	282 (12.8)	879 (39.8)
4	369 (16.3)	858 (38.0)
5 (highest)	585 (24.1)	954 (39.2)
No of obs	*1589*	*3856*
P value (age adjusted)	*<0.001*	*<0.001*
Occupational class		
Higher prof./managerial	327 (22.6)	588 (40.7)
Tech./associate prof.	202 (19.6)	412 (39.9)
Clerical/service workers	178 (17.4)	393 (38.3)
Skilled agr./craft/trades	172 (13.6)	447 (35.3)
Semi and unskilled manual	264 (13.2)	705 (35.3)
No of obs	*1143*	*2545*
P value (age adjusted)	*<0.001*	*<0.001*

b. Association with health

In men, belonging to a household that lent to or borrowed from both family and friends was associated with significantly lower risk of poor self-rated health, although this association was attenuated by education and income. In women, however, borrowing from friends or family was associated with a significantly higher risk of poor self-rated health, even after controlling for education and income (Table 5.33).

Table 5.33 Association between self-rated health at entry and social networks (borrowing and lending) in men and women (regression analysis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)			
	Male		Female	
	(1) Age	(2)Age, income education	(1) Age	(2) Age, income education
Networks (borrowing and lending)				
Neither friends nor family	1	1	1	1
Family only	0.82 (0.66-1.02)	0.83 (0.65-1.06)	1.08 (0.92-1.28)	1.13 (0.94-1.35)
Friends only	0.96 (0.67-1.39)	1.10 (0.73-1.66)	1.30 (0.99-1.70)	**1.49 (1.11-2.00)**
Family and friends	**0.64 (0.40-1.00)**	0.85 (0.53-1.37)	1.06 (0.77-1.44)	1.12 (0.80-1.55)

Income and education education (3 cats), household income per person (household income/ square root no. in household) quintile **N.B. All models adjust for age at entry and cluster by household**

Borrowing and lending from family or friends was strongly but non-significantly protective against mortality in men, although not in women. In men the association was largely explained by education and income (Table 5.34).

Table 5.34 Association between mortality and social networks (borrowing and lending) in men and women (Cox proportional hazards analysis)

	Cox proportional hazards ratio for death during study (95% confidence interval)			
	Male		Female	
	(1) Age	(2) Age, income, education	(1) Age	(2) Age, income, education
Networks (borrowing and lending)				
Neither friends nor family	1	1	1	1
Family only	0.85 (0.69-1.05)	0.90 (0.72-1.12)	0.99 (0.78-1.26)	1.03 (0.79-1.35)
Friends only	0.97 (0.68-1.39)	1.06 (0.72-1.56)	1.10 (0.73-1.65)	1.27 (0.79-2.03)
Family and friends	0.67 (0.42-1.07)	0.80 (0.50-1.29)	1.02 (0.64-1.61)	1.10 (0.64-1.87)

Income and education education (3 cats), household income per person (household income/ square root no. in household) quintile **N.B. All models adjust for age at entry and cluster by household**

5.5.5 Measures of material wellbeing

Several measures of material wellbeing were derived from the RLMS dataset. These were number of household consumer goods, selling household consumer goods for food or clothing, number of household amenities (central heating, central water supply, running hot water, central gas supply, central sewerage) and quintile for living space. These measures are described in more detail in Section 4.3.2.

a. Distribution

Consumer goods

Fifty per cent of respondents lived in a household that owned 3 or more consumer goods, which here were a washing machine, colour TV, VCR, dacha and car. However, more than 7% lived in a household that owned none of these items.

Table 5.35 Ownership of household consumer goods

Number of consumer goods (washing machine, colour TV, VCR, dacha, car) owned by the household	Number (%) of respondents
0	635 (7.1)
1	1270 (14.3)
2	2596 (29.2)
3	2338 (26.3)
4	1529 (17.2)
5	527 (5.9)
Total number of respondents	*8895*

The number of consumer goods was correlated with several socioeconomic variables (Table 5.10, Section 5.3.4). In summary the variables with which it was most strongly correlated were household income (r=0.37 in men) and expenditure (r=0.44). Number of consumer goods was correlated moderately with education (r=0.22) and occupational class (r=0.21). The number of consumer goods owned by the household was only weakly associated with optimism and life satisfaction (r=0.09 and 0.10 respectively) and subjective power and economic status (r=0.14 each), although all these correlations were statistically significant.

Approximately 3 percent of respondents said that their household had sold consumer goods to pay for food or clothes, and this figure was similar amongst respondents in each income quintile (data not shown).

Household amenities

Approximately half the respondents lived in homes that had 5 basic household amenities, but 14% lived in households that had none (Table 5.36). Household amenities varied dramatically by location of residence. Nearly half of rural residents had none of these amenities, whereas nearly 70% of urban dwellers had all five. The number of household amenities was correlated with the number of consumer goods (r=0.23), household income (r=0.18) and education (r=0.22) (Table 5.10).

Table 5.36 Distribution of household amenities

Number of household amenities*	All respondents (%)	Urban residents (%)	Rural residents (%)
0	1595 (14.0)	364 (4.4)	1161 (47.2)
1	833 (7.3)	312 (3.8)	481 (19.6)
2	697 (6.1)	367 (4.5)	295 (1.0)
3	534 (4.7)	324 (4.0)	167 (6.8)
4	1470 (12.9)	1229 (15.0)	173 (7.0)
5	6235 (54.9)	5596 (68.3)	181 (7.4)
Total respondents	11364 (100)	8192 (100)	2458 (100)

**5 household amenities: central heating, central water supply, running hot water, central gas supply, central sewerage*

Living space per person

Living space per person (based on 9,849 responses) was not correlated with socioeconomic or other material variables. However, it was inversely correlated with self-rated health (r= -0.15) and positively correlated with increasing age (r=0.26) (Section 5.3.4 and Table 5.10). The mean amount of living space per person did not differ greatly between urban dwellers (15.7) and rural residents (16.9).

b. Association with health

Consumer goods

Ownership of an increasing number of household consumer goods was associated with a significantly lower risk of poor self-rated health in both sexes, even after adjusting for all income and education (Table 5.37). Ownership of consumer goods

was not associated with mortality in men. In women, a higher number of goods was associated with higher mortality, significantly so in the multivariate model (Table 5.38).

Selling consumer goods

Selling household consumer goods for food or clothes was associated with poor self-rated health in both sexes. This association was significant in men, and was not explained by income and education (Table 5.37). Selling consumer goods was also associated with significantly higher mortality in men, and non-significantly higher mortality in women. Again the association was independent of income and education (Table 5.38).

Household amenities

Men and women with a greater number of household amenities were less likely to report poor health, significantly so in women. This association was explained by income and education, fully in men and partly in women (Table 5.37). Men with a greater number of household amenities experienced significantly lower mortality, but this association was partly explained by income and education. In women, the number of household amenities was not significantly associated with mortality (Table 5.38).

Living space

Living space was significantly correlated with age, but not with socioeconomic position (Table 5.10). Living space per person was not significantly associated with poor self-rated health in either sex. A greater amount of living space was associated with lower mortality, significantly so in women. This association was largely explained by education and income

Table 5.37 Association between self-rated health at entry and material conditions in men and women (regression analysis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)			
	Male		Female	
	(1) Age	(2) Age, income, education	(1) Age	(2) Age, income, education
Sold consumer goods for food/clothes				
No	1	1	1	1
Yes	**1.65 (1.07-2.54)**	**1.73 (1.05-2.85)**	1.43 (1.00-2.05)	1.40 (0.94-2.08)
Number of household consumer goods (0-5)				
Change per unit (per good)	**0.80 (0.74-0.88)**	**0.85 (0.76-0.94)**	**0.88 (0.82-0.94)**	**0.88 (0.81-0.95)**
Number of household amenities (central heating, water, gas and sewerage and hot water)				
Per unit increase	0.96 (0.92-1.00)	1.00 (0.95-1.05)	**0.94 (0.91-0.97)**	0.96 (0.92-1.00)
Living space per person (m^2) – quintiles				
Change per quintile	0.99 (0.92-1.07)	1.01 (1.00-1.02)	0.98 (0.93-1.04)	1.00 (0.99-1.01)

Income and education: Education (3 cats), household income per person (household income/ square root no. in household) quintile **N.B. All models adjust for age at entry and cluster by household**

Table 5.38 Association between mortality and material conditions in men and women (Cox proportional hazards analysis)

	Cox proportional hazards ratio for death during study (95% confidence interval)			
	Male		Female	
	(1) Age	(2) Age, income, education	(1) Age	(2) Age, income, education
Sold consumer goods for food/clothes				
No	1	1	1	1
Yes	**1.75 (1.17-2.63)**	**1.88 (1.21-2.92)**	1.59 (0.92-2.74)	1.41 (0.79-2.52)
Number of household consumer goods (0-5)				
Change per unit (per good)	0.91 (0.83-1.01)	0.95 (0.86-1.06)	1.09 (0.99-1.20)	**1.15 (1.01-1.29)**
Number of household amenities (central heating, water, gas and sewerage and hot water)				
Per unit increase	**0.95 (0.91-0.99)**	0.98 (0.94-1.03)	1.03 (0.98-1.08)	1.06 (1.00-1.12)
Living space per person (m^2) – quintiles				
Change per quintile	0.95 (0.88-1.02)	1.00 (0.99-1.01)	**0.82 (0.75-0.88)**	**0.97 (0.96-0.99)**

Income and education: Education (3 cats), household income per person (household income/ square root no. in household) quintile **N.B. All models adjust for age at entry and cluster by household**

5.5.6 Discussion

Several variables were associated with both socioeconomic position and with mortality or self-rated health, and could therefore potentially explain the associations between socioeconomic position and health. Although these explanatory variables are not the primary focus of this thesis, some interesting findings emerged which merit further discussion.

Marital status

In this study, a much higher proportion of women than men were widowed and, together with the high proportion of women in the older age groups, this illustrates the high rate of premature male deaths in Russia and the well recognised phenomenon of 'missing men'[44]. Widowhood was more common in women with less education. This could have been partly because the mean age of women with an incomplete secondary education was higher than that of men (57 years compared with 42 years). It may also be partly because less educated widows had been married to men with less education, who experience higher premature mortality[2], since many studies in different countries have shown that people select spouses who have a similar education [23].

The higher mortality of divorced and single men, and the worse self-rated health of single men, compared with those who were married is consistent with the well-established protective effect of marriage on health outcomes, especially mortality [146]. Single person households were excluded from the final data analysis, though , and this might in theory have affected the risk of mortality associated with marital status, since people who live alone are generally not married. However, the sensitivity analysis (Section 4.6.1), showed that when single person households were included, divorce and singleness in men were still significantly associated with mortality, and that the odds of mortality were similar in the model which adjusted for household size to the model here which excluded single person households. The association between widowhood and mortality in women was stronger when single person households

were excluded, but as stated in Chapter 4, this is probably because of under-reporting of deaths in single person households, many of which consisted of widows. Therefore divorce and singleness in men were almost certainly associated with increased mortality, and it is likely that widowhood in women was also associated with increased mortality. Unmarried people, whether single, divorced and widowed, were more likely to leave the study than those who were married (Section 4.5), and this may mean that the protective effect of marriage against death may be greater than these figures suggest. Information was recorded about household size at entry, but not in the round before death, and so household size could have changed, and this could affect the reporting accuracy if people were living alone just before the time of death.

The divorce rate has increased further in Russia since the transition to 3.7 per 1,000 population in 1999, one of the highest rates in the world. The ratio of divorces to new marriage has increased, but the marriage rate is declining with a greater trend towards cohabitation[12]. Cohabiting relationships are not officially recorded and may be less permanent than marriage, so the true rate of relationship breakdown may differ from the official divorce statistics. Widowhood in women is also increasing, due to the increase in premature deaths amongst middle-aged men mean that there are many more widows. The increasing number of widowed and divorced people in the population, together with the association between these marital states and mortality, mean that widowhood and divorce may themselves may have an increasing impact on mortality in the Russian population as a whole.

Geographical area

Median household income, unsurprisingly, was significantly higher amongst residents of the principal cities of Moscow and St Petersburg. Differences in incomes between the other regions were harder to interpret. The regional differences in poor self-rated health may be related to broad socioeconomic conditions, since self-rated health was generally better in the areas with a higher median income, notably Moscow and St Petersburg and the associations between region and self-rated health were partly explained by education and income.

Again, it was difficult to interpret the differences in health between the other, somewhat large, regions of Russia, particularly the low mortality amongst men in Siberia and the Far East. Differences in health were not explained whether the area was urban or rural, neither were the associations between urban or rural area and health explained by region (data not shown). A more detailed knowledge of these regions, and the individual study centres within them, would be required to understand how features of these areas and communities might influence health and mortality. It has been shown in Russia that mortality is higher in areas with less social cohesion, indicated by high unemployment, crime, and divorce rates, and it is possible that these vary between study centres in RLMS [45].

Smoking

These data confirm the high prevalence of smoking amongst men and the low prevalence in women (62% and 13% of respectively), comparable to rates of 62% of men and 14% of women in a 1996 national survey [17]. However the prevalence of smoking in RLMS was slightly higher than in a St Petersburg cohort from the 1980s where only 54% of men smoked [2].

The pattern of smoking in Russia, where the rates of smoking is high in men and lower in women, is very different from the West, where smoking prevalence is typically intermediate and similar in both sexes (for example in the UK 29% of men and 26% of women smoke [147]). Two findings in this study suggest that the pattern of smoking in Russia may be changing, though. First, smoking was less common amongst men in the higher educational and occupational categories, although the difference in prevalence was relatively small [148], and smoking prevalence in the West is higher in the manual than the professional classes [149]. Data from St Petersburg also indicate a gradual reduction in smoking in men – 58.3% of men in a cohort screened in 1975-7 smoked, compared with 54.7% of a cohort screened in 1985-88 [2]. Second, smoking was more common amongst the youngest adult women, which may represent a cohort effect in which smoking in women is increasing.

The strong, independent association between smoking and subsequent mortality in both sexes is consistent with Bobak and Murphy's study of sibling data, which found that mortality in current male and female smokers was approximately twice as high as in never-smokers [138].

Smoking was not associated with poor self-rated health, despite its strong association with mortality. Deaths amongst smokers could therefore be preceded by a rapid decline in health.

Alcohol

The prevalence of alcohol consumption in this study was comparable with the 1996 New Russia Barometer survey where 70% of men and 30% of women reported consuming alcohol in the last month [17]. Nineteen percent of men and 3.5% of women reported drinking alcohol more than once a week, compared with 10% of men and 2% of women who drank alcohol several times a week in the NRB.[56] The rates of binge drinking were similar in RLMS (43% of men and 9% of women) to both the NRB (47% of men and 9% of women) [56] and a Siberian study from the 1980s and 1990s (55% of men) [150]. The high rates of frequent alcohol consumption and of binge drinking amongst men are as expected and fit in with what is known about an established cultural pattern[8].

However, several findings here suggest that the pattern of alcohol consumption in Russia may be changing towards a more Western pattern. Moderate (non-binge) drinking was more common amongst university educated professional men; and frequent and moderate drinking were both common in high-income groups. This differs from the findings of Bobak where there was no significant variation in either alcohol frequency or binge drinking by education or material deprivation [56].

Binge drinking in women was more common amongst the younger age groups, as noted by others [56]. One previous Russian study suggested that women may under-report alcohol consumption, more so than men [49]. If this is the case, the true

proportion of women who binge drinking or drinking more than once a week could be higher than recorded here.

Findings from this survey suggest that there may be three principal patterns of alcohol consumption, the traditional predominantly male binge drinking, moderate drinking by professionals (although many professional men still binge drink), and binge drinking amongst younger, more wealthy women.

In general, increasing frequency of alcohol consumption was associated with a lower likelihood of poor self-rated health but higher mortality than drinking once a month.

Men and women who had not consumed alcohol in the last month had both worse self-rated health and significantly higher mortality than moderate drinkers. The higher mortality in non-drinkers and frequent drinkers is broadly consistent with the 'J shaped curve' found in many other studies where moderate alcohol consumption was associated with the lowest mortality, although many of the other studies measured quantity rather than frequency of alcohol consumption [54].

In RLMS, however, the mortality curve in relation to alcohol consumption was U-shaped rather than J-shaped, where non-drinkers experienced similar mortality to people who drank more than once a week. In this study the distribution of self-rated health in relation to alcohol consumption formed a 'reverse J-shaped curve' where self-rated health may be worse in non-drinkers than heavy drinkers. This finding is not dissimilar to a U-shaped curve noted in another study in Russia [151]. One reason for the relatively good self-rated health in frequent drinkers, despite higher mortality, is that alcohol consumption is used by Russian men as a coping strategy since it "helps them forget everyday cares and difficulties" [152]. Therefore health concerns may be forgotten, but the adverse physical consequences of frequent alcohol consumption remain.

Non-drinkers experienced a higher risk of poor self-rated health and mortality than moderate (non-binge) drinkers. This may be because some were former heavy drinkers who had become too ill to drink. The highest proportion of non-drinkers was amongst the lowest income quintiles, and this may be because older people, who had

lower incomes, drank less. However, age did not explain the association between alcohol and mortality. Non-drinkers could have experienced material disadvantage, since the highest proportion of non-drinkers was amongst those with the lowest socioeconomic position, and the rate of alcohol consumption in this study population was lower in 1998, the year of the 'rouble crisis', than in 1996 or 2000. However, education and income did not explain the association. It is possible that people in poor health may have chosen not to drink, but this cannot be studied in these data.

One disadvantage of RLMS was that it did not differentiate between respondents who drank less than once a month and those who abstained completely. In the New Russia Barometer 20.5% of men and 35.5% of women drank less than once a month, and an additional 9.5% of men and 34.5% of women never drank alcohol. It is possible that there were differences between very infrequent drinkers and non-drinkers that could not be studied in RLMS.

In men, binge drinking was more weakly associated with mortality than was frequency of alcohol consumption, similar to findings in a Siberian study [150]. This does not fit with the theory that the high rate of sudden cardiovascular deaths in men during the 1990s was due to cardiac arrhythmias which followed the consumption of a large amount of alcohol on an individual occasion [143]. However, in women binge drinking was much more strongly associated with mortality. The definition of binge drinking (80g alcohol per occasion) was the same as has been used in other studies [150]. However, it is possible that men may have needed to consume a greater quantity of alcohol to experience the same increase in mortality as women who drank 80g.

In ecological studies, alcohol consumption (measured by sales) in Russia increased during the early 1990s, and fluctuated in line with the changes in national mortality rates (Figure 2.2). However, in contrast, the prevalence of binge drinking and weekly alcohol consumption amongst respondents in RLMS was stable throughout the study period, and in 1998 (the year of the 'rouble crisis', and of a peak in mortality) the prevalence was slightly lower than in other years (Figure 5.1). Although alcohol consumption was independently associated with mortality, the stability of alcohol consumption during the 1990s makes the role of alcohol in the mortality crisis appear less certain.

Satisfaction and optimism

The low levels of life satisfaction in this study were comparable with data from the 1995 World Values Survey where only 38% of Russians were satisfied with their lives (in fact this figure had fallen from 70% in 1981 and 48% in 1991) [18]. The prevalence of low life satisfaction and optimism fluctuated between individual study rounds (Figure 5.1) in line with changes in median income, and were much less stable than self-rated health. However, adjusting for year of entry did not affect the association between life satisfaction and self-rated health or mortality (data not shown).

The strong associations between life satisfaction, optimism and self-rated health were unsurprising since they were closely correlated (Table 5.10). Each of these variables measures some aspect of personal satisfaction, and all are self-reported and therefore subject to cross-contamination. These relationships will be discussed further in Chapter 8.

Networks

People with higher education and income were more likely to belong to households that borrowed or lent from family or friends, in contrast with findings from qualitative research where more advantaged people lost more of their social networks during the transition [11;35]. However, the RLMS investigators noted that more wealthy households were less likely to respond in each round, and were more likely to move away during the course of the study[7], and this could have influenced the results.

Belonging to a household that borrowed or lent from others was protective of self-rated health in men, but otherwise had little effect on self-rated health and mortality. The weak and inconsistent associations between social networks and health contrast with Rose's finding of a protective effect of social support on health in Russia [17]. In that study, men and women who relied on informal sources support (from friends or family) were significantly less likely to report poor health than those who relied on formal (statutory) sources[17]. However, the findings may differ between the two studies because of differences in the way social support was measured. Borrowing and

lending was the best available measure available within RLMS data, and is in theory a key function of social networks in Russia [11]. However, it is possible that this measure may not capture the protective function of social support on health in the same way as sources of support [17]. Selecting an appropriate measure of social support in Russia is not entirely straightforward. Western measures such as membership of societies and clubs or political parties are not generally helpful, since such activities are not widespread in Russia [34].

There are other possible explanations for differences between the sexes in protective effect of networks on health. Women who borrowed and lent experienced worse self-rated health, which could have been because they were more vulnerable in some way, and had a need to rely on others. However, the prevalence of borrowing and lending did not vary by sex. Borrowing and lending was measured at household level, and may not reflect characteristics of individuals within households.

Social networks in Russia are known to vary according to both sex and socioeconomic position. Men's networks are predominantly based on employment associates and are often used to find jobs. Women's networks are based on home and neighbourhood and are used more often for social support [153]. Networks in Russia often consist of people with a similar socioeconomic status, so that materially disadvantaged people associate with others who are equally disadvantaged [153]. It is therefore possible that the benefits of network membership vary according to sex and socioeconomic position.

Material measures

A greater proportion of respondents in RLMS owned household consumer goods than in the 1996 New Russia Barometer survey [17], in which 17% of households had neither a car, TV or video, and 11% had all three. This could reflect temporal changes over the 8 year period of RLMS.

Ownership of an increasing number of household consumer goods was significantly associated with self-rated health, independently of income and education. This was

consistent with the findings of Pikhart et al [154], based on data from the New Russia Barometer [17], where ownership of luxury goods (unlike non-luxury items) was associated with self-rated health independently of material conditions. In contrast, ownership of household consumer goods in RLMS was not associated with mortality, although this differed from findings in a study based on widowhood data, where a greater number of consumer goods was associated with significantly lower mortality[145].

It has been proposed that ownership of household consumer goods influences health through a psychosocial mechanism related to social participation [154;155]. In support of this theory, the association between ownership of household consumer goods and self-rated health in RLMS was independent of material factors. The association was also independent of satisfaction and optimism (data not shown), suggesting that the social participation [154], or other form of positive feeling related to ownership of consumer goods, did not influence health simply through satisfaction.

However, these data do not fully support the theory that ownership of consumer goods influences health through social participation. First, the number of household consumer goods was more strongly correlated with objective measures of socioeconomic position such as income, education and occupation, than with subjective social status, satisfaction or optimism. This suggests that the number of household consumer goods in RLMS was in part an indicator of material wellbeing. Second, although ownership of consumer goods in RLMS was associated with self-rated health, it was not associated with the more objective outcome of mortality.

Selling consumer goods for food or clothes was strongly associated with mortality. The proportion of those who sold goods (between 3.5 and 4%) was similar in all income quintiles. Nearly 5% of respondents' households sold goods in 1994, a bad year for the Russian economy, compared with only 2% in 2000, a year when there had been economic improvement.

It is possible that selling goods could correspond with a particular crisis in the household, perhaps a health or financial crisis. In support of this, men were more likely to sell consumer goods if they were in poor health both at entry and at round 2

[OR 2.46 (1.06-5.70)], or if their health declined from good or average to poor in Round 2 [OR 2.76 (1.06-7.17)] than men whose health was good or average throughout. The same associations were present in women, but these associations were not statistically significant [1.43 (0.71-2.87) and 1.27 (0.65-2.48) respectively].

It seems that the pathway between material disadvantage and self-rated health can operate in both directions, and that selling consumer goods could occur in response to a crisis, such as illness or a financial crisis, especially if the man, who earns a higher proportion of the household income, is affected.

The inconsistent association between number of household amenities and health and mortality was surprising, since the amenities recorded were fairly basic. Although number of household amenities was strongly associated with rural location of residence, adjusting for this had little effect on the associations between household amenities and self-rated health and mortality (data not shown).

The correlation between living space and self-rated health is likely to be because both variables were strongly correlated with increasing age (in the case of self-rated health this was a negative correlation). After adjusting for age, living space was not associated with self-rated health or mortality.

Overall, the associations between the different measures of material wellbeing and self-rated health and mortality followed quite different patterns. Number of household consumer goods was strongly associated with self-rated health, whereas selling consumer goods and living space per person were more strongly associated with mortality.

5.6 Associations between socioeconomic position, self-rated health and mortality using multivariate models

In this section I present more detailed multivariate analyses of the associations between socioeconomic position and mortality. I describe the process of constructing the multivariate models, with the incorporation of the selected variables that may mediate or modify the relationships. I then present the findings of the analyses.

5.6.1 Construction of the multivariate models

Predictor variables

I selected several measures of socioeconomic position to use in multivariate analyses. In order to study different types of measure, I selected education, occupation, a financial measure, and measures of subjective social status. I selected the latter two measures as follows.

As the financial measure of socioeconomic position, I selected household income per person. Household income was more strongly associated with self-rated health and mortality than was expenditure. I chose household rather than individual income because many individuals had no individual income, and this group had different health outcomes to people in the lowest individual income quintile. However, comparing the explanatory variables for the associations between wage based and non-wage based income and health would have been interesting. I did not select expenditure, since it was more weakly associated than income with health.

Of the subjective measures, I selected self-rated power and economic status for use in further analyses, as well as a composite measure of economic, power and respect, since these were the variables that were most strongly associated with self-rated health, and to a lesser extent mortality.

Selection of covariates

On the basis of the results presented so far, I selected several variables that might explain the associations between socioeconomic position and health to include in multivariate analyses. The principal "exposure" variables in these analyses were the selected measures of socioeconomic position which were household income per person, education and occupation. As in previous analyses, the outcome variables were self-rated health and mortality. All models were adjusted for age, and for clustering by household.

The selection process is summarised in Table 5.39. I selected potential explanatory variables which were (a) associated with socioeconomic position, and (b) associated with either self-rated health or mortality. Variables that met both these criteria might explain the relationships between socioeconomic position and health.

Geographical area and marital status were associated with both socioeconomic position (measured by income and education respectively) and self-rated health, and I therefore included them in multivariate analyses of the relationships between socioeconomic position and health.

I included smoking, which was associated with mortality and education, and frequency of alcohol intake, which was associated with socioeconomic position, self-rated health and mortality. However, I omitted binge drinking since it was associated more weakly with self-rated health and mortality in men than alcohol frequency.

Life satisfaction and optimism were strongly associated with self-rated health (although not with mortality), and were significantly correlated with income. Satisfaction was also correlated with self-rated health. I therefore included satisfaction and optimism in the multivariate analyses. Although social networks (as measured by household borrowing and lending) were associated with socioeconomic position, their associations with mortality and self-rated health were generally weak, and so I excluded them.

Table 5.39 Selection of variables to include in the multivariate analyses

Variable	Associated with self-rated health or mortality?	Associated with socioeconomic position?	Include in multivariate analyses?	Comment
Smoking	Yes (mortality)	Yes	Yes	
Alcohol frequency	Yes (both)	Yes	Yes	
Binge drinking	Mortality (women only)	Yes	No	Association with health inconsistent (weaker than alcohol frequency)
Marital status	Yes (both)	Yes	Yes	
Geographical area	Yes	Yes	Yes	
Rural or urban	No	Yes	No	
Number of consumer goods	Yes (s-r health)	Yes	Yes	
Selling consumer goods	Yes (both, esp in men)	Yes	Yes	
Quintile for living space	Weakly protective for mort in women, otherwise no	No	No	
Number of household amenities	Yes	Yes	Yes	
Life satisfaction	Yes (s-r health)	Yes	Yes	
Optimism	Yes (s-r health)	Yes	Yes	
Social networks	No (weakly protective in men)	Yes	No	Effects on health weak.
Wage arrears	Yes (s-r health)	Yes	Yes	
Compulsory leave	Yes (s-r health and mortality in women)	Yes	Yes	
Payment in goods	Yes (mortality in men)	Yes	Yes	
Perceived job insecurity	Yes	Yes	Yes	
Unemployment	Yes	Yes	....	

I included number of household consumer goods and household amenities, which were both strongly associated with self-rated health and were also correlated with income and education. However, I excluded living space per person, since this was not associated with socioeconomic position, self-rated health or mortality. As stated above, there is some debate as to whether these variables, especially ownership of consumer goods, are material or psychosocial, but they will be used in a single model, although the results will be discussed in the context of this debate.

Unemployment and variables associated with insecure employment (wage arrears, compulsory leave, payment in goods and job insecurity) are considered in Section 5.9.

Self-rated health was associated with mortality (Section 5.3.2). I included this in a separate model, since there is some uncertainty as to whether it is an intermediary rather than a confounder in the associations between other variables and mortality.

Construction of models

From the selected variables, I constructed 5 basic multivariate models for the association between socioeconomic position and health (Table 5.40). As previously described, the predictor variables were income and education, occupation, subjective power and economic status, and a combined measure of subjective social status. The outcome variables, as before, were self-rated health and mortality. To ensure that the models for both mortality and self-rated health were comparable, I included the same covariates in both sets of models.

Table 5.40 Multivariate models of the associations between socioeconomic position, self-rated health and mortality

Model	Covariates [§]	Variable of interest
1A	Age	Income Or Education Or Subjective social status (or Occupation – in the employed population)
1B	Age and self-rated health (where mortality was the outcome)	
2	Alcohol frequency and smoking	
3	Life satisfaction, optimism	
4	Education and income*	
5	Education and income*, material conditions, geographic area	
6	Education and income*, material conditions, geographic area, alcohol consumption, smoking, life satisfaction and optimism*	

[§] Each model adjusted for age and clustering by household,
*Each model adjusts for measures of socioeconomic position other than the variable of interest. Occupation was also included in analyses of the employed population.

Model 1A was adjusted for age and clustering alone, and formed a baseline. In the case of the other models, similar variables were grouped together (Table 5.40). Model 6 was a composite of the other models. Two additional models with employment-related variables are described in the section relating to the employed population. Each model was adjusted for age, and for clustering by household to take into account

the possible similarities between individuals in a household that could influence their health.

5.6.2 Objective measures of socioeconomic position

In this section I describe the associations between objective measures of socioeconomic position (household income quintile and education) and self-rated health and mortality (Table 5.41 and Table 5.42).

Education

Lower educational attainment was significantly associated with poor self-rated health in the simpler models (Table 5.17) earlier in the chapter. More detailed multivariate analyses now showed that the educational gradient was independent of health behaviours, satisfaction and optimism in both sexes. In men the gradient was independent of material factors. In women material measures explained the gradient almost entirely (Table 5.41), and further analysis showed that it was number of consumer goods that was the strongest explanatory variable (full data not shown).

Earlier analyses also showed that education was even more strongly and significantly associated with mortality (Table 5.18)). The educational mortality gradient was independent of behavioural risk factors, satisfaction and optimism and material factors in both sexes (Table 5.42). In men, the mortality gradient was partly reduced by material factors, although this was not the case in women.

Household income

A significant trend in the association between household income and poor self-rated health was noted earlier. This was present in both sexes, and was independent of education (Table 5.17). Further multivariate analyses showed that the effect of income on self-rated health was attenuated after adjusting for material factors (Table 5.41).

Table 5.41 Association between self-rated health at entry, education and income in the general population (logistic regression analysis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)					
	(1) Age	(2) Age, alcohol and smoking	(3) Age, satisfaction, optimism,	(4) Age, income, education	(5) = (4) plus geographic and material factors	(6) = (2)-(5) combined
Male						
Education						
Primary/incomplete secondary	**1.33 (1.00-1.77)**	**1.34 (1.01-1.78)**	1.26 (0.94-1.67)	1.30 (0.97-1.75)	1.30 (0.93-1.82)	1.21 (0.84-1.75)
Complete secondary	1	1	1	1	1	1
Higher	0.79 (0.61-1.03)	0.80 (0.61-1.04)	0.80 (0.61-1.05)	0.81 (0.61-1.06)	0.76 (0.56-1.05)	0.73 (0.52-1.04)
Continuous	**0.77 (0.69-0.87)**	**0.77 (0.69-0.87)**	**0.80 (0.71-0.90)**	**0.79 (0.70-0.89)**	**0.77 (0.66-0.89)**	**0.78 (0.65-0.92)**
Household income quintile (hh income/ square root no. in hh)						
1 (lowest)	**1.64 (1.21-2.22)**	**1.58 (1.16-2.15)**	**1.59 (1.15-2.20)**	**1.54 (1.14-2.09)**	**1.48 (1.03-2.13)**	1.44 (0.97-2.12)
2	**1.21 (0.90-1.63)**	1.21 (0.89-1.63)	1.26 (0.92-1.73)	1.17 (0.86-1.58)	1.12 (0.78-1.60)	1.14 (0.78-1.66)
3	1	1	1	1	1	1
4	**1.06 (0.79-1.44)**	1.05 (0.77-1.42)	1.12 (0.81-1.55)	1.09 (0.81-1.48)	1.11 (0.77-1.60)	1.14 (0.76-1.71)
5 (highest)	**0.68 (0.49-0.95)**	**0.69 (0.49-0.96)**	0.79 (0.55-1.13)	0.71 (0.51-1.00)	0.91 (0.62-1.34)	1.08 (0.71-1.64)
Change per unit (quintile)	**0.83 (0.77-0.89)**	**0.84 (0.78-0.90)**	**0.86 (0.80-0.93)**	**0.85 (0.80-0.92)**	**0.91 (0.83-0.99)**	0.94 (0.85-1.04)
Female						
Education						
Primary/incomplete secondary	1.24 (0.98-1.56)	1.22 (0.97-1.54)	1.18 (0.92-1.51)	1.19 (0.93-1.51)	0.93 (0.70-1.24)	0.85 (0.62-1.17)
Complete secondary	1	1	1	1	1	1
Higher	0.95 (0.78-1.15)	0.96 (0.78-1.16)	0.91 (0.74-1.12)	0.96 (0.79-1.18)	0.95 (0.76-1.21)	0.86 (0.66-1.11)
Continuous	**0.88 (0.81-0.97)**	**0.89 (0.81-0.98)**	**0.88 (0.80-0.97)**	0.91 (0.82-1.00)	1.01 (0.90-1.13)	0.98 (0.87-1.12)
Household income quintile (hh income/ square root no. in hh)						
1 (lowest)	**1.34 (1.06-1.70)**	1.27 (1.01-1.61)	1.24 (0.97-1.59)	**1.30 (1.02-1.66)**	1.19 (0.89-1.59)	1.04 (0.75-1.43)
2	1.20 (0.96-1.51)	1.17 (0.93-1.47)	1.14 (0.89-1.45)	1.19 (0.94-1.51)	1.14 (0.87-1.51)	1.03 (0.76-1.41)
3	1	1	1	1	1	1
4	0.99 (0.78-1.26)	1.00 (0.79-1.27)	1.02 (0.79-1.31)	1.03 (0.80-1.33)	1.04 (0.78-1.40)	1.06 (0.76-1.47)
5 (highest)	0.87 (0.67-1.11)	0.93 (0.72-1.18)	0.93 (0.71-1.21)	0.93 (0.71-1.20)	1.02 (0.75-1.38)	1.12 (0.80-1.58)
Change per unit (quintile)	**0.90 (0.85-0.95)**	**0.92 (0.87-0.97)**	**0.93 (0.88-0.99)**	**0.92 (0.87-0.98)**	0.96 (0.89-1.03)	1.02 (0.94-1.10)

Income and education: Education (3 cats), household income quintile per person **Material :** number of consumer goods, number of household amenities, household sold consumer goods for clothes/food **Sociodemographic factors** marital status, rural/urban, district in Russia **Smoking and alcohol**- alcohol frequency (none, monthly, 2-3 times/month, weekly, >weekly), current smoking **Life satisfaction** - 5 point scale **Optimism** believes family economic situation will improve in 12 months (5 point scale) **N.B. 1. All models adjust for age at entry and cluster by household; 2. All models adjust only for variables other than predictor variable**

In men, there was a significant mortality gradient in relation to household income, but in women this gradient was weak and non-significant. In both sexes the income gradient was largely explained by education, and in women by material factors. Adjusting for health behaviours, satisfaction and optimism did not greatly affect the relative risk of mortality (Table 5.42).

Table 5.42 Association between mortality, education and income in the general population (Cox proportional hazards analysis)

	Cox proportional hazards ratio for death during study (95% confidence interval)						
	(1) Age	(2) Age, SR health	(3) Age, alcohol and smoking	(4) Age, satisfaction, optimism	(5) Age, income, education	(6) = (5) plus material and geographic factors	(7) = (3)-(6) combined
Male							
Education							
Primary/incomplete secondary	**1.65 (1.28-2.14)**	**1.65 (1.27-2.15)**	**1.56 (1.21-2.02)**	**1.65 (1.26-2.16)**	**1.64 (1.25-2.14)**	1.30 (0.93-1.80)	1.19 (0.84-1.69)
Complete secondary	1	1	1	1	1	1	1
Higher	**0.72 (0.56-0.92)**	**0.74 (0.57-0.95)**	**0.75 (0.59-0.97)**	**0.75 (0.57-0.98)**	**0.69 (0.53-0.89)**	0.73 (0.54-1.00)	0.76 (0.54-1.05)
Continuous	**0.66 (0.59-0.74)**	**0.67 (0.60-0.75)**	**0.69 (0.62-0.78)**	**0.67 (0.60-0.76)**	**0.65 (0.58-0.73)**	**0.75 (0.65-0.87)**	**0.80 (0.68-0.93)**
Household income quintile (hh income/ square root no. in hh)							
1 (lowest)	**1.41 (1.05-1.88)**	**1.37 (1.02-1.84)**	**1.37 (1.02-1.85)**	**1.37 (1.01-1.86)**	1.29 (0.96-1.72)	1.35 (0.95-1.93)	1.33 (0.91-1.96)
2	0.98 (0.73-1.30)	0.99 (0.74-1.32)	0.97 (0.72-1.29)	1.00 (0.74-1.35)	0.93 (0.70-1.23)	0.99 (0.70-1.41)	0.96 (0.66-1.39)
3	1	1	1	1	1	1	1
4	0.89 (0.66-1.21)	0.91 (0.67-1.24)	0.90 (0.66-1.23)	0.89 (0.64-1.22)	0.97 (0.72-1.31)	0.89 (0.60-1.31)	0.92 (0.61-1.39)
5 (highest)	1.12 (0.83-1.52)	1.20 (0.88-1.63)	1.15 (0.85-1.56)	1.09 (0.79-1.50)	1.20 (0.89-1.63)	1.17 (0.79-1.74)	1.21 (0.80-1.84)
Change per unit (quintile)	0.94 (0.88-1.02)	0.96 (0.90-1.04)	0.96 (0.89-1.03)	0.94 (0.87-1.02)	0.99 (0.92-1.06)	0.95 (0.86-1.05)	0.97 (0.87-1.08)
Female							
Education							
Primary/incomplete secondary	1.36 (0.95-1.94)	1.30 (0.91-1.86)	1.41 (0.98-2.03)	1.37 (0.92-2.03)	1.39 (0.96-2.02)	**1.66 (1.06-2.60)**	1.57 (0.94-2.61)
Complete secondary	1	1	1	1	1	1	1
Higher	**0.43 (0.30-0.64)**	**0.43 (0.29-0.63)**	**0.45 (0.31-0.66)**	**0.46 (0.30-0.70)**	**0.43 (0.29-0.64)**	**0.54 (0.34-0.86)**	**0.57 (0.34-0.94)**
Continuous	**0.57 (0.50-0.65)**	**0.58 (0.51-0.66)**	**0.57 (0.50-0.65)**	**0.58 (0.51-0.67)**	**0.56 (0.49-0.64)**	**0.57 (0.48-0.68)**	**0.60 (0.50-0.73)**
Household income quintile (hh income/ square root no. in hh)							
1 (lowest)	1.19 (0.86-1.65)	1.14 (0.82-1.59)	1.15 (0.83-1.60)	1.17 (0.82-1.65)	1.03 (0.76-1.40)	1.00 (0.65-1.54)	0.82 (0.50-1.34)
2	0.94 (0.67-1.30)	0.93 (0.67-1.29)	0.94 (0.68-1.31)	0.87 (0.61-1.25)	0.77 (0.56-1.05)	0.88 (0.58-1.33)	0.74 (0.46-1.18)
3	1	1	1	1	1	1	1
4	1.00 (0.72-1.39)	1.00 (0.71-1.39)	1.01 (0.72-1.40)	1.13 (0.79-1.61)	0.96 (0.71-1.31)	1.02 (0.68-1.54)	1.11 (0.71-1.76)
5 (highest)	0.75 (0.50-1.13)	0.77 (0.51-1.16)	0.74 (0.49-1.12)	0.78 (0.50-1.21)	0.80 (0.55-1.18)	0.76 (0.46-1.26)	0.63 (0.36-1.12)
Change per unit (quintile)	0.93 (0.85-1.01)	0.94 (0.86-1.03)	0.93 (0.86-1.02)	0.96 (0.87-1.05)	0.98 (0.91-1.06)	0.98 (0.87-1.09)	1.01 (0.89-1.15)

Income and education: Education (3 cats), household income quintile per person **Material :** number of consumer goods, number of household amenities, household sold consumer goods for clothes/food **Sociodemographic factors** marital status, rural/urban, district in Russia **Smoking and alcohol**– alcohol frequency (none, monthly, 2-3 times/month, weekly, >weekly), current smoking **Life satisfaction** – 5 point scale **Optimism** believes family economic situation will improve in 12 months (5 point scale) **N.B. 1. All models adjust for age at entry and cluster by household; 2. All models adjust only for variables other than predictor variable**

Effect modification

I tested for effect modification between income and education and self-rated health and mortality, using formal statistical tests for interaction. There was no statistically significant interaction between income and education in relation to self-rated health (p=0.45 in men, p=0.26 in women) or mortality (p=0.79 in men, p= 0.41 in women).

5.6.3 Subjective social status

The strong and significant associations between self-rated health and subjective power and economic status and the composite measure of subjective social status (power, economic and respect), independent of income and education, were described earlier in the chapter (Table 5.19). In a wider range of multivariate models, the gradient in self-rated health in relation to each of the selected measures of subjective social status in both sexes was shown to be largely independent of health behaviours, satisfaction and optimism, income, education, and material measures (Table 5.43).

A significant mortality gradient in relation to subjective economic status in both sexes was also noted earlier (Table 5.20), although it was largely explained by income and education. In men, the significant association between subjective power and mortality was explained by income, education and material factors. In women, subjective power was not significantly associated with mortality (Table 5.44). In both sexes there was a significant association between the combined measure for subjective social status and mortality. In men, this association was mediated by income, education and material factors. However, in women the gradient was independent of satisfaction and optimism, health behaviours and material factors (Table 5.44).

Table 5.43 Association between self-rated health at entry and subjective social status (logistic regression analysis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)					
	(1) Age	(2) Age, alcohol and smoking	(3) Age, satisfaction, optimism	(4) Age, income, education	(5) = (4) plus geographic and material factors	(6) = (2)-(5) combined
Males						
Subjective economic status						
1-2 (lowest)	**1.60 (1.30-1.98)**	**1.62 (1.31-2.01)**	**1.44 (1.14-1.82)**	**1.56 (1.23-1.97)**	**1.56 (1.18-2.06)**	1.30 (0.94-1.79)
3-4	1	1	1	1	1	1
5-9 (highest)	**0.71 (0.55-0.91)**	**0.72 (0.56-0.93)**	0.84 (0.64-1.10)	0.79 (0.60-1.05)	0.74 (0.53-1.03)	0.92 (0.64-1.33)
Continuous across 3 categories	**0.66 (0.58-0.75)**	**0.66 (0.57-0.75)**	**0.75 (0.65-0.88)**	**0.70 (0.61-0.81)**	**0.68 (0.57-0.82)**	0.84 (0.68-1.03)
Subjective power						
1-2 (lowest)	**1.78 (1.42-2.22)**	**1.81 (1.45-2.26)**	**1.57 (1.23-2.00)**	**1.71 (1.34-2.17)**	**1.62 (1.23-2.14)**	**1.38 (1.01-1.88)**
3-4	1	1	1	1	1	1
5-9 (highest)	0.89 (0.65-1.22)	0.91 (0.66-1.24)	0.96 (0.68-1.34)	1.02 (0.72-1.44)	0.86 (0.56-1.31)	0.86 (0.54-1.37)
Continuous across 3 categories	**0.67 (0.58-0.77)**	**0.66 (0.58-0.77)**	**0.74 (0.63-0.87)**	**0.71 (0.61-0.82)**	**0.69 (0.58-0.83)**	**0.75 (0.61-0.92)**
Combined subjective status (power, economic and respect - 24 point scale)						
0-4 (lowest)	**1.69 (1.29-2.22)**	**1.73 (1.32-2.27)**	**1.50 (1.12-2.01)**	**1.66 (1.24-2.23)**	**2.07 (1.45-2.95)**	**1.77 (1.19-2.61)**
5-9	1	1	1	1	1	1
10-14	**0.79 (0.63-0.99)**	**0.79 (0.63-0.99)**	0.95 (0.75-1.21)	0.86 (0.67-1.10)	0.96 (0.72-1.28)	1.12 (0.82-1.55)
15-24 (highest)	**0.47 (0.30-0.74)**	**0.49 (0.31-0.78)**	0.64 (0.40-1.04)	0.65 (0.40-1.05)	0.62 (0.34-1.14)	0.82 (0.42-1.61)
Continuous across 4 categories	**0.69 (0.61-0.78)**	**0.69 (0.61-0.78)**	**0.80 (0.70-0.93)**	**0.75 (0.65-0.86)**	**0.72 (0.61-0.85)**	0.84 (0.70-1.02)
Females						
Subjective economic status						
1-2 (lowest)	**2.02 (1.72-2.37)**	**1.97 (1.68-2.31)**	**1.79 (1.51-2.14)**	**1.91 (1.60-2.28)**	**1.74 (1.42-2.15)**	**1.54 (1.23-1.93)**
3-4	1	1	1	1	1	1
5-9 (highest)	0.83 (0.69-1.02)	0.84 (0.69-1.03)	0.95 (0.76-1.18)	0.80 (0.64-1.00)	0.87 (0.68-1.11)	0.97 (0.73-1.28)
Continuous across 3 categories	**0.62 (0.56-0.68)**	**0.63 (0.57-0.70)**	**0.69 (0.62-0.78)**	**0.63 (0.56-0.70)**	**0.68 (0.60-0.78)**	**0.77 (0.67-0.90)**
Subjective power						
1-2 (lowest)	**1.72 (1.46-2.02)**	**1.71 (1.45-2.01)**	**1.59 (1.33-1.89)**	**1.67 (1.40-2.00)**	**1.50 (1.22-1.84)**	**1.36 (1.08-1.70)**
3-4	1	1	1	1	1	1
5-9 (highest)	0.96 (0.75-1.22)	0.97 (0.76-1.24)	1.18 (0.91-1.52)	1.03 (0.78-1.36)	0.99 (0.72-1.35)	1.15 (0.81-1.62)
Continuous across 3 categories	**0.69 (0.62-0.77)**	**0.70 (0.63-0.78)**	**0.79 (0.70-0.89)**	**0.72 (0.64-0.81)**	**0.77 (0.67-0.88)**	**0.77 (0.67-0.90)**
Combined subjective status (power, economic and respect - 24 point scale)						
0-4 (lowest)	**1.55 (1.25-1.91)**	**1.51 (1.22-1.86)**	**1.35 (1.08-1.70)**	**1.47 (1.18-1.85)**	**1.54 (1.18-2.01)**	1.33 (1.00-1.77)
5-9	1	1	1	1	1	1
10-14	**0.65 (0.55-0.77)**	**0.66 (0.56-0.78)**	**0.74 (0.61-0.89)**	**0.67 (0.56-0.81)**	**0.75 (0.60-0.93)**	0.83 (0.65-1.05)
15-24 (highest)	**0.69 (0.49-0.96)**	**0.71 (0.51-0.99)**	0.95 (0.66-1.36)	**0.58 (0.39-0.87)**	0.69 (0.44-1.09)	0.99 (0.61-1.61)
Continuous across 4 categories	**0.69 (0.63-0.77)**	**0.70 (0.64-0.78)**	**0.80 (0.71-0.89)**	**0.69 (0.62-0.77)**	**0.73 (0.65-0.83)**	**0.84 (0.73-0.97)**

Table 5.44 Association between mortality and subjective social status (Cox proportional hazards analysis)

	Cox proportional hazards ratio for death during study (95% confidence interval)						
	(1) Age	**(2) Age, SR health**	**(3) Age, alcohol and smoking**	**(4) Age, satisfaction, optimism**	**(5) Age, income, education**	**(6) = (5) plus material and geographic factors**	**(7) = (3)-(6) combined**
Males							
Subjective economic status							
1-2 (lowest)	1.02 (0.83-1.25)	0.97 (0.78-1.20)	0.94 (0.76-1.16)	1.03 (0.82-1.30)	0.92 (0.73-1.15)	0.88 (0.66-1.17)	0.88 (0.64-1.20
3-4	1	1	1	1	1	1	1
5-9 (highest)	**0.72 (0.56-0.92)**	**0.74 (0.58-0.95)**	**0.76 (0.60-0.98)**	**0.75 (0.58-0.96)**	0.80 (0.62-1.03)	0.85 (0.63-1.16)	0.93 (0.67-1.28
Continuous across 3 categories	**0.86 (0.76-0.97)**	0.89 (0.78-1.01)	0.92 (0.81-1.04)	**0.86 (0.75-0.99)**	0.94 (0.82-1.08)	0.99 (0.84-1.18)	0.99 (0.84-1.18)
Subjective power							
1-2 (lowest)	0.95 (0.78-1.17)	0.90 (0.73-1.11)	0.91 (0.75-1.12)	0.90 (0.72-1.12)	0.86 (0.69-1.06)	0.93 (0.71-1.20)	0.86 (0.65-1.14
3-4	1	1	1	1	1	1	1
5-9 (highest)	**0.68 (0.50-0.92)**	**0.68 (0.50-0.92)**	**0.73 (0.54-0.99)**	**0.63 (0.46-0.86)**	0.73 (0.53-1.00)	0.87 (0.60-1.27)	0.83 (0.56-1.24
Continuous across 3 categories	0.89 (0.79-1.01)	0.93 (0.82-1.05)	0.94 (0.83-1.07)	0.90 (0.79-1.03)	0.97 (0.84-1.10)	1.00 (0.84-1.18)	1.02 (0.85-1.22)
Combined subjective status (power, economic and respect - 24 point scale)							
0-4 (lowest)	1.09 (0.83-1.42)	0.99 (0.75-1.31)	1.04 (0.79-1.36)	1.02 (0.76-1.38)	0.89 (0.66-1.19)	0.83 (0.56-1.21)	0.70 (0.46-1.08
5-9	1	1	1	1	1	1	1
10-14	0.88 (0.71-1.09)	0.89 (0.71-1.10)	0.91 (0.74-1.13)	0.88 (0.71-1.10)	0.95 (0.75-1.19)	0.94 (0.71-1.23)	0.90 (0.67-1.20
15-24 (highest)	0.66 (0.43-1.02)	0.65 (0.42-1.01)	0.74 (0.47-1.16)	**0.61 (0.39-0.97)**	0.73 (0.47-1.15)	0.95 (0.57-1.59)	0.95 (0.55-1.67
Continuous across 4 categories	**0.87 (0.78-0.98)**	0.90 (0.80-1.01)	0.91 (0.81-1.03)	**0.88 (0.77-1.00)**	0.97 (0.85-1.10)	1.02 (0.87-1.20)	1.05 (0.88-1.25
Females							
Subjective economic status							
1-2 (lowest)	**1.30 (1.03-1.63)**	1.21 (0.96-1.53)	1.22 (0.97-1.53)	1.22 (0.94-1.57)	1.21 (0.94-1.57)	1.17 (0.86-1.58)	1.09 (0.77-1.54
3-4	1	1	1	1	1	1	1
5-9 (Highest)	0.89 (0.65-1.21)	0.94 (0.68-1.28)	0.93 (0.68-1.27)	0.86 (0.61-1.20)	0.91 (0.64-1.30)	0.85 (0.55-1.30)	0.88 (0.55-1.42
Continuous across 3 categories	**0.81 (0.70-0.94)**	0.87 (0.74-1.01)	0.86 (0.74-1.00)	0.84 (0.70-1.00)	0.84 (0.71-1.00)	0.85 (0.69-1.05)	0.91 (0.72-1.16)
Subjective power							
1-2 (lowest)	1.23 (0.98-1.56)	1.18 (0.92-1.50)	1.19 (0.94-1.52)	1.24 (0.96-1.60)	1.19 (0.90-1.57)	1.24 (0.89-1.72)	1.32 (0.93-1.88
3-4	1	1	1	1	1	1	1
5-9 (highest)	1.22 (0.82-1.79)	1.26 (0.85-1.85)	1.28 (0.87-1.89)	1.37 (0.91-2.06)	1.42 (0.92-2.18)	1.23 (0.72-2.10)	1.52 (0.85-2.74
Continuous across 3 categories	0.93 (0.78-1.10)	0.97 (0.82-1.15)	0.96 (0.81-1.15)	0.95 (0.79-1.15)	0.98 (0.82-1.18)	0.92 (0.74-1.15)	0.93 (0.72-1.19)
Combined subjective status (power, economic and respect - 24 point scale)							
0-4 (lowest)	**1.33 (1.01-1.74)**	**1.32 (1.00-1.74)**	1.30 (0.98-1.71)	1.34 (0.99-1.81)	**1.38 (1.03-1.86)**	1.22 (0.85-1.75)	1.18 (0.79-1.76
5-9	1	1	1	1	1	1	1
10-14	0.80 (0.60-1.05)	0.84 (0.64-1.11)	0.83 (0.63-1.09)	0.78 (0.59-1.05)	0.84 (0.61-1.14)	0.71 (0.49-1.02)	0.72 (0.48-1.07
15-24 (highest)	0.67 (0.34-1.35)	0.72 (0.37-1.42)	0.73 (0.36-1.48)	0.65 (0.31-1.38)	0.84 (0.41-1.72)	0.77 (0.33-1.76)	0.88 (0.35-2.23
Continuous across 4 categories	**0.78 (0.67-0.91)**	**0.80 (0.69-0.93)**	**0.81 (0.69-0.94)**	**0.77 (0.65-0.92)**	**0.82 (0.69-0.97)**	**0.79 (0.65-0.96)**	0.81 (0.64-1.01

5.7 Discussion of the associations between measures of socioeconomic position and health

Education

The strong and significant associations between education, mortality and self-rated health are consistent with findings in other studies in Russia [2;3;87], and these comparisons were described and discussed in more detail in Section 5.6.4.

There were differences between the sexes in the way material factors explained the associations between education, self-rated health and mortality. The relationship between education and self-rated health was explained by material factors in women with incomplete school education, but not in men. Material factors explained the association between education and mortality in men, particularly the higher mortality of men with an incomplete secondary education. However, this was not the case in women. Further analysis showed that number of consumer goods was the strongest explanatory variable for both the association between education and self-rated health in women and education and mortality in men. There is some debate as to whether number of consumer goods constitutes a material measure or a psychosocial measure (since it is thought to reflect social participation [154]), and this issue will be discussed further in Section 8.6. The differences between the sexes were difficult to interpret.

The relationship between education and mortality was not attenuated after adjusting for alcohol and smoking, which is not surprising since although these common behavioural risk factors were independently associated with mortality, they did not vary according to socioeconomic position.

Income

Individual and household incomes were more strongly associated with self-rated health than with mortality. Comparisons with other studies were discussed in Section 5.6.4.

The income gradient in self-rated health was explained most strongly by material factors in women, and further analysis showed that number of household consumer goods was mainly responsible. As stated previously, ownership of goods could either be acting as a material measure (it was correlated with income) or a psychosocial variable. The income gradient in mortality was explained most strongly by education in both sexes, and much less by any of the other covariates studied here.

The association between income and self-rated health was much stronger in men than in women both here and in the New Russia Barometer [17]. It is not clear why this was so. Since ownership of consumer goods explained some of the association, it is possible that psychosocial factors other than those studied could have played a role, but clearly this is a tentative explanation.

Overall, it is possible that the strength of the association between income and health may have been underestimated because of measurement issues. Household income fluctuated between years, wage arrears were common (these will be investigated further in Section 6) and non-monetary income (exchanging favours or bartering goods) was not quantified, nor was money for unofficial work (outside primary and secondary occupations). In addition, people with higher incomes were more likely to leave the study. The difficulties in measuring income will be discussed further in Section 8.2.7.

Reverse causation

I also examined the possibility of reverse causation, in order to test whether there was health selection (the selection of people in poor health into lower socioeconomic groups). In this case I examined the prospective association of poor health with low income, since income was the measure of socioeconomic position most likely to change during the short duration of the study.

I first examined the association of self-rated health at entry with a drop in household income of 40% between entry and the second round of participation (this affected 33% of respondents). I adjusted the association for income quintile at entry and for age, since both these factors were strongly associated with a decline in income and also with self-rated health.

Poor self-rated health was not significantly associated with a subsequent drop in household income of 40%, even after adjusting for household income quintile at entry. People in higher income quintiles were significantly more likely to experience such a fall in income, as were younger people, especially women (Table 5.45).

Table 5.45 Association between age, income and self-rated health at entry with a 40% fall in income over 2 years

	Unadjusted		Adjusted for age and income quintile	
	Male	**Female**	**Male**	**Female**
Self-rated health at entry				
Good	-	-	1	1
Poor	-	-	0.94 (0.72-1.22)	1.02 (0.84-1.24)
Income quintile				
Per quintile	-	-	**1.66 (1.56-1.76)**	**1.65 (1.55-1.76)**
Age at entry				
18-24	1	1	1	1
25-34	1.05 (0.84-1.30)	1.24 (0.99-1.55)	1.16 (0.92-1.46)	**1.29 (1.02-1.63)**
35-44	0.98 (0.79-1.21)	1.12 (0.90-1.38)	1.04 (0.83-1.29)	1.15 (0.92-1.42)
45-54	0.96 (0.76-1.21)	1.25 (1.00-1.56)	1.00 (0.78-1.28)	**1.32 (1.05-1.67)**
55-64	1.02 (0.79-1.30)	**1.35 (1.07-1.71)**	1.25 (0.97-1.62)	**1.66 (1.30-2.11)**
65-74	0.77 (0.56-1.06)	1.02 (0.78-1.34)	1.06 (0.76-1.48)	1.28 (0.96-1.70)
75-84	0.80 (0.46-1.40)	1.19 (0.84-1.68)	1.06 (0.60-1.88)	1.27 (0.89-1.81)
85+	1.35 (0.42-4.32)	0.73 (0.40-1.34)	1.47 (0.43-4.98)	0.99 (0.54-1.80)

I then tested whether a change in health influenced socioeconomic position in the next round. A decline in self-rated health between the first and second rounds was significantly inversely associated with income quintile in the second round, even after adjusting for age and income quintile at entry. Poor self-rated health in both rounds was also inversely associated with income quintile in the second round, but not significantly so (Table 5.46). Men who experienced a decline in health were significantly more likely to have experienced a 40% fall in household income than men who did not.

Table 5.46 Association between change in self-rated health and (i) Income quintile in the second round and (ii) a 40% drop in household income between the first and second rounds (adjusted for age and household income quintile at entry)

	(i) Household income quintile in second round (linear regression)		(ii) Drop in household income of 40% between first and second rounds	
	Male	**Female**	**Male**	**Female**
Change in self-rated health between first and second rounds				
Good/average throughout	1	1	1	1
Decline from good/average to poor	**-0.23 (-0.41- -0.04)**	**-0.16 (-0.31- -0.01)**	**1.46 (1.04-2.05)**	1.05 (0.79-1.40)
Poor throughout	-0.19 (-0.39- 0.01)	-0.08 (-0.22- 0.06)	0.96 (0.65-1.40)	0.99 (0.76-1.28)

A decline in self-rated health was significantly associated both with a lower household income quintile in the second round, and with a 40% decline in household income between the first two rounds. However self-rated health itself was not associated with a decline in income, but it was the decline in self-rated health that was important. A causal pathway between income and self-rated health therefore seems to operate in both directions, since it was previously shown that income was associated prospectively with mortality. In addition, income was also associated with poor self-rated health in the second round even after adjusting for self-rated health at entry (data not shown). The role of health selection will be discussed further in Chapter 8.

Subjective social status

Self-rated health was strongly associated with subjective measures of socioeconomic position, particularly subjective power and economic status, and much of this

association was not explained by the covariates studied here. Satisfaction and optimism explained part of these associations in men and women. There may have been some cross-contamination, since subjective social status and health were both based on self-report, and both were correlated with life satisfaction (Table 5.10).

The associations between subjective measures of socioeconomic status and mortality in men were largely explained by income, education and material factors. Earlier it was shown that subjective social status was correlated with objective measures of socioeconomic position. It is therefore likely that it is these objective measures, on which the subjective assessment of social position was based, that explained the differences in mortality. This supports findings from both a British study [32] and a Russian study, where subjective social status was based predominantly on objective measures of socioeconomic position [86].

However, the association between the combined measure of subjective social status and mortality in women was not explained by the covariates studied here. It is possible that combining the individual measures of subjective social status may have given weight to the objective socioeconomic component of each individual measure, giving a combined measure that reflected too powerfully the objective aspects of socioeconomic status.

Overall, the differences in the associations between subjective social status and mortality in men and women, and in the variables that explained these associations, were surprising. The correlations between objective and subjective measures of socioeconomic position were similar in both sexes, except that individual income and subjective economic status, and occupation and subjective power, were more strongly correlated in men. Although the distribution of subjective social status in the study population was also similar in both sexes, it is possible that subjective status is associated with different socioeconomic and other measures in men and women, as was shown in another Russian study [86].

5.8 Summary of the associations between socioeconomic position and health in the general population

Socioeconomic position was associated with both self-rated health and mortality in RLMS. Of the objective measures of socioeconomic position, education was the one that was most strongly associated with mortality, and it was associated with self-rated health to a lesser degree. Income was moderately associated with both self-rated health and mortality, although its association with self-rated health was stronger. Subjective measures of social status were more strongly associated with self-rated health than mortality.

The associations between education and mortality, and between subjective social status and self-rated health were both largely independent of the covariates studied here. The relationships between income, education and self-rated health, were partly mediated by material measures, particularly ownership of consumer goods [154]. However, the associations between socioeconomic position and self-rated health and mortality were not mediated by alcohol and smoking.

Several of the potential covariates were associated with mortality independently of income and education. These were marital status, alcohol consumption and smoking, selling consumer goods for money and number of household amenities. Variables that were significantly associated with poor self-rated health were satisfaction, optimism and number of household consumer goods. Self-rated health was also strongly and independently associated with mortality.

Difficulties in measuring socioeconomic position, especially income, could have weakened the associations between socioeconomic position and health, and affect the interpretation of the results. The findings in this chapter, together with limitations in measurement, will be discussed further in Chapter 8.

6 Associations between measures of socioeconomic position, self-rated health and mortality in the employed population

6.1 Introduction

In this thesis I have already demonstrated a clear association between socioeconomic position and health in the total study population. Here I examine the same associations in the working population. My reasons for doing so were as follows.

This dataset provides a unique opportunity to study the association between occupation and health, which has scarcely been studied in Russia. This association is of particular interest due to the major changes in social and occupational structure that followed the transition, described in Chapter 2.

Unemployment, wage arrears, compulsory unpaid leave and payment in goods (instead of money) were all widespread during the period of RLMS. The increase in mortality in Russia during the 1990s was most pronounced amongst people of working age, especially men. Employment-related factors are known to influence health and mortality, and form an important part of the socioeconomic environment. I wanted to test whether adverse employment conditions were associated with health, and whether they explained the association between health and socioeconomic position.

I have divided this chapter into 4 sections. First I measure the association between occupation and health. Second, I measure the distribution of employment-related factors (such as wage arrears) and their associations with self-rated health and mortality. Third, I compare the associations between occupation and other measures of socioeconomic position (income and education) and self-rated health and mortality in the working population and whether these associations were explained by employment experiences. Fourth, I perform some more detailed multivariate analyses of the associations between occupation, self-rated health and mortality.

6.2 Occupation and its association with self-rated health and mortality

The distribution of occupational class in this study population and its correlation with other socioeconomic measures were described early in Chapter 5. Summarising these findings, 17% of men and 25% of women were in professional or managerial occupations. The commonest type of occupation varied by sex. Nearly forty percent of men were in semi- or unskilled manual occupations and 50% of women were either in technical or clerical occupations. Occupational class was closely correlated with education (R=0.52), although a substantial minority of clerical and manual workers had completed a higher education. Occupation was less strongly, although still significantly, correlated with income (R=0.13).

I measured the association between occupational class and self-rated health using logistic regression, and its association with mortality using Cox proportional hazards analysis. The associations between occupation, self-rated health and mortality are shown in Table 6.1 and Table 6.2, and are based on 3,498 male and 3,274 female respondents with an occupation recorded at the time they entered the study.

As with the other socioeconomic variables I used models that adjusted for age and then other measures of socioeconomic position. However, this time I used three models. The first was age-adjusted, the second was adjusted for income, and the third was adjusted for income and education. This was because the ISCO-88 classification is partly based on the education required for a particular job, and there is some debate as to whether to adjust occupational class for education in multivariate models[156].

There was a significant occupational gradient in self-rated health, in which people in the lower occupational classes were more likely to report worse health. In men the gradient was partly explained by income and education, but in women it was explained by neither of these measures.

Within the gradient, men in skilled manual occupations had a significantly higher risk of poor self-rated health than professionals and managers, but this was partly explained by income (Table 6.1). Women in semi-skilled and unskilled occupations

were significantly more likely to report poor health than women in professional or managerial occupations, independently of income and education.

Table 6.1 Association between occupation and self-rated health (logistic regression analyis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)					
	Male			Female		
	(1) Age	(2) Age and income	(3) Age, income, education	(1) Age	(2) Age and income	(3) Age, income, education
Occupational category (at entry)						
Higher prof/manag	1	1	1	1	1	1
Technic/assoc prof	0.42 (0.15-1.22)	0.45 (0.15-1.31)	0.48 (0.16-1.42)	1.01 (0.71-1.43)	1.00 (0.69-1.45)	1.03 (0.70-1.51)
Clerical/service workers	1.83 (0.90-3.75)	1.68 (0.80-3.56)	1.44 (0.62-3.33)	1.23 (0.88-1.73)	1.19 (0.83-1.72)	1.08 (0.72-1.61)
Skilled agr/craft/trade	**1.63 (1.04-2.56)**	1.45 (0.90-2.35)	1.38 (0.80-2.40)	0.97 (0.55-1.70)	1.01 (0.56-1.83)	0.97 (0.51-1.83)
Semi and unskilled manual	1.37 (0.88-2.15)	1.21 (0.75-1.93)	1.12 (0.63-2.00)	**1.73 (1.26-2.39)**	**1.70 (1.20-2.39)**	**1.66 (1.11-2.49)**
Continuous	**1.12 (1.01-1.23)**	1.08 (0.97-1.20)	1.05 (0.92-1.20)	**1.14 (1.06-1.24)**	**1.14 (1.05-1.24)**	**1.14 (1.03-1.26)**

Income and education education (3 cats), household income per person (household income/ square root no. in household) quintile **N.B. All models adjust for age at entry and cluster by household**

Table 6.2 Association between occupation and mortality (Cox proportional hazards analyis)

	Cox proportional hazards ratio for mortality (95% confidence interval)					
	Male			Female		
	(1) Age	(2) Age and income	(3) Age, income, education	(1) Age	(2) Age and income	(3) Age, income, education
Occupational category (at entry)						
Higher prof/manag	1	1	1	1	1	1
Technic/assoc prof	1.67 (0.80-3.49)	1.74 (0.83-3.63)	1.34 (0.64-2.82)	0.86 (0.28-2.66)	0.87 (0.29-2.65)	0.65 (0.20-2.12)
Clerical /service workers	**2.31 (1.11-4.82)**	**2.42 (1.16-5.07)**	1.67 (0.80-3.49)	1.63 (0.62-4.28)	1.43 (0.52-3.94)	0.73 (0.22-2.42)
Skilled agr/craft/trade	**2.18 (1.35-3.52)**	**1.91 (1.18-3.09)**	1.08 (0.63-1.85)	1.90 (0.49-7.35)	1.92 (0.49-7.53)	0.97 (0.24-3.82)
Semi and unskilled manual	**1.74 (1.08-2.82)**	**1.61 (1.00-2.59)**	0.83 (0.49-1.42)	2.07 (0.86-5.01)	1.98 (0.83-4.71)	1.01 (0.35-2.90)
Continuous	**1.12 (1.02-1.23)**	1.09 (0.99-1.20	0.92 (0.82-1.03	**1.23 (1.01-1.51)**	1.22 (1.00-1.50	1.06 (0.84-1.35

Income and education education (3 cats), household income per person (household income/ square root no. in household) quintile **N.B. All models adjust for age at entry and cluster by household**

There was also a significant mortality gradient in relation to occupation in both sexes. In particular, men in clerical and service work, skilled occupations and semi- and unskilled occupations had significantly higher mortality than professional men (Table 6.2). In women, there were large, but statistically non-significant, differences in mortality between individual occupational groups, and in particular women in semi- and unskilled occupations had twice the mortality of professional women.

The association between occupation and mortality was largely explained by education, although not by income. As stated previously ISCO-88 is an education based occupational classification [156], and there could be overadjustment in the models which include education. However, I condensed ISCO-88 into 5 categories, which has been shown by others to give a measure that broadly corresponds with other occupational classifications [156]. It is therefore likely that the relationship between occupation and mortality was in fact explained by education.

6.3 The labour market in post transition Russia and distribution of variables in the population

Table 6.3 Self-reported unemployment, compulsory leave and wage arrears

	Number (%) of respondents		
	Male	**Female**	**All**
Unemployed (self-report)			
No	4449 (89.4)	5298 (91.6)	9747 (90.6)
Yes	528 (10.6)	488 (8.4)	1016 (9.4)
Number of respondents	*4977*	*5786*	*10763*
On compulsory leave			
No	3094 (91.9)	2826 (90.1)	5920 (91.0)
30 days or less	174 (5.2)	214 (6.8)	388 (6.0)
More than 30 days	100 (3.0)	95 (3.0)	195 (3.0)
Number of respondents	*3368*	*3135*	*6503*
Wage arrears			
No	2160 (60.5)	2139 (65.1)	4299 (62.7)
3 months or less	1293 (36.2)	1030 (31.3)	2323 (33.9)
More than 3 months	118 (3.3)	118 (3.6)	236 (3.4)
Number of respondents	*3571*	*3287*	*6858*
Paid in goods			
No	3007 (89.3)	2908 (92.7)	5915 (90.9)
Yes	362 (10.8)	229 (7.3)	591 (9.1)
Number of respondents	*3369*	*3137*	*6506*
Concern re chance of job loss			
Very	1084 (30.5)	1321 (40.5)	2405 (35.3)
A little	802 (22.6)	623 (19.1)	1425 (20.9)
Yes and no	357 (10.1)	273 (8.4)	630 (9.3)
Not too	630 (17.8)	535 (16.4)	1165 (17.1)
Not at all	677 (19.1)	511 (15.7)	1188 (17.4)
Number of respondents	*3550*	*3263*	*6813*

Nearly 10% of respondents reported themselves as unemployed at the time they entered the study. Amongst individuals in employment, nearly 40% had experienced

wage arrears during the year prior to entry into the study, although these were usually of less than 3 months' duration, and nearly 10% had been on compulsory leave. Ten per cent of employed men in this study had been paid in goods (instead of money), and more than 50% of men and nearly 60% of women were very concerned about the possibility of job loss (Table 6.3). Overall, 45% of respondents had experienced either wage arrears, compulsory leave or payment in goods at the time they entered the study, and 10% of respondents had had more than one of these experiences (full data not shown).

Employment and socioeconomic position

I examined the relationship between employment experiences and socioeconomic position. A greater proportion of people in the lower household income quintiles were in wage arrears, and experiencing compulsory leave and payment in goods. Of people in the lowest household income quintile over 50% were in wage arrears, and 15% were on compulsory leave (Table 6.10). The causal direction of this association will be discussed later in the chapter.

Figure 6.1 Labour market variables according to household income quintile

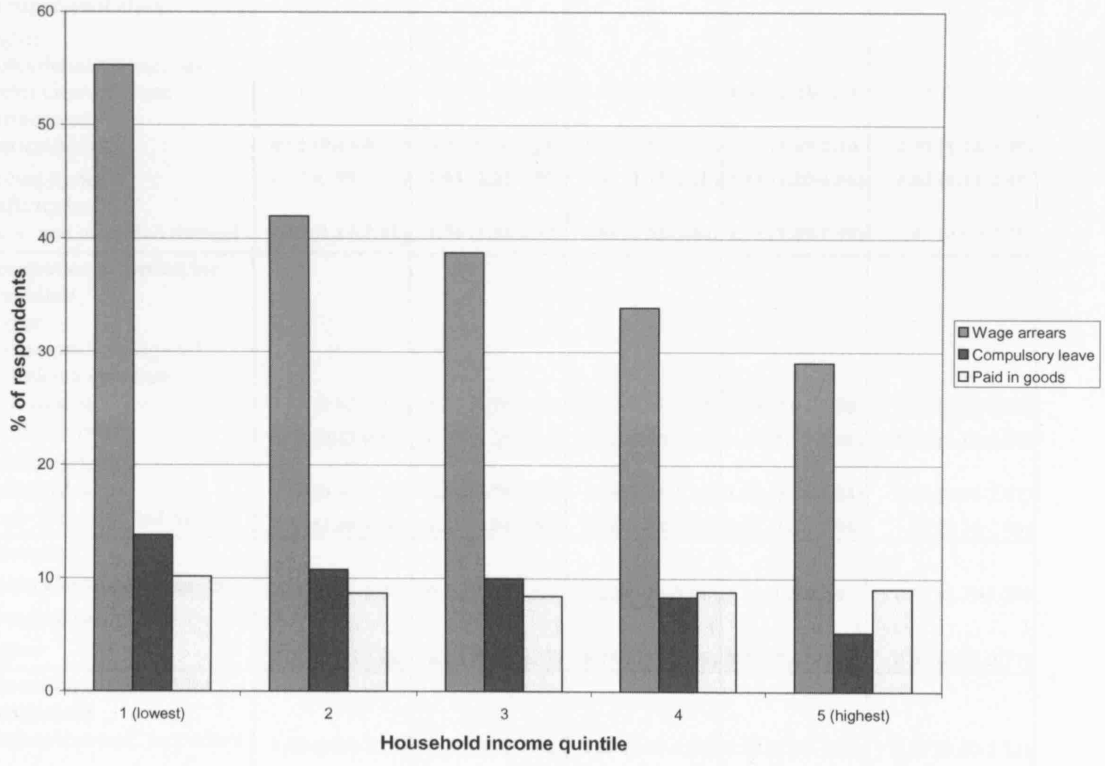


Table 6.4 shows the associations between socioeconomic position and several employment-related variables. Occupation was strongly associated with wage arrears, payment in goods and compulsory leave, and these were commonest amongst manual workers. People in clerical and service occupations and skilled manual occupations at entry were significantly more likely than professionals and managers to report themselves unemployed in the second round of contact. Clerks, service workers and unskilled workers were significantly more likely to be concerned about job loss than professionals or managers (Table 6.4).

Experiences in the labour market were also influenced by educational achievement (Table 6.4). Payment in goods and perceived job insecurity were associated with education independently of occupation (Table 6.4). However, wage arrears and compulsory leave did not vary by education after adjusting for occupation.

Table 6.4 Association between socioeconomic position, wage arrears, compulsory leave, payment in goods job insecurity and unemployment (regression analysis)

	Odds ratio (95% confidence interval) - adjusted for age and sex				
	Wage arrears	**Compulsory leave**	**Paid in goods**	**Very concerned about chance of job loss**	**Unemployment at second (subsequent) round**
Occupational class					
Higher professional/managerial	1	1	1	1	1
Technician/associate professional	1.01 (0.85-1.19)	1.19 (0.87-1.63)	1.01 (0.71-1.45)	**1.46 (1.23-1.74)**	1.17 (0.67-2.06)
Clerical/service	**0.51 (0.43-0.62)**	0.90 (0.64-1.26)	1.22 (0.86-1.74)	**1.77 (1.49-2.10)**	**2.05 (1.24-3.39)**
Skilled agricult/ crafts/trades	1.17 (0.99-1.37)	**2.95 (2.22-3.93)**	**1.61 (1.18-2.20)**	**1.41 (1.20-1.66)**	**1.82 (1.12-2.94)**
Semi- and unskilled manual	**1.31 (1.14-1.51)**	**1.74 (1.33-2.27)**	**2.66 (2.03-3.48)**	**1.72 (1.49-1.99)**	1.43 (0.90-2.26)
Occupation adjusted for education					
Higher professional/managerial	1	1	1	1	1
Technician/associate professional	0.99 (0.83-1.18)	1.08 (0.78-1.49)	0.88 (0.61-1.28)	**1.25 (1.04-1.50)**	1.14 (0.65-1.99)
Clerical/service	**0.51 (0.42-0.63)**	0.79 (0.55-1.14)	1.02 (0.70-1.49)	**1.37 (1.13-1.66)**	**1.86 (1.10-3.14)**
Skilled agricult/ crafts/trades	1.14 (0.94-1.37)	**2.40 (1.75-3.31)**	1.36 (0.96-1.92)	**1.51 (1.24-1.84)**	1.58 (0.94-2.67)
Semi- and unskilled manual	**1.30 (1.09-1.54)**	**1.42 (1.04-1.93)**	**2.22 (1.62-3.05)**	**1.63 (1.36-1.96)**	1.24 (0.74-2.06)
Education					
Primary/incompl. secondary	1.04 (0.88-1.24)	0.78 (0.59-1.04)	**1.62 (1.26-2.09)**	1.11 (0.93-1.32)	0.94 (0.71-1.24)
Complete secondary	1	1	1	1	1
Higher	0.96 (0.86-1.08)	**0.64 (0.53-0.77)**	**0.73 (0.59-0.89)**	**0.70 (0.62-0.79)**	**0.63 (0.52-0.77)**
Education (adjusted for occupation)					
Primary/incompl. secondary	1.00 (0.84-1.19)	0.77 (0.58-1.02)	**1.53 (1.19-1.98)**	1.08 (0.90-1.28)	0.67 (0.40-1.12)
Complete secondary	1	1	1	1	1
Higher	1.02 (0.89-1.16)	**0.77 (0.62-0.96)**	0.99 (0.79-1.25)	**0.83 (0.72-0.94)**	0.75 (0.54-1.04)

6.4 Associations between employment conditions, self-rated health and mortality

In this section I first measure the association between unemployment and health in people of working age. I then measure the associations between the other employment experiences (wage arrears, compulsory leave, payment in goods and job insecurity) and health in people who had an occupational category at entry.

6.4.1 Unemployment

Analyses of the association between unemployment, self-rated health and mortality were restricted to people below the official retirement age in Russia (60 in men and 55 in women).

Table 6.5 Association between self-rated health at entry and unemployment in people of working age (logistic regression analysis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)			
Unemployment (self-reported)	**(1) Age**	**(2) Age, alcohol and smoking**	**(3) Age, income, education**	**(4) = (3) plus geographic and material factors**
Male (aged under 60)				
Employed	1	1	1	1
Unemployed	0.75 (0.47-1.18)	0.71 (0.44-1.13)	**0.61 (0.37-0.99)**	0.58 (0.32-1.04)
Female (aged under 55)				
Employed	1	1	1	1
Unemployed	**1.44 (1.05-1.96)**	**1.41 (1.03-1.92)**	1.20 (0.85-1.68)	1.37 (0.94-2.00)

Income and education: Education (3 cats), household income quintile per person **Material** number of consumer goods, number of household amenities, household sold consumer goods for clothes/food **Sociodemographic factors** marital status, rural/urban, district in Russia **Smoking and alcohol**– alcohol frequency (none, monthly, 2-3 times/month, weekly, >weekly), current smoking **N.B. All models adjust for age at entry and cluster by household**

Table 6.6 Association between mortality and unemployment in people of working age (Cox proportional hazards analysis)

	Cox proportional hazards ratio for death during study (95% confidence interval)			
Unemployment (self reported)	**(1) Age**	**(2) Age, alcohol and smoking**	**(3) Education and income**	**(4) = (3) plus geographic and material factors**
Male (aged under 60)				
Employed	1	1	1	1
Unemployed	**1.84 (1.29-2.63)**	**1.67 (1.17-2.39)**	**1.50 (1.02-2.22)**	1.55 (0.98-2.44)
Female (aged under 55)				
Employed	1	1	1	1
Unemployed	1.43 (0.61-3.31)	1.18 (0.48-2.90)	0.84 (0.31-2.32)	0.87 (0.28-2.75)

Income and education: Education (3 cats), household income quintile per person **Material** number of consumer goods, number of household amenities, household sold consumer goods for clothes/food **Sociodemographic factors** marital status, rural/urban, district in Russia **Smoking and alcohol**– alcohol frequency (none, monthly, 2-3 times/month, weekly, >weekly), current smoking **N.B. All models adjust for age at entry and cluster by household**

Men who reported themselves as unemployed were considerably less likely to report poor health at entry than other men of working age, and this association became statistically significant after adjusting for income and education (Table 6.5). In contrast, unemployed men had significantly higher mortality than other men of working age, an association that was only weakly explained by education and income (Table 6.6)).

Women who were unemployed at entry were significantly more likely to report poor health than other women of working age, and this association was explained partly by income and education (Table 6.5). Unemployed women also had a non-significantly higher risk of mortality (Table 6.6), an association which was fully explained by income and education and also partly explained by alcohol consumption and smoking.

6.4.2 Wage arrears, compulsory leave and payment in goods

Men who had experienced up to 3 months' wage arrears during the previous year were significantly more likely to have poor self-rated health, independent of education, income and material factors. A longer duration of wage arrears in men was also associated with poor health, but not significantly so. Women with up to 3 months' arrears were significantly more likely to report poor health, but this association was largely explained by income and education (Table 6.7). In contrast,

however, men and women who had been in wage arrears had non-significantly lower mortality than other employed men and women (Table 6.8).

There was no significant difference in self-rated health amongst men and women who were paid in goods compared with other employed respondents (Table 6.7). However, men paid in goods during the last year had significantly higher mortality than other employed men. This association was partly explained by socioeconomic position, and partly by material factors (Table 6.8).

Men who had been on compulsory unpaid leave in the previous year were no more likely to report poor health than other employed men. However, women on compulsory leave were significantly more likely to report poor health, and this association was only weakly explained by socioeconomic position (Table 6.7). Men who had been on compulsory leave for less than 3 months had non-significantly higher mortality than other employed men. In contrast, compulsory unpaid leave of either more or less than 30 days in women was strongly and significantly associated with mortality, an association that was not explained by socioeconomic position and only weakly explained by material factors (Table 6.8).

People who were concerned about job loss were more likely to report poor health, and there was a continuous and statistically significant gradient in self-rated health in relation to perceived job insecurity in both men and women, which was partly explained by socioeconomic position and material factors (Table 6.7). There was also a mortality gradient in relation to job insecurity in men, which was only weakly explained by socioeconomic position. In women there was no significant gradient in mortality in relation to perceived job insecurity (Table 6.8).

Table 6.7 Associations between labour market conditions and self-rated health at entry in employed men and women (logistic regression analysis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)			
	(1) Age	(2) Age, alcohol and smoking	(3) Age, income, education	(4) = (3) plus socio-demographic and material factors
Male				
Wage arrears				
No	1	1	1	1
3 months or less	**1.76 (1.30-2.37)**	**1.77 (1.31-2.39)**	**1.67 (1.20-2.33)**	**1.63 (1.09-2.44)**
More than 3 months	1.09 (0.43-2.77)	1.14 (0.45-2.93)	1.18 (0.41-3.39)	1.43 (0.49-4.18)
Compulsory leave				
No	1	1	1	1
30 days or less	0.76 (0.37-1.56)	0.79 (0.38-1.62)	0.70 (0.33-1.47)	0.87 (0.39-1.96)
More than 30 days	1.18 (0.53-2.64)	1.21 (0.54-2.70)	1.30 (0.58-2.91)	1.08 (0.37-3.13)
Paid in goods				
No	1	1	1	1
Yes	1.00 (0.61-1.64)	0.99 (0.60-1.62)	0.82 (0.47-1.44)	0.75 (0.32-1.77)
Job insecurity (concern re chance of job loss)				
Not at all	1	1	1	1
Not too	0.89 (0.51-1.52)	0.89 (0.52-1.53)	0.91 (0.51-1.65)	0.76 (0.38-1.51)
Yes and no	0.90 (0.47-1.72)	0.88 (0.46-1.69)	1.04 (0.53-2.05)	0.99 (0.46-2.12)
A little	1.27 (0.79-2.03)	1.26 (0.78-2.02)	1.27 (0.76-2.14)	1.18 (0.66-2.13)
Very	1.43 (0.93-2.21)	1.42 (0.92-2.19)	1.32 (0.82-2.14)	1.16 (0.66-2.03)
Continuous (5 cats)	**1.12 (1.01-1.24)**	**1.12 (1.01-1.24)**	1.09 (0.98-1.22)	1.07 (0.94-1.22)
Female				
Wage arrears				
No	1	1	1	1
3 months or less	**1.36 (1.07-1.72)**	**1.34 (1.06-1.70)**	1.14 (0.88-1.48)	1.22 (0.89-1.66)
More than 3 months	0.57 (0.27-1.23)	0.61 (0.28-1.33)	0.64 (0.27-1.54)	0.76 (0.31-1.83)
Compulsory leave				
No	1	1	1	1
30 days or less	1.46 (0.98-2.19)	**1.55 (1.03-2.32)**	1.33 (0.86-2.05)	1.38 (0.86-2.23)
More than 30 days	**1.95 (1.12-3.40)**	**2.10 (1.21-3.65)**	1.72 (0.94-3.14)	**2.35 (1.25-4.40)**
Paid in goods				
No	1	1	1	1
Yes	1.15 (0.75-1.76)	1.13 (0.74-1.73)	0.85 (0.52-1.39)	0.73 (0.36-1.51)
Job insecurity (concern re chance of job loss)				
Not at all	1	1	1	1
Not too	0.81 (0.52-1.27)	0.81 (0.52-1.27)	0.77 (0.48-1.23)	0.84 (0.50-1.41)
Yes and no	0.71 (0.40-1.25)	0.70 (0.39-1.24)	0.64 (0.34-1.18)	0.65 (0.32-1.29)
A little	1.21 (0.81-1.79)	1.18 (0.79-1.75)	1.07 (0.69-1.65)	0.95 (0.58-1.55)
Very	1.27 (0.90-1.80)	1.23 (0.87-1.75)	1.02 (0.70-1.49)	1.00 (0.65-1.56)
Continuous (5 cats)	**1.10 (1.02-1.19)**	**1.09 (1.01-1.19)**	1.04 (0.96-1.14)	1.03 (0.93-1.13)

Income and education: Education (3 cats), household income quintile per person, **Material:** number of consumer goods, number of household amenities, household sold consumer goods for clothes/food **Sociodemographic factors:** marital status, district in Russia **Smoking and alcohol**: alcohol frequency (none, monthly, 2-3 times/month, weekly, >weekly), current smoking
N.B. 1. All models adjust for age at entry and cluster by household

Table 6.8 Associations between labour market conditions and mortality in employed men and women (Cox proportional hazards analysis)

	Cox proportional hazards ratio for death during study (95% confidence interval)			
	(1) Age	(2) Age, alcohol and smoking	(3) Age, income, education	(4) = (3) plus socio-demographic and material factors
Male				
Wage arrears				
No	1	1	1	1
3 months or less	0.92 (0.69-1.22)	0.93 (0.70-1.24)	0.79 (0.58-1.08)	0.64 (0.43-0.95)
More than 3 months	0.50 (0.16-1.60)	0.60 (0.19-1.92)	0.40 (0.10-1.63)	0.47 (0.11-1.93)
Compulsory leave				
No	1	1	1	1
30 days or less	1.42 (0.85-2.36)	1.46 (0.88-2.41)	1.26 (0.74-2.16)	0.74 (0.34-1.60)
More than 30 days	0.41 (0.13-1.26)	0.40 (0.13-1.24)	0.45 (0.14-1.40)	0.20 (0.03-1.47)
Paid in goods				
No	1	1	1	1
Yes	**1.72 (1.20-2.49)**	**1.63 (1.13-2.35)**	1.44 (0.96-2.17)	1.25 (0.63-2.50)
Job insecurity (concern re chance of job loss)				
Not at all	1	1	1	1
Not too	1.26 (0.75-2.11)	1.37 (0.81-2.30)	1.14 (0.66-1.94)	1.09 (0.56-2.14)
Yes and no	1.40 (0.75-2.59)	1.41 (0.76-2.62)	1.29 (0.69-2.40)	1.16 (0.55-2.48)
A little	1.57 (0.97-2.55)	1.62 (0.99-2.64)	**1.65 (1.01-2.70)**	**1.89 (1.05-3.39)**
Very	**1.59 (1.03-2.45)**	**1.60 (1.03-2.49)**	1.37 (0.87-2.16)	1.47 (0.84-2.59)
Continuous (5 cats)	**1.11 (1.01-1.22)**	**1.11 (1.01-1.21)**	1.09 (0.99-1.20)	1.12 (0.99-1.27)
Female				
Wage arrears				
No	1	1	1	1
3 months or less	0.88 (0.45-1.75)	0.92 (0.46-1.84)	0.89 (0.43-1.84)	1.14 (0.52-2.49)
More than 3 months	0.76 (0.10-5.64)	0.85 (0.11-6.52)	0.85 (0.11-6.40)	0.93 (0.12-7.07)
Compulsory leave				
No	1	1	1	1
30 days or less	**2.57 (1.06-6.22)**	**2.96 (1.22-7.23)**	**3.00 (1.20-7.48)**	2.25 (0.83-6.08)
More than 30 days	**5.65 (2.17-14.69)**	**5.88 (2.22-15.57)**	**5.75 (2.12-15.60)**	**4.76 (1.54-14.74)**
Paid in goods				
No	1	1	1	1
Yes	1.19 (0.37-3.86)	1.32 (0.40-4.41)	1.07 (0.32-3.60)	1.27 (0.30-5.43)
Job insecurity (concern re chance of job loss)				
Not at all	1	1	1	1
Not too	0.72 (0.26-2.01)	0.79 (0.27-2.26)	0.70 (0.22-2.21)	0.65 (0.20-2.05)
Yes and no	0.55 (0.12-2.56)	0.62 (0.13-2.92)	0.63 (0.13-3.07)	0.56 (0.11-2.74)
A little	0.49 (0.15-1.65)	0.57 (0.16-2.00)	0.57 (0.17-1.99)	0.44 (0.11-1.74)
Very	0.90 (0.37-2.14)	0.96 (0.40-2.33)	0.92 (0.37-2.27)	0.98 (0.37-2.59)
Continuous (5 cats)	0.99 (0.79-1.24)	1.00 (0.81-1.25)	1.00 (0.81-1.25)	1.02 (0.80-1.30)

Income and education: Education (3 cats), household income quintile per person, **Material:** number of consumer goods, number of household amenities, household sold consumer goods for clothes/food **Sociodemographic factors:** marital status, district in Russia **Smoking and alcohol**: alcohol frequency (none, monthly, 2-3 times/month, weekly, >weekly), current smoking
N.B. 1. All models adjust for age at entry and cluster by household

6.4.3 Discussion of the associations between labour market conditions and health

Many respondents experienced wage arrears, compulsory leave, payment in goods, job insecurity and unemployment. Manual and clerical workers were generally at greater risk than professionals and managers. This concurs with the finding that those in lower status employment, often working in obsolete industries, have lost income and prospects for improving their situation compared with professionals and managers[157]. These findings could also be because state employees were more likely to be affected than workers at privately owned enterprises, since certain occupations are more strongly associated with particular employment sectors[20], although it is hard to be certain from these data. Education was protective against adverse employment experiences, in some cases independently of occupation. The reasons for this are uncertain, but it is possible that education may provide resilience or coping skills, evidenced by the association between education and higher perceived control [158]. It has also been shown that people in Russia with a higher education have better social networks, which they use to find jobs [153].

Wage arrears and compulsory leave were both strongly associated with low income. A causal association in either direction is plausible, since arrears have a direct impact on income, and wage arrears were more common amongst people in manual occupations, who had lower incomes (Table 5.8). It was difficult to test the direction of the association formally in the whole working population, since wage arrears in individuals varied between years, and arrears were recorded if they occurred at any time during the preceding 12 months. The period of wage arrears might not have included the month immediately prior to the survey when income was measured.

To overcome these difficulties, I compared the odds of wage arrears, compulsory leave or payment in goods at 2 years in relation to household income quintile per person at entry. I included only individuals who were not experiencing payment difficulties when they entered the study. There was a significant trend in wage arrears at the second round in men [0.85 (0.76-0.95)] but not in women in relation to income quintile, but there were no significant trends in compulsory leave or payment in goods. The predominant causal pathway is therefore likely to be that wage arrears,

compulsory leave, and payment in goods cause low incomes, with the exception of wage arrears and income in men, where the pathway may operate in both directions.

Unemployment was significantly and strongly associated with mortality in men, but in women this association was much weaker. Qualitative research has shown that the traditional male role in a Russian household is as principal breadwinner, and suggests that unemployment has a particularly high impact on men in Russia because they do not have a traditional role in the home [159]. However, in this study the association between unemployment and mortality was strongly explained by socioeconomic position and material factors, which have been shown elsewhere to mediate the effects of unemployment on health [114]. In contrast with mortality, unemployment was associated with significantly better self-rated health in men, an inconsistent finding that is hard to explain.

Using a definition of unemployment based on self-report gave much higher rates of unemployment (10% in men and 8% in women) than by using the BLS definition and government registered unemployment (Section 4.3.5). However, the high mortality amongst individuals who reported themselves as unemployed is consistent with the well-established association between unemployment and mortality, and could indicate that these individuals were genuinely unemployed.

Certain adverse employment experiences were associated with self-rated health or mortality, although there were inconsistencies that were hard to explain. Wage arrears and job insecurity were strongly associated with self-rated health in both sexes. Compulsory leave was strongly associated with self-rated health and mortality in women, and payment in goods and job insecurity were significantly associated with mortality in men.

It is surprising that wage arrears was associated with self-rated health, and also that a longer duration of wage arrears was associated with better self-rated health. This could be because only a very small percentage of respondents experienced more than 3 months' arrears, and also because the arrears could have occurred at any time during the previous year, not necessarily at the time of the interview.

The association between compulsory leave and mortality in women was not surprising since compulsory leave has been called Russia's 'hidden unemployment' [97], and unemployment has been shown to be associated with higher mortality both in this study Table 6.6) and elsewhere [112]. However it is surprising that compulsory leave was not associated with mortality in men. It is also interesting that compulsory leave was more strongly associated than unemployment with mortality in women. Higher mortality amongst women on compulsory leave may have had a particularly high impact on population health. This is because women were more likely to be placed on leave than men, shown both here and in an other study [160], especially in the early 1990s, although less so by 1996 [115].

A higher rate of perceived job insecurity amongst people in manual and clerical jobs and respondents with lower education reflected realistic concerns, since these individuals were more likely to be unemployed in the following round. Job insecurity has been shown in other studies to be associated with worse self-rated health and physiological outcomes [110;111]. However, the association between perceived job insecurity and self-rated health could also be partly due to cross-contamination, since both measures are self-reported.

Perceived job insecurity was also associated with mortality in men in this study, but the association was explained by socioeconomic position. Further multivariate analyses showed that concern about job loss did not mediate the associations between wage arrears, compulsory leave or payment in goods and self-rated health or mortality (data not shown). Perceived job insecurity was more common amongst women than men, but it was much more weakly associated with mortality in women. It is possible that this may be because women earn a lower proportion of the household income (Section 5.2.1) and that women had a lower median individual income than men in the same occupational class (Table 5.8). Overall, however, perceived job insecurity had a weak independent effect on mortality in this study.

Another proposed mechanism previously shown to mediate the association between working conditions and health is effort-reward imbalance [102], which could in theory explain the associations between wage arrears, payment in goods and health in a very

literal way, when work is not rewarded financially as promised. Unfortunately it was not possible to study this mechanism within these data.

Overall, despite the inconsistencies in the associations between employment related variables and health and mortality, the high frequency of these factors in the Russian population makes the labour market consequences of economic instability a potentially important public health problem.

6.5 Comparing the associations of occupation, education and income with self-rated health and mortality, and the influence of labour market variables

In order to study the association between occupation and heath in more detail, I first compared the associations between occupation, income, education and self-rated health and mortality in the employed population. This also determined whether the associations between income and education and health were similar in the employed population and the total population.

Multivariate models

I also tested whether the associations between socioeconomic position and health were explained by the other measures of socioeconomic position, or by labour market variables. I included payment in goods, wage arrears, compulsory leave and job insecurity, since each of these was associated with occupational class and, though somewhat inconsistently, with either self-rated health or mortality. I then performed some more detailed multivariate analyses of the association between occupation and health, using models similar to those used in the previous chapter for the other measures of socioeconomic position.

6.5.1 Associations between occupation, income and education and self-rated health and mortality, and the influence of labour market variables

(i) Occupation

The association between occupation and health was described in Section 6.2, and is shown again here to compare this association with those of education and income. The relationships between occupation and self-rated health (Table 6.9) and mortality (Table 6.10) were not explained by labour market variables.

(ii) Education

Amongst employed men and women, there was a weak but non-significant gradient in self-rated health in relation to education (Table 6.9). In both sexes, this trend became weaker after adjusting for income and occupation. Further analysis showed that in men the association was explained more strongly by income, but in women it was explained by occupation (data not shown).

There was a significant educational gradient in mortality in both sexes, as in the total study population. The differences in mortality between individual educational categories were of a similar magnitude in both sexes, although they were only statistically significant in men.

The relationships between education, self-rated health and mortality were not explained by labour market variables, with the exception that the significantly lower mortality in women with a higher education was partly explained by labour market variables.

(iii) Income

The significant gradient in poor self-rated health in relation to household income quintile per person in employed people of both sexes (Table 6.9) was only weakly explained by education, occupation and labour market variables. There was also a weak and very inconsistent mortality gradient in relation to income quintile in both sexes, which again was only weakly explained by education and occupation, (Table 6.10). In general labour market variables did not explain the mortality gradient, although they explained the non-significantly higher relative risk of mortality of men in the highest income quintile.

Table 6.9 Association between socioeconomic position and self-rated health and the influence of labour market conditions (logistic regression analysis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)					
	Male			Female		
	(1) Age	(2) Age, measures of SEP	(3) Age and labour market factors	(1) Age	(2) Age, measures of SEP	(3) Age and labour market factors
Occupational class						
Higher prof/manag	1	1	1	1	1	1
Technic/assoc prof	0.42 (0.15-1.22)	0.49 (0.17-1.44)	0.43 (0.15-1.24)	1.01 (0.71-1.43)	1.04 (0.71-1.52)	0.92 (0.65-1.31)
Clerical/service	1.83 (0.90-3.75)	1.50 (0.66-3.39)	**2.12 (1.03-4.39)**	1.23 (0.88-1.73)	1.10 (0.73-1.64)	1.18 (0.83-1.67)
Skilled agric/ Craft/trades	**1.63 (1.04-2.56)**	1.50 (0.87-2.59)	1.57 (0.98-2.53)	0.97 (0.55-1.70)	1.00 (0.54-1.86)	0.79 (0.45-1.41)
Semi and unskilled manual	1.37 (0.88-2.15)	1.22 (0.70-2.14)	1.29 (0.80-2.07)	**1.73 (1.26-2.39)**	**1.70 (1.14-2.55)**	**1.60 (1.16-2.21)**
Continuous	**1.12 (1.01-1.23)**	1.08 (0.94-1.23)	1.09 (0.98-1.22)	**1.14 (1.06-1.24)**	1.15 (1.04-1.26)	**1.13 (1.04-1.22)**
Education						
Primary/incomplete secondary	1.54 (0.99-2.40)	1.43 (0.92-2.24)	1.51 (0.98-2.33)	1.25 (0.84-1.88)	1.17 (0.77-1.79)	1.25 (0.83-1.90)
Complete secondary	1	1	1	1	1	1
Higher	0.99 (0.69-1.43)	1.15 (0.76-1.76)	1.00 (0.69-1.44)	0.90 (0.68-1.18)	1.05 (0.76-1.45)	0.90 (0.68-1.19)
Per unit increase	0.82 (0.67-1.01)	0.91 (0.71-1.15)	0.83 (0.67-1.02)	0.86 (0.73-1.01)	0.97 (0.79-1.18)	0.86 (0.72-1.02)
Quintile for household income per person						
1 (lowest)	1.53 (0.91-2.58)	1.47 (0.86-2.51)	1.37 (0.81-2.32)	**1.75 (1.18-2.58)**	**1.72 (1.15-2.58)**	**1.83 (1.22-2.74)**
2	1.55 (0.93-2.57)	1.41 (0.83-2.38)	1.40 (0.83-2.34)	1.21 (0.82-1.79)	1.24 (0.82-1.86)	1.21 (0.80-1.82)
3	1	1	1	1	1	1
4	1.25 (0.76-2.07)	1.21 (0.72-2.04)	1.31 (0.79-2.16)	0.94 (0.63-1.40)	1.05 (0.70-1.59)	1.02 (0.68-1.54)
5 (highest)	0.91 (0.54-1.51)	1.03 (0.61-1.73)	0.94 (0.56-1.60)	0.94 (0.64-1.39)	1.05 (0.70-1.57)	1.05 (0.70-1.56)
Change per quintile	**0.88 (0.79-0.98)**	0.92 (0.82-1.03)	0.92 (0.82-1.04)	**0.86 (0.79-0.94)**	**0.89 (0.81-0.97)**	**0.88 (0.81-0.96)**

(2) Measures of SEP - education, occupation, household income quintile
(3) Labour market factors: wage arrears payment in goods, compulsory leave, perceived job insecurity
N.B. 1. All models adjust for age at entry and clustering by household. 2. All models adjust only for variables other than the predictor variable

Table 6.10 Association between socioeconomic position and mortality and the influence of labour market conditions (Cox proportional hazards analysis)

	Cox proportional hazards ratio (95% confidence interval)					
	Male			Female		
	(1) Age	(2) Age, measures of SEP	(3) Age and labour market factors	(1) Age	(2) Age, measures of SEP	(3) Age and labour market factors
Occupational class						
Higher prof/manag	1	1	1	1	1	1
Technic/assoc prof	1.67 (0.80-3.49)	1.40 (0.65-3.03)	1.62 (0.73-3.59)	0.86 (0.28-2.66)	0.69 (0.21-2.27)	0.88 (0.28-2.81)
Clerical/service	**2.31 (1.11-4.82)**	1.82 (0.83-4.00)	**2.23 (1.00-4.95)**	1.63 (0.62-4.28)	0.81 (0.24-2.68)	1.66 (0.59-4.67)
Skilled agric/ Craft/trades	**2.18 (1.35-3.52)**	1.22 (0.69-2.16)	**1.98 (1.18-3.30)**	1.90 (0.49-7.35)	1.10 (0.24-5.10)	1.63 (0.40-6.54)
Semi and unskilled manual	**1.74 (1.08-2.82)**	0.95 (0.53-1.71)	1.53 (0.91-2.55)	2.07 (0.86-5.01)	1.10 (0.35-3.45)	1.79 (0.70-4.59)
Continuous	**1.12 (1.02-1.23)**	0.95 (0.83-1.08)	1.08 (0.97-1.21)	**1.23 (1.01-1.51)**	1.08 (0.83-1.41)	1.18 (0.95-1.47)
Education						
Primary/incomplete secondary	**2.29 (1.58-3.32)**	**2.29 (1.56-3.36)**	**2.15 (1.46-3.16)**	2.26 (0.91-5.63)	2.38 (0.94-6.03)	2.34 (0.89-6.14)
Complete secondary	1	1		1	1	
Higher	0.85 (0.60-1.22)	0.79 (0.51-1.20)	0.87 (0.60-1.26)	0.59 (0.26-1.31)	0.72 (0.27-1.89)	0.72 (0.31-1.67)
Per unit increase	**0.62 (0.51-0.75)**	**0.57 (0.46-0.71)**	0.64 (0.53-0.78)	**0.51 (0.34-0.77)**	**0.54 (0.33-0.90)**	0.57 (0.37-0.87)
Quintile for household income per person						
1 (lowest)	1.52 (0.96-2.39)	1.42 (0.91-2.24)	1.40 (0.88-2.23)	0.68 (0.26-1.76)	0.67 (0.25-1.80)	0.73 (0.27-1.99)
2	0.97 (0.60-1.55)	0.91 (0.56-1.46)	0.91 (0.56-1.48)	0.63 (0.25-1.58)	0.49 (0.18-1.32)	0.47 (0.16-1.35)
3	1	1	1	1	1	1
4	0.67 (0.40-1.11)	0.69 (0.42-1.15)	0.61 (0.36-1.01)	0.66 (0.28-1.59)	0.73 (0.29-1.79)	0.69 (0.28-1.70)
5 (highest)	1.14 (0.74-1.76)	1.19 (0.77-1.85)	1.02 (0.65-1.59)	**0.30 (0.10-0.91)**	0.36 (0.11-1.11)	0.32 (0.10-1.00)
Change per quintile	0.92 (0.82-1.03)	0.95 (0.85-1.05)	0.91 (0.81-1.02)	0.87 (0.71-1.07)	0.94 (0.73-1.20)	0.90 (0.70-1.15)

(2) Measures of SEP - education, occupation, household income quintile
(3) Labour market factors: wage arrears payment in goods, compulsory leave, perceived job insecurity
N.B. 1. All models adjust for age at entry and clustering by household. 2. All models adjust only for variables other than the predictor variable

6.5.2 Associations between occupation, self-rated health and mortality – further multivariate analyses

For completeness, I performed some further multivariate analyses of the associations between occupation and self-rated health and mortality, using a set of models similar to the models of the associations between income and education and health in Chapter 5. These models did not include education. This was partly because education was used as an explanatory variable in the previous section (Table 6.9 and Table 6.10). It was also because the ISCO-88 occupational classification scheme is based on the education required for a particular occupation, and some researchers suggest that education should be excluded from multivariate models of the associations between occupation and health [156].

Table 6.11 Associations between occupational class and self-rated health at entry (logistic regression analysis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)				
	(1) Age	(2) Age, alcohol and smoking	(3) Age, satisfaction, optimism	(4) Income	(4) Income plus geographic and material factors
Occupational class (at entry)					
Male					
Higher prof/managerial	1	1	1	1	1
Technical/assoc. prof	0.42 (0.15-1.22)	0.41 (0.14-1.19)	0.57 (0.19-1.68)	0.45 (0.15-1.31)	**0.12 (0.02-0.86)**
Clerical/service	1.83 (0.90-3.75)	1.81 (0.88-3.71)	1.77 (0.75-4.19)	1.68 (0.80-3.53)	1.50 (0.67-3.37)
Skilled agric/crafts/trade	**1.63 (1.04-2.56)**	**1.59 (1.00-2.51)**	**1.69 (1.02-2.82)**	1.45 (0.91-2.33)	1.06 (0.62-1.80)
Semi and unskilled manual	1.37 (0.88-2.15)	1.33 (0.85-2.10)	1.51 (0.91-2.50)	1.21 (0.75-1.93)	1.08 (0.63-1.83)
Continuous	**1.12 (1.01-1.23)**	**1.11 (1.00-1.23)**	**1.13 (1.01-1.27)**	1.08 (0.96-1.20)	1.06 (0.93-1.21)
Female					
Higher prof/managerial	1	1	1	1	1
Technical/assoc. prof	1.01 (0.71-1.43)	0.99 (0.69-1.40)	1.05 (0.72-1.53)	1.00 (0.69-1.45)	0.89 (0.59-1.35)
Clerical/service	1.23 (0.88-1.73)	1.20 (0.85-1.68)	1.26 (0.87-1.81)	1.19 (0.84-1.70)	1.11 (0.74-1.66)
Skilled agric/crafts/trade	0.97 (0.55-1.70)	0.98 (0.56-1.72)	0.94 (0.52-1.72)	1.01 (0.57-1.81)	1.14 (0.62-2.11)
Semi and unskilled manual	**1.73 (1.26-2.39)**	**1.64 (1.19-2.27)**	**1.68 (1.19-2.38)**	**1.70 (1.20-2.39)**	1.44 (0.96-2.16)
Continuous	**1.14 (1.06-1.24)**	**1.13 (1.05-1.22)**	**1.13 (1.04-1.23)**	**1.14 (1.05-1.24)**	**1.11 (1.01-1.22)**

Income Household income quintile per person (household income divided by square root of number in household), **Material** number of consumer goods, number of household amenities, household sold consumer goods for clothes/food **Sociodemographic factors** marital status, rural/urban, district in Russia **Smoking and alcohol**– alcohol frequency (none, monthly, 2-3 times/month, weekly, >weekly), current smoking **Life satisfaction** – 5 point scale **Optimism** believes family economic situation will improve in 12 months (5 point scale) **N.B.** All models adjust for age at entry and cluster by household

The significantly worse self-rated health of men in skilled manual occupations compared with professionals was largely explained by material variables (Table 6.11),

and the particularly low mortality amongst men in technical and associate professional occupations became even lower after adjusting for material factors. The significant occupational gradient in self-rated health in women and the particularly high relative risk of poor self-rated health in women in semi-and unskilled occupations were partly explained by material factors (Table 6.11).

In the previous section it was shown that the occupational gradient in mortality in both sexes was largely explained by education (Table 6.10). Additionally in men, this gradient was weakly explained by alcohol and smoking, and more strongly by material factors (Table 6.12). The occupational gradient in mortality in women was also weakly explained by satisfaction and optimism.

Table 6.12 Associations between occupational class and mortality (Cox proportional hazards analysis)

	Cox proportional hazards ratio for death during study (95% confidence interval)					
	(1) Age	(2) Age + self-rated health	(3) Age, alcohol and smoking	(4) Age, satisfaction, optimism	(5) Income	(6) Income plus geographic and material factors
Occupational class (at entry)						
Males						
Higher prof/managerial	1	1	1	1	1	1
Technical/assoc. prof	1.67 (0.80-3.49)	1.66 (0.79-3.49)	1.58 (0.76-3.28)	1.62 (0.74-3.51)	1.74 (0.81-3.73)	1.36 (0.56-3.30)
Clerical/service	**2.31 (1.11-4.82)**	**2.32 (1.11-4.83)**	**2.25 (1.07-4.72)**	2.13 (0.94-4.79)	**2.42 (1.12-5.22)**	1.70 (0.66-4.35)
Skilled agric/crafts/trade	**2.18 (1.35-3.52)**	**2.09 (1.29-3.37)**	**1.82 (1.12-2.96)**	**2.10 (1.28-3.46)**	**1.91 (1.16-3.16)**	1.74 (0.99-3.03)
Semi and unskilled manual	**1.74 (1.08-2.82)**	**1.71 (1.06-2.76)**	1.50 (0.93-2.42)	**1.86 (1.13-3.05)**	1.61 (0.98-2.65)	1.27 (0.71-2.26)
Continuous	**1.12 (1.02-1.23)**	**1.11 (1.01-1.22)**	1.07 (0.98-1.18)	1.14 (1.03-1.26)	1.09 (0.98-1.21)	1.06 (0.93-1.20)
Females						
Higher prof/managerial	1	1	1	1	1	1
Technical/assoc. prof	0.86 (0.28-2.66)	0.86 (0.28-2.66)	0.89 (0.29-2.74)	0.71 (0.21-2.37)	0.87 (0.27-2.76)	0.93 (0.28-3.12)
Clerical/service	1.63 (0.62-4.28)	1.61 (0.61-4.24)	1.66 (0.64-4.29)	1.50 (0.56-4.04)	1.43 (0.51-4.00)	1.68 (0.56-4.97)
Skilled agric/crafts/trade	1.90 (0.49-7.35)	1.90 (0.49-7.33)	2.00 (0.51-7.78)	1.37 (0.28-6.67)	1.92 (0.49-7.58)	2.24 (0.54-9.19)
Semi and unskilled manual	2.07 (0.86-5.01)	2.00 (0.81-4.91)	2.03 (0.83-4.91)	1.88 (0.79-4.51)	1.98 (0.79-4.99)	1.92 (0.67-5.52)
Continuous	**1.23 (1.01-1.51)**	**1.22 (1.00-1.50)**	**1.22 (1.00-1.50)**	1.21 (0.99-1.49)	1.22 (0.99-1.51)	1.21 (0.96-1.53)

Income Household income quintile per person (household income divided by square root of number in household), **Material** number of consumer goods, number of household amenities, household sold consumer goods for clothes/food **Sociodemographic factors** marital status, rural/urban, district in Russia **Smoking and alcohol**– alcohol frequency (none, monthly, 2-3 times/month, weekly, >weekly), current smoking **Life satisfaction** – 5 point scale **Optimism** believes family economic situation will improve in 12 months (5 point scale) **N.B.** All models adjust for age at entry and cluster by household

6.5.3 Tests for interaction between different socioeconomic measures in the employed population

I tested for interactions between education, household income quintile per person and occupation in their associations with mortality and self-rated health in the employed population, and found no statistically significant interactions. In men, the interaction between occupation and household income quintile per person fell slightly short of statistical significance in relation to both self-rated health (p=0.06) and mortality (p=0.09).

6.5.4 Discussion of the associations between occupation, other measures of socioeconomic position and health in the employed population

Education and occupation were both significantly associated with mortality in the working population, and household income was less strongly associated with mortality.

The association between occupation and mortality was largely explained by education. There are several possible reasons for this. The first is that education and occupation were strongly correlated, and it was education that was protective against mortality. The second reason, as discussed in Section 6.2, is that adjusting the educationally based ISCO-88 occupational classification for education could represent an overadjustment[156]. However, the 5 summarised occupational categories used here corresponded broadly to other classifications[156], and it therefore seems likely that the relationship between occupation and mortality really is explained by education. A more detailed discussion of the explanatory role of education in the association between occupation and mortality is to be found in Chapter 8.

In contrast, education did not explain the association between occupation and self-rated health. This is likely to be because education was only weakly associated with self-rated health in the employed population (Table 6.9).

The relationships between occupation and mortality were generally similar in magnitude in both sexes, but were more often statistically significant in men. This is likely to be because there were fewer deaths amongst employed women, and therefore less power to detect significant differences in mortality (Section 4.8.3).

Education was more strongly associated with mortality than was income, a pattern similar to that seen in the total study population. The associations between education and income and self-rated health and mortality were generally weaker amongst the employed population than in the general population, again perhaps partly because there were fewer deaths amongst employed people and consequently less power to detect significant differences in mortality.

It is interesting that there were no significant interactions between income, education and occupation in their associations with self-rated health and mortality in Russia, a society in which many well-educated people had low incomes or were in manual occupations. Each measure of socioeconomic position appears to have an independent effect on health.

It is debatable whether it is appropriate to measure the gradient in mortality or self-rated health across occupations, or to treat occupational classes as separate, non-stratified entities. It has been shown that occupations form a similar gradient in status in many different countries [23]. However, there is still a considerable amount of debate about the nature of class structure in post-Communist societies[10;157].

It was therefore interesting to study the association between occupation health both as a gradient and by separate classes. In general, men in clerical and manual occupations experienced worse self-rated health and greater mortality than professionals and associate professionals. However, there was no stratification within the lowest 3 categories, and the gradient in self-rated health and mortality, although present, was not consistently and evenly distributed. Amongst women, the gradient in self-rated health and mortality was more evenly distributed (with the exception of skilled female manual workers, of whom there were few), and women in semi- and unskilled manual occupations experienced particularly poor self-rated health. Overall, people in the top two classes in this study experienced better health and lower mortality than the lower

3 classes. However, in men there was not a consistent gradient. It is possible that in a transforming society that classes could be differently formed. This issue is discussed further in Chapter 8.

Ninety per cent of households in this study were headed by a man, and some household characteristics may be influenced more by the male head of household (such as occupational class), since men are traditionally considered to be the main breadwinners [29;159]. It would have been interesting to compare health and mortality in women based on the occupation of the male head of household, but this was not possible within the available data. However, men are more likely to marry women from similar educational backgrounds[23], and are likely to be in similar occupational classes if both are working, although women earn a lower proportion of the household income. Difficulties in measuring and classifying occupation could have weakened its association with health, and are considered further in the main discussion chapter.

6.6 Summary of the association between socioeconomic position, employment-related variables and health in the working population

Occupation was associated with self-rated health and mortality, although its association with mortality was explained by education, and to a lesser degree by material variables. Associations between income and education were broadly similar in the employed and total study populations.

Payment in goods, unemployment, compulsory leave and wage arrears were all common in the working population in RLMS, and were more common amongst the lower socioeconomic groups.

Although there were some inconsistencies, several of these adverse employment experiences, particularly unemployment, compulsory leave in women and payment in goods in men, had a deleterious effect on self-rated health and mortality. However, labour market variables did not explain the associations between socioeconomic position and either self-rated health or mortality.

7 Principal components analysis of the socioeconomic variables

To study the associations between socioeconomic position and self-rated health and mortality in more detail, I used principal components analysis.

I have previously demonstrated associations between measures of socioeconomic position, self-rated health and mortality, and described the variables that explained these associations in the general and the employed population. I also demonstrated correlations between objective and subjective measures of socioeconomic position, indicating that there was some common variance between the different measures.

Defining the variance underlying these measures of socioeconomic position, and understanding its relationship with self-rated health and mortality might provide some useful additional information. In particular, separating the variance underlying subjective measures of socioeconomic position could separate the objective and subjective influences on the assessment of subjective social status by individuals. In addition, it may be possible to understand better the influence of occupation and education on health, since in this study the occupational classification was educationally based, and a high proportion of well-educated people were in low status jobs, which made these socioeconomic variables more difficult to study.

7.1 Identifying the principal components

I first used principal components analysis to identify factors (components) which described the variance underlying several measures of socioeconomic position and material wellbeing. I included the following socioeconomic and material variables: household and individual income; subjective power, economic status and respect; education and occupational class; and numbers of household consumer goods and household amenities. These results of the analysis are shown in Table 7.1. Three principal components emerged: Factor 1 (power, economic and respect ranks); Factor 2 (education and job category); and Factor 3 (household and individual incomes, number of consumer goods and number of household amenities).

Table 7.1 Principal components analysis of socioeconomic variables

Variable	Factor			Uniqueness
	1	2 (reverse scored)	3	
Subjective power	**0.83**	0.10	0.01	0.31
Subjective respect	**0.57**	0.08	0.04	0.67
Subjective economic status	**0.80**	0.02	0.21	0.32
Household income quintile	0.12	0.07	**0.81**	0.33
Individual income quintile	0.10	-0.01	**0.79**	0.36
Education	0.06	**0.85**	0.05	0.27
Occupational class	-0.06	**-0.85**	-0.05	0.27
Number of consumer goods	0.14	0.28	**0.48**	0.67
Number of household amenities	-0.09	0.17	**0.42**	0.79

7.2 Associations between the principal components and self-rated health and mortality

I then measured the associations between the components (factors) that were identified and self-rated health and mortality. I used a series of multivariate models, broadly similar to those used in previous chapters, with an additional model that adjusted for all 3 components. The results are shown in Table 7.2 and Table 7.3.

Factor 1

In women, Factor 1 (based on subjective power, economic status and respect) was significantly and independently associated with self-rated health – the higher the value of this variable the lower the odds of reporting poor health (Table 7.2). This significance persisted in all but the final multivariate model. In men the association between Factor 1 and self-rated health was mediated by life satisfaction and optimism, unsurprisingly, since Factor 1 was itself significantly correlated in both sexes with satisfaction (0.37) and optimism (0.32). Factor 1 was not associated with mortality in men, but was weakly (non-significantly) associated with lower mortality in women (Table 7.3).

Factor 2

In men and women Factor 2 (education and occupational class) was associated with poor self-rated health (Table 7.2). This association was not statistically significant, except in men in the model that adjusted for satisfaction and optimism. Factor 2 was associated with significantly higher mortality in men in all but the final multivariate model (Table 7.3). Factor 2 was only weakly (non-significantly) associated with lower mortality in women.

Factor 3

Factor 3 (based on household and individual income, household amenities and consumer goods) was significantly associated with poor self-rated health in women, independently of the other components. Factor 3 was not associated with poor self-rated health in men (Table 7.2), though, and it was not significantly associated with mortality in either sex (Table 7.3).

Table 7.2 Association between self-rated health at entry and factors identified by principal components analysis of socioeconomic variables in the employed population (logistic regression analysis)

	Odds ratio for poor or very poor self-rated health at entry (95% confidence interval)				
	(1) Age	(2) Age, alcohol and smoking	(3) Age, satisfaction, optimism	(4) Age , all 3 principal components (factors)	(5) = (2)-(4) combined
Male					
Factor 1 (power, economic and respect rank)	**0.73 (0.59-0.90)**	**0.73 (0.59-0.90)**	0.83 (0.65-1.06)	**0.73 (0.59-0.91)**	0.83 (0.65-1.06)
Factor 2 (education and job)	0.86 (0.72-1.03)	0.88 (0.73-1.06)	**0.82 (0.67-0.99)**	0.88 (0.73-1.05)	0.83 (0.68-1.02)
Factor 3 (income and material wellbeing)	0.96 (0.79-1.16)	0.98 (0.81-1.19)	1.00 (0.80-1.26)	1.01 (0.82-1.25)	1.11 (0.86-1.43)
Female					
Factor 1 (power, economic and respect rank)	**0.75 (0.65-0.87)**	**0.77 (0.66-0.89)**	**0.82 (0.69-0.97)**	**0.77 (0.66-0.89)**	**0.82 (0.70-0.97)**
Factor 2 (education and job)	0.87 (0.76-1.01)	0.90 (0.78-1.04)	0.85 (0.73-0.99)	0.89 (0.77-1.03)	0.89 (0.76-1.04)
Factor 3 (income and material wellbeing)	**0.78 (0.67-0.91)**	**0.82 (0.70-0.96)**	**0.80 (0.67-0.95)**	**0.79 (0.67-0.93)**	0.86 (0.71-1.03)

Employment factors wage arrears, compulsory leave, paid in goods **Demographic factors** marital status, rural/urban, district in Russia **Smoking and alcohol** - alcohol frequency (none, monthly, 2-3 times/month, weekly, >weekly), current smoking **Life satisfaction** 5 point scale **Optimism** believes family economic situation will improve in 12 months (5 point scale)
N.B. 1. All models adjust for clustering by household and age at entry; 2. All models adjust only for variables other than the predictor variable

Table 7.3 Association between mortality and factors identified by principal components analysis of socioeconomic variables in the employed population (Cox proportional hazards analysis)

	Cox proportional hazards analysis for death in study (95% confidence interval)					
	(1) Age	(2) Age + self-rated health	(3) Age, alcohol and smoking	(4) Age, satisfaction, optimism	(5) Age , all 3 principal components (factors)	(6) = (3)-(5) combined
Male						
Factor 1 (power, economic and respect rank)	1.02 (0.85-1.22)	1.02 (0.85-1.22)	1.02 (0.85-1.22)	0.99 (0.82-1.20)	1.01 (0.83-1.21)	0.92 (0.76-1.13)
Factor 2 (education and job)	**0.77 (0.63-0.93)**	**0.76 (0.62-0.93)**	**0.81 (0.66-1.00)**	**0.75 (0.61-0.91)**	**0.79 (0.64-0.97)**	0.81 (0.65-1.00)
Factor 3 (income and material wellbeing)	0.88 (0.72-1.06)	0.88 (0.72-1.07)	0.90 (0.74-1.09)	0.84 (0.69-1.01)	0.95 (0.77-1.15)	0.86 (0.68-1.07)
Female						
Factor 1 (power, economic and respect rank)	0.73 (0.48-1.13)	0.75 (0.49-1.14)	0.76 (0.50-1.14)	0.77 (0.50-1.19)	0.73 (0.46-1.13)	0.77 (0.50-1.19)
Factor 2 (education and job)	0.71 (0.49-1.02)	0.71 (0.50-1.02)	0.70 (0.47-1.03)	0.74 (0.52-1.07)	0.72 (0.49-1.07)	0.77 (0.53-1.11)
Factor 3 (income and material wellbeing)	0.94 (0.67-1.31)	0.97 (0.69-1.35)	0.98 (0.70-1.38)	0.94 (0.67-1.32)	1.08 (0.73-1.61)	1.15 (0.76-1.74)

Employment factors wage arrears, compulsory leave, paid in goods **Demographic factors** marital status, rural/urban, district in Russia **Smoking and alcohol**– alcohol frequency (none, monthly, 2-3 times/month, weekly, >weekly), current smoking
Life satisfaction – 5 point scale **Optimism** believes family economic situation will improve in 12 months (5 point scale)
N.B. 1. All models adjust for clustering by household and age at entry; 2. All models adjust only for variables other than the predictor variable

7.3 Discussion of the principal components analysis

The results of these analyses provided some interesting additional information. Since principal components analysis is based on the strengths of correlations between the variables in the model, it is not surprising that the principal components identified here reflected the correlations between different socioeconomic variables shown in the earlier analyses. Factor 1 was related to the three measures of subjective social status; Factor 2 to occupational class and education; and Factor 3 to income, consumer goods and household amenities.

The strong association of Factor 1 (subjective social status) with self-rated health in women was not surprising, since subjective power and economic status were associated with self-rated health. This is likely to be because of cross-contamination between these self-reported, satisfaction-based measures. However, there was also a weak, non-significant association between Factor 1 and mortality in women. Factor 1 separated the subjective components of social position from the objective

components, such as education and material factors. It therefore seems that the association between subjective social position and mortality in women was independent of objective measures of socioeconomic position. Although this association in women was non-significant, this may be because the power to detect a significant difference in mortality was weakest amongst employed women amongst whom there were few deaths (Section 4.8.3). In contrast, though, subjective social status was not associated with mortality in men.

Factor 2 represents the variance underlying education and occupation, and was particularly strongly associated with mortality. The strong association between Factor 2 and mortality, particularly in men, was consistent with the fact that education and occupation were both associated with mortality. There are a number of possible explanations for this association. In the previous chapter it was shown that the association between occupation and mortality was largely explained by education. It is therefore likely that Factor 2 is associated with mortality because it is an indicator of education. It is also possible that it could reflect being in an occupation appropriate to one's level of education.

Factor 3 was the component least strongly associated with either self-rated health or mortality (except self-rated health in women). This factor was likely to represent material wellbeing, since it included income and material measures. The lack of association between Factor 3 and mortality is consistent with the relatively weak associations between income, material variables and mortality. It is surprising, however, that Factor 3 was not associated with self-rated health in men, since income and the individual material measures were all strongly associated with self-rated health.

7.4 Summary of the principal components analysis

Principal components analysis showed that the component related to subjective social status was strongly associated with self-rated health; and the component underlying education and occupation was strongly associated with mortality. There were several differences between men and women in the associations.

8 Discussion

I have structured the discussion chapter as follows. A summary of the results is followed by a discussion of the limitations of the study. Next, the main findings of the thesis are discussed, focusing particularly on the relationships between different measures of socioeconomic position, their associations with health, and possible explanations for these associations. This discussion leads to a proposed model for the association between socioeconomic position, health and mortality in Russia. Then follows a discussion of possible implications of these findings for understanding the mortality crisis, and finally some directions for future research are proposed.

8.1 Summary of results

In this thesis I have used data from a large population based panel study to study the socioeconomic gradient in self-rated health and mortality in Russia, and the possible explanations for this gradient. The key findings can be summarised as follows:

- Education and occupation were moderately correlated, but both were only weakly correlated with income.
- Low socioeconomic position was significantly associated with mortality. Education was the measure of socioeconomic position most strongly associated with mortality, independently of the covariates studied here. The associations between occupational class and income and mortality were weaker, and were explained by education. The association between socioeconomic position and mortality was not explained by alcohol or smoking.
- Low income, education and occupational class were each moderately associated with poor self-rated health. The association between education and self-rated health was attenuated by adjustment for occupation. However, the associations between both occupation and income with self-rated health were independent of the other measures of socioeconomic position. The relationships between income, education and self-rated health were partly explained by material factors.
- In contrast to the objective measures of socioeconomic position, low subjective social status was strongly associated with poor self-rated health. This association was independent of objective measures of socioeconomic position, although it was

attenuated somewhat by controlling for satisfaction and optimism. The association between low subjective social status and mortality was somewhat stronger in women than in men. In men the association was largely explained by objective measures of socioeconomic position, although it was not fully explained by these measures in women.

- Several other variables were associated with poor self-rated health or mortality, independently of socioeconomic position. Frequent alcohol consumption and smoking, both common in this study population, were associated with a higher risk of mortality, as were number of household amenities and selling consumer goods for food and clothes, and divorce and singleness in men (the latter subject to the limitations of excluding single-person households). Number of household consumer goods, satisfaction and optimism were all associated with better self-rated health, independently of socioeconomic position.
- Unemployment, wage arrears, compulsory leave and payment in goods were all widespread in this study population. Unemployment was associated with significantly higher mortality in men. The other measures of unstable employment (such as wage arrears and compulsory leave) were also associated with poor self-rated health and mortality, although somewhat inconsistently. However, employment-related variables did not mediate the associations between socioeconomic position and health.
- Poor self-rated health was significantly associated with mortality, even though individual predictor variables often differed in their associations with self-rated health and mortality.

RLMS is probably the largest cohort study to date in post-transition Russia, and many of the measures studied were tailored to the Russian cultural, social and economic context. The findings in this thesis therefore make a unique and useful contribution to the literature on the socioeconomic determinants of health in Russia.

8.2 Limitations of the study

This study had several limitations that will be considered before the main findings of the study are discussed.

8.2.1 Secondary data analysis

A key limitation of this thesis is that it was based on secondary data analysis. Although the RLMS investigators gave a clear and detailed description of their methods [7], there could have been problems of which I was unaware, particularly in relation to the fieldwork. I had no influence over the design or measurement of the variables or the frequency of follow up. These issues are important, but clearly I could not address them.

8.2.2 Study design and conduct

Response rate

The overall response rate in RLMS was over 80% in most regions, although in St Petersburg and Moscow it was less than 70% [7]. The response rate was also lower amongst wealthier respondents, consistent with the difficulties experienced by other researchers in getting very wealthy respondents to participate in surveys [136]. Participants from Moscow and St Petersburg and people with high incomes may therefore be under-represented, and it is possible that mortality in these groups could have been underestimated, thereby influencing the associations between income, region and mortality. However, the overall response rate in this study was more favourable than a rate of 66% in the 1996 New Russia Barometer[17].

Sample size and power

The power of the study to detect statistically significant differences in self-rated health and mortality between population groups was described in Section 4.8.3. In general, the power was weakest in relation to mortality in employed women, since there were very few deaths amongst these respondents. The associations between

measures of socioeconomic position and mortality in employed women were often strong, but nevertheless were not statistically significant, and this is likely to be due to a lack of power. Otherwise, in most other analyses of self-rated health and mortality, there was generally sufficient power (more than 80%) to detect a relative risk of 1.5 or more. The power was greatest to detect significant differences in self-rated health in both sexes, and mortality in men, in the total study population.

Missing values

Data were missing for measures of socioeconomic position in a small proportion of respondents. Of these, income was the variable most affected, and approximately 6% of respondents had missing household income data. Respondents with missing income data were similar to the rest of the population in terms of education and occupation, so it is unlikely that the missing income data had a great effect on the results. Missing data on education data were rare.

Data were missing for most of the covariates in only a small proportion of respondents, for example information about alcohol and smoking was missing in only 1%. However, data for satisfaction and optimism were missing in a higher proportion (10%) of respondents. However, when analyses of the associations between measures of socioeconomic position and health were restricted to subjects with complete data (results not shown), the results were similar, suggesting that the missing data did not affect the main findings to any great extent.

Clustering

It is likely that there was some degree of clustering of individuals in households. For example, members of the same household, or people from the same geographical area, may have similar levels of risk factors for poor health as a result of either inherited or environmental factors. Throughout the analyses I controlled for clustering (autocorrelation) by household in order to overcome this effect. Many of the analyses were adjusted additionally for geographical region, since in STATA[140] it was only possible to control for clustering by one variable at a time. However, clustering would lead to narrower confidence intervals, but it would not affect the point estimates and

general pattern of results. This, in combination with the statistical techniques adopted to allow for clustering makes it unlikely that the findings were distorted.

Household and individual measures

It was not possible to link data for individual respondents with information about other members of their household. For example, characteristics of the head of the household, such as income, occupation or wage arrears, could influence the socioeconomic conditions of other household members. Unfortunately, such analyses were not possible.

Study duration

The second phase of RLMS commenced in 1994, and covered at most 8 years of the respondents' adult lives. It was not possible to study the influence of socioeconomic conditions from before this time on health and mortality within the available data. This was unfortunate, since it would have been interesting to study how factors before the transition, and conditions in participants' early lives, could have influenced respondents' subsequent health and risk of mortality.

8.2.3 Mortality data

Studying mortality was not one of the original intentions of RLMS. However, analyses of mortality data were possible because participants' deaths were reported by other household members. Measuring mortality was not a central aim of the study, though, and the quality of the mortality data was limited in several ways.

Firstly, mortality was probably underestimated. Individuals living in single-person households were excluded from the final data analysis since deaths in this group were almost certainly under-reported. However, under-reporting of deaths was also possible to a lesser extent in some individuals who were included. Death rates were slightly lower than expected amongst respondents in two person households, who remained in the dataset. In addition, fewer deaths were reported between rounds 5 and 6 (the first 2 rounds of this second phase of RLMS) than between later rounds, suggesting that not all deaths between rounds 5 and 6 may have been reported. In another study of

mortality in Russia based on deaths reported by relatives, men may have underreported women's deaths [138]. Overall, it is possible that mortality may have been underestimated, and the underestimation could have been greater amongst women. However, this could not be tested formally since the mortality data were not fully validated by the RLMS investigators (for example by checking death certificates or revisiting households).

However, two observations suggested that the mortality data were sufficiently reliable to use in further analyses. First, the mortality rates using pooled data from the final study sample stratified by age group and sex were broadly similar to national mortality rates. Second, the relative risks of mortality by education and smoking were comparable to findings in other studies [2;3;138]. Both these findings indicate that the results of analyses of differences within the cohort were valid.

The second principal limitation in the mortality data in RLMS was that deaths were not recorded by individual cause in each round. Causes of death were recorded in the two most recent rounds, but the numbers were insufficient to analyse with adequate power.

Finally, the exact dates of entry and exit for participants were not recorded and therefore had be estimated (Section 4.1.4). However, this was not likely to have caused serious inaccuracies, since in the early stages of data analysis, correcting errors in the estimation of these dates had little effect on the associations between the predictor variables and mortality.

8.2.4 Individuals excluded from the final data analysis

One person households

As previously stated, people who lived alone were excluded from the final data analysis because their deaths were likely to have been under-reported. Individuals living alone were often particularly deprived, and many were widows with little education, low income and poor self-rated health. Therefore omitting this group could have led to the loss of some important information. Results from the sensitivity

analysis (Section 4.6.1), particularly from the model that assumed that some single-person households who left the study had died, suggest that the associations between mortality and divorce in men, widowhood in women, and low income in women could have been underestimated by excluding these households. Omitting single-person households also meant that it was not possible to study the association between living alone and mortality, which would have been interesting since many individuals who live alone lack social support.

Others

A proportion of respondents was excluded from the final analysis because data from different study rounds had not merged correctly for these individuals. This may have been because the individuals within particular households were not given consistent identifying number in different rounds, a problem noted by the investigators[7]. It is not known whether such individuals differed from the remaining study participants, but there is no reason to suspect that this was so. Assuming that these errors were distributed randomly, the results would not be affected.

8.2.5 Losses to follow up

A number of participants left the study before Round 11, the most recent round of follow up. These participants formed two broad groups. The first consisted of people who simply disappeared without explanation, and the second of people who were reported as having left the study by other household members. Both groups differed from the rest of the study population in several important respects (Section 4.5).

Losses to the study could have two implications for the results of analysis of mortality data. First, some unexplained absences may have been due the to death of respondents, even after the exclusion of single-person households (see Section 8.2.3). Second, relatively high numbers of wealthy, urban respondents with little education left, as well as people who were single or divorced, and this may have influenced the results. The loss of a proportion of relatively wealthy people, recognised by the RLMS investigators[7], differed from the UK 1946 birth cohort, in which adults who left the study were more likely to be disadvantaged, with low income and education[139]. The different pattern in this Russian study could be due to increasing

geographical mobility amongst those have become rich, or because wealthy people in Russia are unwilling to answer questionnaires or disclose their incomes [7]. In theory, therefore, the associations between mortality and income, geographical area and education could have been affected by the losses to this study. However, the association between education and mortality was similar to that found in other Russian studies[2;3], which suggests that the effect on these associations of the losses was probably small.

8.2.6 Using observations from people who entered the study in different years

RLMS took place during a time of major socioeconomic change, and the distribution of variables such as income, satisfaction and labour market factors (such as wage arrears) in the study population fluctuated between years.

Most of the analyses in this thesis were based on data from respondents who entered RLMS in different years, using baseline measurements from the time of entry. This ensured that the maximum possible number of respondents could be included in the analyses. However, temporal variations in certain variables, such as median income and the prevalence of satisfaction and wage arrears, could indicate that the effect of these variables on self-rated health and mortality varied between years.

I tested this possibility by comparing the association between household income, wage arrears and satisfaction (variables that fluctuated during the study) and self-rated health and mortality using a model that included year of entry. This had almost no effect on the strength of the associations (data not shown), indicating that the year in which the individual entered the study was unlikely to influence the association between these variables and health. It is also reassuring that the prevalence of poor self-rated health fluctuated very little during the study, suggesting that it was a stable and reliable outcome measure.

8.2.7 Measurements

Imperfect measurement of certain variables in RLMS could have affected the results of the analyses. Inaccurate measurement of socioeconomic variables was likely to

have had the greatest effect overall, influencing the strength of the associations between these predictor variables and health.

Education

Education was less likely than other measures of socioeconomic position (for example, income) to have been influenced by inaccurate measurement. However, the measurement of education was limited because a complex educational system was condensed into a small number of categories. This was due to small numbers of respondents in some subcategories, inconsistencies in the coding of technical secondary education, and unclear differentiation between different types of higher education in the raw data. Combining different types of education overcame these practical difficulties, but also meant that it was not possible to differentiate between the smaller sub-categories. Whilst the classification of education may affect direct comparability with other countries, educational differences in self-rated health and mortality were consistent with findings in other studies in Russia[2;3;135] and therefore appear reliable. In this thesis I used data from RLMS that measured educational qualifications rather than years of education, as used by some other authors [76], and findings in this study are therefore not directly comparable with studies that measured education in years.

Income

The measurement of income in Russia is complicated by the presence of wage arrears and non-monetary income. In addition, although informal income in RLMS was measured by the value of home-grown produce sold, it was not possible to quantify fully the bartering and exchanging favours in monetary terms. Adjusting income in each study round to the value of the 1992 rouble accounted for the large currency fluctuations within the period of RLMS, but incomes still fluctuated, predominantly because of wage arrears. For the reasons above, income measurement was likely to have been imprecise, but difficulties in measuring income would have been difficult to overcome, and are likely to apply to all studies in Russia. More wealthy respondents were more likely to leave the study, as discussed in Section 8.2.5, and this could also have weakened the associations between income and mortality. However, in the principal components analysis, the factor underlying income and

several material measures was only weakly associated with mortality in both sexes, and with self-rated health in men. This would support the idea that the weak association between income and health was not solely related to difficulties in measurement.

The measure of household income used in this thesis was total household income divided by the square root of the number household members. This widely used method, initially proposed by Atkinson [137], takes into account the sharing of income and expenditure between household members. This method is clearly an approximation and there are several alternative methods of measuring household income, although each of these also has limitations. The first alternative is to apply the total household income to each household member, but that would have placed a disproportionate number of people in two person households in the lowest income quintile, simply because such households contained fewer potential earners. The second alternative measure is household income divided by the number of people resident in the household, but this would have underestimated income amongst individuals in large households in which expenses are likely to be shared. The third possible method is to use a formula (for example based on the number of adults, children and elderly people) to estimate household income per person, but this was not possible within the available data, and would still have been an approximation. Although the chosen method, dividing the total household income by the square root of the number of household members, is likely to be an over-simplification, it is a well-established method [137] and, on balance, appeared to be the most suitable option.

The potential inaccuracies in recording income, and its fluctuations over time, remain a problem, though. If inaccurate measurements were randomly distributed, the association between income and health would be underestimated, and could partly explain the relatively weak associations between income and both mortality and self-rated health. This topic will be discussed further in Section 8.5.

Occupation

The ISCO-88 occupational classification is known to be associated with certain measurement difficulties. Although the presence of several layers of sub-codes makes

this a very comprehensive classification, the large number of categories also make it prone to coding errors [156]. However, in this analysis I only used the first (most basic) level of codes, condensing them from 10 into 5 categories (Section 4.2.1), and ignoring sub-codes, which are most prone to error, reduced the influence of coding errors. In RLMS, a locally adapted version of ISCO-88 was used but its validity had not been previously tested in Russia, so it is uncertain whether it behaved the same way as in other countries.

ISCO-88 is based on the education required for a particular occupation, rather than on other theories of class formation and market relations[156]. One example of a classification based on the latter is the Erikson Goldthorpe schema, which has been used by several other researchers studying social stratification and mobility in Russia and other post-communist countries[22;157]. Despite the difference in theoretical bases, the different occupational classifications have been shown to be strongly correlated and to have similar predictive value in other studies [156]. However, in empirical data from the UK, mortality gradients have been shown to vary with the occupational classification used [161]. It is possible that the risks of mortality and poor self-rated health in different occupational groups might differ if a different, perhaps more theoretically based, occupational classification had been used.

Overall the associations between occupation, self-rated health and mortality could have been partly influenced by the choice of ISCO-88 as a measure of occupational class in Russia. However, it is not clear which is the most suitable occupational classification for use in Russia, and therefore the benefits of using alternative classifications are unclear.

Socioeconomic position – general

In this study I used odds ratios and Cox proportional hazards ratios respectively to compare the risks of poor self-rated health and mortality according to socioeconomic position. However, this method did not take account of the varying numbers of respondents in different categories of each measure. An alternative would be a method such as the relative index of inequality (RII) [162], which is interpreted as ratio of health outcome rate at the bottom and the top of hierarchy. The RII takes into account the

size of each social group and is therefore thought to provide a more stable measure of socioeconomic differences in health.

The RII is often used for comparative purposes, for example to compare different countries or time periods. Since this study was restricted to Russia and a relatively short period, using the RII would not have added any information in this respect. In addition, the RII assumes that socioeconomic position forms a hierarchy. Since it was uncertain whether this was the case here for occupation, and because income fluctuations between years could have affected the hierarchy in income measurement, comparing individual categories, as was done here, was likely to produce more meaningful results.

Covariates

Potential limitations in the measurement of different covariates were described in detail in Section 5.5.6, and these included some psychosocial and material measures. For example, in the case of psychosocial variables, the measure of social networks was based on borrowing and lending, and did not assess social support, and well-established psychosocial measures were not included. Some measures were arguably material or psychosocial (such as number of consumer goods) and there was no measure of material deprivation, such as going without essentials. These shortcomings may have reduced the explanatory power of the covariates which might have explained some more of the effects of the main socioeconomic "exposures", if they had been measured more precisely. Overall, though, these were much less likely to have had an important effect on the main results than the difficulties in measuring the predictor variables (measures of socioeconomic position) mentioned above.

Self-rated health

For the purposes of the main analyses, I dichotomised self-rated health into very good, good or average versus poor or very poor, instead of using the full 5-point scale for several reasons. There were only very small numbers of individuals in the extreme categories, poor or very poor self-rated health was a negative outcome present in a substantial minority of respondents, and self-rated health in women was not

continuously associated with mortality. However dichotomising self-rated health could have led to a loss of information and I performed further analyses to test this possibility.

I first examined the effect of a change in self-rated health (on a 5-point scale) between the first and second rounds of contact on mortality. Self-rated health was unchanged between the first and second rounds of contact in approximately 60% of respondents. In most of the remainder there was a change of only one point (either positive or negative), and there was a decline 2 or more points in only 1 or 2 % of respondents (full data not shown).

Table 8.1 Changes in self-rated health over 2 years and subsequent mortality

	Cox proportional hazards ratio (95% confidence interval)	
	Male	**Female**
Change in self-rated health between entry and 2 years later		
(a) Any self-rated health at entry		
No change	1	1
Improvement	0.94 (0.68-1.32)	1.04 (0.71-1.51)
Decline (1 point)	1.15 (0.85-1.55)	1.35 (0.98-1.86)
Decline (2-3 points)	**2.10 (1.09-4.06)**	**2.40 (1.33-4.33)**
(b) Good self-rated health at entry		
No change	1	1
Improvement	1.05 (0.14-7.88)	-
Decline (1 point – to average)	0.88 (0.42-1.85)	0.70 (0.10-4.83)
Decline (2-3 points – to poor/very poor)	**3.91 (1.46-10.48)**	**7.30 (1.13-47.16)**
(c) Average self-rated health at entry		
No change	1	1
Improvement	1.04 (0.63-1.71)	1.06 (0.41-2.71)
Decline (1 point – to poor)	**1.88 (1.25-2.83)**	1.50 (0.87-2.59)
Decline (2 points – to very poor)	2.02 (0.73-5.60)	2.13 (0.87-5.24)

A decline in self-rated health of 2 points between the first and second rounds of contact was more strongly associated with mortality than a one-point decline (Table 8.1), although this association varied according to self-rated health at entry. In people who reported good health at entry a 1 point decline (to average health) in the second round was not associated with higher mortality compared with no decline. However, people whose health declined by 2 or more points (from good to poor or very poor) experienced significantly higher mortality than those whose health remained good

(Table 8.1). In contrast, amongst people in whom self-rated health was average at entry, a decline of either one or two points (to poor or very poor) was associated with significantly higher mortality compared with no decline. Crossing the border between average health and poor health therefore appeared to be an important risk factor for mortality (Table 8.1).

Table 8.2 Socioeconomic variables, self-rated health and mortality, comparing linear regression (5 categories of self-rated health) with logistic regression (poor or very poor health)

	Logistic regression for poor /very poor health		Linear regression for self-rated health (5-point scale)	
	Male	Female	Male	Female
Education (continuous variable)	**0.77 (0.69-0.87)**	**0.88 (0.81-0.97)**	**-0.10 (-0.12- -0.07)**	**-0.05 (-0.07- -0.03)**
P value	*<0.001*	*<0.001*	*<0.001*	*<0.001*
HH income per person (continuous variable)	**0.83 (0.77-0.89)**	**0.90 (0.85-0.95)**	**-0.03 (-0.05- -0.02)**	**-0.03 (-0.04- -0.01)**
P value	*<0.001*	*<0.001*	*<0.001*	*<0.001*

I also tested whether any information was lost by dichotomisation when self-rated health was the outcome variable. I compared the results of linear regression of the associations between two socioeconomic variables (income and education) and self-rated health as a continuous variable, with the results of logistic regression using the same predictor variables but with an outcome of poor or very poor health (Table 8.2). Overall the relationships between education, income and self-rated health were similar in direction and significance using either method.

In summary, these further analyses showed that a decline across the border between average and poor self-rated health predicted mortality, and where self-rated health was the outcome the odds ratios and p values were similar whether a dichotomous or a continuous measure was used. This meant that dichotomising self-rated health (into poor/very poor or very good/good/average) was likely to be appropriate, and was unlikely to have resulted in any important loss of information.

8.2.8 Conclusions about the limitations of the study

The most serious potential limitation in this study was the quality of the mortality data. However mortality rates in this study were comparable to national rates from official data sources, and relative risks of mortality were comparable to findings from previous research. The mortality data therefore appeared sufficiently reliable to use in this study. Other potential problems, such as measurement of variables and losses to the study, were unlikely to have had a major effect on the results. Therefore the overall quality of the data in RLMS appears sufficient to study the association between socioeconomic position and health in Russia.

8.3 Generalisability of the findings

Sampling techniques used by the investigators (described in Section 4.1) aimed to provide a representative sample of the Russian population, in particular by using a wide range of geographical centres.

The sample on which the final data analyses were based was similar in terms of age and sex distribution to the Russian population as a whole [21]. The prevalence of smoking and alcohol consumption was similar to findings in other studies[17]. The educational level of respondents was similar to that noted in other Russian studies, although higher than in census data[3]. However, this may have been partly because the average educational level was lower amongst people who lived alone, who were excluded from the final dataset. In addition, experience from elsewhere shows that participants in epidemiological studies have, on average, higher socioeconomic status and education than non-respondents [163].

Overall, the small differences between the official data and other studies, and the sampling methods used, mean that the study population is sufficiently representative for the findings of this study to be generalisable to the Russian population as a whole.

8.4 Relationships between measures of socioeconomic position

In this section I discuss the associations between different measures of socioeconomic position in this study, and compare them with other studies in Russia and elsewhere.

Within Russia

The strong correlation between occupational class and education in RLMS (r= 0.5 in both sexes) suggests that many people were in an occupation appropriate to their level of education. However, this was not true for a substantial minority of respondents, since more than 20% of semi- and unskilled male workers had completed a higher education. This observation is consistent with findings in sociological research that that post-transition Russia is a society where parental and adult social class are strongly associated and transmitted through education, but where downward social mobility between generations exceeds upward mobility [22].

The relatively weak correlation between household income per person and education was consistent with findings in the New Russia Barometer study (r=0.21) [17], and also another study in which returns to education were poor and did not increase during the transition [10]. The weak association between income and education could also partly be explained by the large fluctuations in median income during the study period.

International comparisons

International comparisons are important, but are made difficult by the variety of methods and measures used by different investigators. Only a few studies are directly comparable.

In RLMS the correlation between occupation and education (R=0.52) was much stronger than either the correlation between education and income (R=0.08) or occupation and income (R=0.13). Two other studies have made such comparisons. In one American study, these correlations were 0.67, 0.32 and 0.41 respectively [164], and in an older study from Jerusalem in 1982, they were 0.57, 0.45 and 0.43 respectively[165]. The correlations between education and occupation were broadly similar in each study, but the correlations between both occupation and education and income were much weaker in RLMS than in the other two [164;165].

An alternative method is to compare the earnings of people with different educational qualifications. In RLMS, respondents with a university education earned

approximately 1.5 times as much as those with an incomplete secondary education. Again, there are few studies in other countries with which it is possible to make direct comparisons of the associations between socioeconomic variables, due to differences in the methods of measurement of both education and its returns. However, one recent study from the United States, based on census data, showed that people with a college education earned nearly two and a half times as much as those with an incomplete school education, and people with a professional qualification earned nearly five times as much [28]. Clearly this is much higher than in these Russian data. However, the USA has one of the highest returns to education in the world [38], so perhaps it is not the best comparator. Research from the UK, based on 3 datasets from the early 1990s, showed that people with a degree in addition to school qualifications earned 80% more than people who had no school qualifications, and graduates with professional qualifications earned even more[166]. Returns in this UK study were more modest than in the US, although still higher than Russia. However, comparing such studies directly is difficult because the age distributions of the different study populations are not known, and the studies took place at different times.

A further alternative, more indirect, method of comparison is to consider the results in the context of studies that measured the returns to education in different ways. Several international studies have compared (income) returns to years of education, rather than returns to qualifications, as measured here. Returns to years of education are measured using regression analyses with income, using a range of multivariate models. Comparisons are only possible within studies, since each study uses a slightly different multivariate model.

It is of particular importance that one such study used data from RLMS. In that study, returns to education in Russia decreased during the transition (despite the rapid increase in income inequalities), and were much less in Russia than in other former communist countries, such as Poland and the Czech Republic [37]. Similarly, another study showed that returns to education in Russia were relatively low before the transition, in fact only half of those in the US and two fifths of those in the UK, although slightly larger than in Sweden and Norway [38]. A third study showed that returns to education did not increase in Russia during the transition [167].

The correlation between education and income in RLMS differed slightly between men and women. Income and education were correlated more closely in employed men (r=0.15) than women (r=0.11), although it is not certain whether the difference between the sexes was statistically significant. This contrasted with another study in Russia in which returns to education were greater in women than in men [167] (implying that income and education were more closely correlated in women). The correlation between income and education in RLMS also varied by region from r=0.07 in the Volga district to r=0.14 in Siberia and the Far East, and these differences are consistent with regional variations in the returns to education shown in another study[167].

Overall, despite the limitations in making direct comparisons, the correlation between income and both education and occupation was weaker in Russia than in other countries. This is likely to be due to the low income returns to education in Russia, which results primarily from the low wages associated with professional occupations[10;168]. Data from Russia are therefore useful in studying the association between socioeconomic position and health, because they could potentially break the confounding between education, occupation and income that characterises Western countries in which these variables are often closely associated.

8.5 Comparison of the associations between different measures of socioeconomic position and health

This section starts with separate discussions of the associations of socioeconomic position with mortality and self-rated health, and is followed by a more general discussion.

Mortality

In this large and nationally representative Russian dataset, education was the measure of socioeconomic position most strongly associated with mortality, followed by occupation and lastly by income. The associations between both income and occupation and mortality were largely explained by education, suggesting that occupation and income were associated with mortality largely because they reflected

respondents' education. The association between education and mortality was not attenuated by controlling for income or occupation, and this suggests that the pathway between education and mortality followed a different route.

In theory, the difficulties in measuring income and occupation described in Section 8.2.5 could explain why these two variables were more weakly associated with mortality than education. However, principal components analysis showed that the factor underlying income and material variables was not associated with mortality in either sex, supporting the view that the weak association between income and mortality was genuine rather than reflecting difficulties in measuring income. In contrast, though, the factor underlying education and occupation was strongly associated with mortality. Since education and occupation were closely correlated, and education explained the effects of occupation on mortality, it is likely that education is the main driver of this factor. It is possible that this factor could represent human capital, since those with a better education and occupational skills might be better able to cope in an uncertain economy. It is also possible that the associations between different socioeconomic measures and mortality could result from the way in which the measures reflect the accumulation of health-related exposures over the life course. Current income is unlikely to reflect income or socioeconomic circumstances before the transition, whereas education is more likely to be associated with experiences earlier in life, since the children of professional families were better educated even in Soviet times [6;25]. Education may therefore reflect socioeconomic circumstances in childhood and possibly early adulthood. This issue will be considered further in Section 8.6.5.

The association between subjective social status and mortality in men was weak, and was accounted for almost entirely by objective measures of socioeconomic position. In women, however, subjective social status was more strongly associated with mortality, an association that was not fully explained by objective socioeconomic measures. The very few studies on this subject show inconsistent findings. A British study showed that associations between subjective social status and several objective health measures in both sexes disappeared after adjusting for objective socioeconomic measures[32], similar to the findings in men in this study. However, another study, measuring psychobiological mechanisms, showed that early morning cortisol

responses in elderly people were attenuated in subjects with lower subjective socioeconomic position, independently of education [169]. The latter study supports the idea that subjective social status could be independently associated with mortality and objective health outcomes (more similar to the findings in women in this study). However, it is unclear why the findings differed between the sexes, although it is possible that the determinants of subjective social status could differ between men and women, as shown in another Russian dataset [86].

The strong association between education and mortality, and the fact that education accounted for the associations between both occupation and income and mortality, is inconsistent with findings from the relatively few Western studies that have made direct and simultaneous comparisons between different socioeconomic variables. For example, in studies in Germany [122] and the US [123], income and wealth were found to be more important determinants of mortality than other measures of socioeconomic position [122;123]. In two British studies, however, occupation was the strongest determinant of mortality. In a Scottish study, occupation was a stronger determinant of all-cause mortality than education [80], and in the Whitehall II study of British civil servants, occupational grade predicted two indicators of coronary heart disease (angina and ECG changes diagnostic of coronary heart disease) independently of education [78]. These two studies were based on specific workplaces, though, and more precise recording of, and greater comparability between, jobs may have accounted for the stronger association between occupation and health. However, in the Scottish study education was the strongest predictor of mortality from coronary heart disease[80], and in another study education predicted coronary risk factors (blood pressure and serum cholesterol) more strongly than income and occupation [164]. This suggests that the strongest socioeconomic predictor of mortality may vary by cause of death.

In summary, the strong association between education and mortality in this Russian study differed from the results of Western studies of all-cause mortality, despite some inconsistencies. However, education strongly predicted mortality and risk factors associated with coronary heart disease, and this was closer to the predictors of all-cause mortality in RLMS.

Self-rated health

Education, occupation and income in RLMS were each moderately associated with self-rated health. In contrast to mortality, the association between education and self-rated health was partly explained by occupation, and the associations between both income and occupation and self-rated health were not attenuated by adjusting for education. Education therefore predicted self-rated health (unlike mortality) partly through occupation. The associations between income and occupation and self-rated health were independent of the other objective measures of socioeconomic position.

In the principal components analysis, the factor underlying occupation and education was relatively weakly associated with self-rated health, in contrast with its strong association with mortality. The factor underlying income and material measures was strongly associated with self-rated health in women, but not in men. The reason for the difference between the sexes is unclear.

Again, there are a relatively small number of Western studies that compare directly and simultaneously the effect of different measures of socioeconomic position on self-rated health. In RLMS, occupation was more strongly associated with self-rated health than was education, similar to findings from a Norwegian study, although in that study the outcome was longstanding limiting illness [125]. In a British study, occupation predicted self-rated health more strongly than income [170]. However, in other studies, education was a more important predictor of self-rated health than occupation. In the USA, Miech showed that the association between occupation and self-rated health was largely accounted for by education [124]. In a Finnish study, occupational inequalities in self-rated health were largely explained by education, and educational inequalities by occupation [79].

In RLMS, income inequalities in self-rated health were independent of both education and occupation. Likewise, in the Finnish study mentioned above, the association between income and self-rated health was only weakly attenuated after adjusting for occupation and education [79]. Income and deprivation were the most important predictors of self rated health in a Dutch study [171] and a British study [172] respectively.

Two other studies show different findings. In a study from Israel, income, education and occupation predicted self-rated health similarly, although in this study from 1982 there were no multivariate analyses [165]. In a study from the United States, the effects of different measures varied throughout the scale: at the top of the scale, education was the strongest predictor of self-rated health, and at the lower end income was the stronger predictor [173].

Overall, these Western studies show inconsistencies in the measure of socioeconomic position most strongly associated with self-rated health, and consequently the results in RLMS do not differ in a marked and consistent way from their findings.

In contrast with objective measures of socioeconomic position, subjective social status was very strongly associated with self-rated health. Principal components analysis showed that the factor underlying subjective social status was most strongly associated with self-rated health in both sexes, independently of objective measures of socioeconomic position, and this is consistent with findings from a limited number of studies in other countries [32;174].

Possible reasons for inconsistencies

There were some differences between RLMS and Western studies in the measures of socioeconomic position that were most strongly associated with self-rated health and mortality, although these were not entirely clear due to the marked inconsistencies between the Western studies. The latter were surprising, since education, occupation and income are considered to be closely associated in the West. There are several possible reasons why the findings in Western studies differed both from each other and from RLMS.

First, differences have been found in the associations between individual measures of socioeconomic position between Western societies, and these could potentially explain inconsistencies in the strongest socioeconomic predictor of health. For example, a higher proportion of British than Swedish respondents in manual occupations had a low income, and although occupational inequalities in self-rated

health were similar in both countries, a higher proportion of the occupational inequalities in Britain were explained by income [126].

Second, variations in the mortality gradient in different countries may result from differences in the prevalence of particular risk factors and diseases in different social classes [77]. These variations could be present between the countries in which the studies quoted earlier that compared socioeconomic predictors of self-rated health and mortality were set.

Third, inconsistencies between studies could also be influenced by limitations in the study methods used. A British study showed that the degree of association between education, income, occupation and psychosocial health outcomes changed if the direction of the association between the socioeconomic measures was accounted for using the technique of structural equation modelling [128]. The authors demonstrated that after accounting for the temporal relationships between socioeconomic variables (i.e. that education precedes occupation, which in turn determines income), education influenced health outcomes through occupation and income [128].

Fourth, measurement issues are also important in determining the reliability of international comparisons. Valkonen proposed education as the best measure for international comparisons of associations between socioeconomic position and health[127]. Another study demonstrated a fairly consistent association in the size of the effect of education on mortality in different countries, even though the total population effect varied [76]. However, differences in the methodology mean that it is not possible to compare directly the findings from that study [76] with findings from RLMS. There are two reasons why difficulties in measuring socioeconomic position are unlikely to be sufficient to explain the inconsistencies between the studies, though. First, if education was the most internationally comparable measure, as suggested by Valkonen [127], it would be likely that education was most strongly associated with health in each study, which was not the case. Second, in RLMS, principal components analysis showed that the variance underlying income and material factors was associated with health in a similar way to income itself, suggesting that difficulties in measuring income did not explain the weak association between income and health.

Fifth, and importantly, international variations in the correlations between measures of socioeconomic position could account for the differences in Russia, where education and occupation are much less closely associated with income than in Western societies. This could in theory underlie the stronger association between education and mortality in Russia, and the weaker association in other countries. International variations in these correlations could mean that individual measures of socioeconomic position reflect different socioeconomic exposures to factors that affect health during life, depending on the country. This will be discussed further in Section 8.6.5. However, this possibility does not fully explain the inconsistencies between the Western studies.

In summary, there were clear differences in the effects of various measures of socioeconomic position, depending on whether the outcome was self-rated health and mortality. In general, differences between the findings in RLMS and Western studies were greater in relation to mortality than to self-rated health. Differences in the correlations between socioeconomic variables could underlie the stronger association between education and mortality in Russia than the West. Other possible reasons for differences between countries in the associations with self-rated health and mortality include differences in study methodology and international variations in the socioeconomic patterning of health behaviours and individual diseases.

Differences between the predictors of self-rated health and mortality

A key finding in this study was that individual measures of socioeconomic position varied in their associations with self-rated health and mortality, even though self-rated health significantly predicted mortality. These differences are likely to be genuine rather than due to biases in the mortality data, since the associations between education, smoking and mortality in RLMS were consistent with other studies in Russia [2;3;138]. There are several possible reasons for these differences.

Tests for statistical interaction between self-rated health and education, income and occupation in their association with mortality showed that the only significant interaction was between education and self-rated health in men. This could imply that the criteria that men used to rate their health varied by education. However, there

were no other significant interactions between socioeconomic position and health, similar to findings in a Swedish study in which there were none[175]. There was also a significant interaction between self-rated health and age in women only (data not shown). This could also imply that age influences the criteria by which women rate their health, and contrasts with findings in one other study where self-rated health interacted with age in its association with mortality in both sexes [175]. Overall, interactions are unlikely to account for the differences in the associations between the predictor variables and self-rated health and mortality in this study.

It is also possible that self-rated health has several different influences. The strong association between self-rated health and mortality showed that, to some degree, it indicated serious illness, and the stronger association between self-rated health and mortality nearer to the time of death is consistent with other studies. In addition, an important proportion of deaths, especially amongst men, was apparently not preceded by ill-health, perhaps indicating sudden death. However, self-rated health was also correlated with satisfaction, and predictor variables that were self-reported and associated with satisfaction were more closely associated with self-rated health than mortality. The presence of two components in self-rated health (satisfaction and serious illness) overall seems more likely to offer an explanation in the differences between the predictors of self-rated health and mortality.

Differences in the predictors of self-rated health and mortality in RLMS were not generally consistent with the studies in other countries, partly because findings varied considerably between the Western studies. However, the strong association between education and mortality in RLMS was consistent with the association between education and coronary heart disease mortality [80] and risk factors [164] in two other studies. Comparisons were limited overall, though, by the small number of studies, none of which directly compared the predictors of self-rated health and mortality.

Using data from Russia, a society in which income was less closely associated with education and occupation than in the West, it was hoped that the confounding between these variables could be broken. In this Russian study education was the strongest predictor of mortality, and this differed in some respects from Western studies, but the difficulties in making comparisons described above and the small

number of Western studies, limit the ability to draw firm conclusions. The need for further research is described in Section 8.9.

Subjective social status was more strongly associated with self-rated health than mortality in this study, and this was generally consistent with other studies. This will be discussed further in Section 8.6.3.

8.6 Possible explanations for the association between socioeconomic position and health

In this section I will discuss whether the present findings support the mechanisms (selection, material, psychosocial, behavioural and life course) proposed for the association between socioeconomic position and health described in the literature review (Chapter 2).

8.6.1 Selection

Within the limitations of these data there was weak prospective evidence that people in poor health were more likely to move into low socioeconomic groups. For example, people whose health deteriorated between entry and 2 years were more likely to be in a lower income quintile 2 years after entry, even after adjusting for income quintile at entry. A decline in health was also associated with selling consumer goods for food or clothes. However, there is much stronger evidence for a prospective association between socioeconomic position and mortality, which was predicted most strongly by education. It is likely that an association between socioeconomic position and health exists in both directions but, given the stable nature of education and the size of its effect on mortality, the prospective association outweighs the effects of selection. This conclusion is consistent with other studies [89-91].

8.6.2 Material factors

Although the association between socioeconomic position and both mortality and self-rated health, consistent with many other studies [75], supports a role for psychosocial factors, the mortality gradient in relation to income was stronger amongst the lower

income quintiles where material deprivation was most likely to operate. The mortality gradient in relation to income in the lower quintiles was explained by education in women, but only partly in men. In these data, therefore, income may reflect absolute deprivation (in the lower part of the distribution) as well as relative deprivation.

The debate as to whether the four variables designated as measures of material wellbeing (number of household consumer goods; selling consumer goods for food or clothes; number of household amenities; and living space per person) were material or psychosocial measures was described previously in Chapter 5. For example, number of consumer goods may be considered in part to reflect social participation rather than deprivation [4]. However this variable was more strongly (although still modestly) correlated with income than satisfaction, and in the principal components analysis it loaded onto the same component as income, suggesting that it also reflects material welfare. Number of consumer goods is considered further in the following section on psychosocial measures.

In contrast, the household amenities measured in this study (such as heating and running water) were rather basic, especially in such a harsh climate, and could therefore genuinely reflect deprivation. However, number of household amenities was only weakly associated with self-rated health in both sexes, and weakly associated with mortality in men. Living space per person could arguably reflect deprivation rather than psychosocial factors. However, living space was not associated with self-rated health in either sex, although it was associated with mortality in women.

The associations between income, education and self-rated health were partly explained by material variables, but further analysis showed that the number of consumer goods had the greatest effect on this association (data not shown). Ownership of consumer goods will be discussed in the next section on psychosocial measures. The relatively weak association between income and mortality was largely independent of material factors.

The study of the effects of material variables was limited by the range of measures used. Different measures that have been used by others, for example going without clothes and food [17], were not measured here. Overall, however, material variables

appeared to play only a limited role in the association between socioeconomic position and health in this study.

8.6.3 Psychosocial factors

Several pieces of evidence from this study support a role for psychosocial factors in explaining the association between socioeconomic position and health.

As discussed in the previous section, the presence here of the well-recognised socioeconomic gradient in mortality and self-rated health [75] suggests that although material factors could partly explain the mortality gradient amongst the lower income quintiles, they are unlikely to explain the mortality gradient amongst the upper quintiles. Among the higher income quintiles, relative, rather than absolute, deprivation may be driving differences in mortality, supporting a role for psychosocial factors.

In general, variables with a psychosocial component were strongly associated with self-rated health. These variables included optimism, satisfaction, social networks, job insecurity, ownership of household consumer goods and subjective social status. However, this could represent cross-contamination, since many of these measures are partly based on satisfaction, as is self-rated health. Number of consumer goods was associated with self-rated health more strongly than any of the other measures which might be arguably material or psychosocial (household amenities and living space per person), and the association was independent of measures of socioeconomic position. This supports Pikhart's finding that luxury goods were more closely associated with self-rated health than were basic necessities [154]. Some of the relationships between socioeconomic position and self-rated health were partly explained by satisfaction, optimism and number of consumer goods. However, the same group of variables was generally not significantly associated with mortality, and neither did these measures explain the associations between socioeconomic position and mortality. Ownership of consumer goods was more weakly associated than the other material/psychosocial measures with the more objective outcome of mortality. The association between ownership of consumer goods and income, described in the previous section, suggests that this variable may also reflect material wellbeing. However it is considered,

though, its association with mortality was weak. The association between subjective social status and mortality in men was largely explained by objective socioeconomic measures such as education and income.

There are several possible reasons why these potential psychosocial variables were more strongly associated with self-rated health than mortality. The strong association between self-reported measures, such as satisfaction, and self-rated health could be due to cross-contamination. Other measures, for example ownership of consumer goods, may indirectly represent satisfaction, of which self-rated health is also measure, rather than being a psychosocial influence on health.

There were some inconsistencies in the associations between the proposed psychosocial variables themselves. In the principal components' analysis, the number of consumer goods was strongly associated with income and other material measures, rather than being associated with subjective social status, suggesting that there are important differences between these two measures.

Selling consumer goods was strongly associated with mortality. In theory this could represent a loss of social participation. However, data analysis suggested that goods were more likely to be sold in response to some sort of crisis, such as a decline in income or self-rated health. Selling consumer goods may therefore be associated with mortality because it indicates a preceding deterioration in financial circumstances or in health.

Mortality was higher in divorced and single men than married men in RLMS, although comparisons by marital status are likely to be biased because single-person households were excluded. However, results of the sensitivity analyses where single-person households were included (Section 4.6.1) also indicated that mortality was higher amongst divorced and single men, suggesting that the main results were likely to be reasonably reliable. Increased mortality amongst divorced and single men, could be accounted for by lack of social support. Excess mortality amongst divorced men has also been shown in Poland and Hungary during the transition [108;109] and this is thought to reflect, at least in part, weak social support.

Unemployment and certain measures of unstable employment, such as wage arrears, payment in goods and compulsory leave, were associated with mortality and self-rated health, although somewhat inconsistently. However, labour market variables did not contribute the associations between socioeconomic position and self-rated health and mortality, and did not therefore appear to be on the pathway between socioeconomic position and health.

The study of psychosocial mechanisms was limited by the small range of variables in RLMS, many of which were not well established. Established psychosocial mechanisms, such as perceived control and effort-reward imbalance, reviewed elsewhere [102], have been shown to mediate the associations between socioeconomic position and health, but were not studied here.

Overall, psychosocial mechanisms appear to be implicated in the association between socioeconomic position and self-rated health. However, the evidence was weak for the association with mortality, perhaps because this was an objective outcome. However, the limited range of variables in RLMS means that it is not possible to draw firm conclusions about the importance of psychosocial factors.

8.6.4 Health behaviours

In this study the relationships between socioeconomic position, self-rated health and mortality were not mediated by cigarette smoking and alcohol consumption, even though these behavioural risk factors were independently associated with mortality.

The fact that alcohol did not explain the socioeconomic gradient in mortality in RLMS concurs with findings from another study in which an educational gradient in mortality was present in both heavy and moderate drinkers [2]. However, this finding contrasts with Shkolnikov's results where educational differences in mortality were greater for alcohol-related causes of death [3]. It was not possible to compare individual causes of death here, though, since they were not recorded in RLMS.

The relatively weak association between smoking and drinking and socioeconomic position also explains why these health behaviours did not mediate the socioeconomic

gradient in mortality. Another nationwide study in Russia also showed only weak associations between alcohol consumption [151], smoking [151] and socioeconomic position. The absence of a socioeconomic gradient in health behaviours contrasts with findings in some other countries. In France, for example, alcohol consumption is much more common amongst the lower social classes, and is thought to explain the particularly large socioeconomic gradient in mortality [77]. In addition, smoking in the UK has been shown to explain part of the socioeconomic gradient amongst civil servants [117] and the general population [57].

One mechanism proposed for the association between education and health is that education influences receptivity to health education messages[176]. The weak role of health behaviours in explaining the strong educational gradient in mortality in RLMS does not support this theory.

Examining the role of health behaviours was limited here, since only alcohol and smoking were studied, and not other behavioural risk factors, such as diet, obesity and exercise. Nevertheless, given the prominence of alcohol in the literature on the Russian mortality crisis, these findings are important.

In summary, alcohol consumption and smoking did not explain the association between socioeconomic position and health, even though both are important causes of mortality in Russia. This is likely to be predominantly because, unlike in some other countries [77], these health behaviours were not strongly associated with socioeconomic position.

8.6.5 Accumulation of exposures during life

As described in Chapter 2, the life course approach states that socioeconomic differences in health occur due to the differential accumulation of risk factors for chronic disease throughout life [119]. Such risk factors may be material, psychosocial or behavioural. The scope of RLMS, as described previously, was restricted by the fact that it covered only a relatively short period of the respondents' adult lives. However, within this constraint there was considerable evidence of socioeconomic differences in exposure to particular hazards during this period, although there was little evidence

that these provided a mechanism through which socioeconomic position influenced health.

One example is insecure employment. Although insecure employment and unemployment are thought to influence health partly through psychosocial mechanisms [110;111;113] (Section 8.6.3), respondents with the least education, and those in manual occupations, were more likely to experience unemployment, thus contributing to the accumulated disadvantage associated with lower socioeconomic position. This finding is not unexpected, given that in Russia many manual jobs disappeared as a result of large-scale factory closures during the 1990s. This finding was also consistent with a study in the UK, in which manual workers were more likely to become unemployed at a time of economic recession [92]. The association between low education and unstable employment was only partly explained by occupational class.

Another common socioeconomic exposure in post-transition Russia was financial loss, and in RLMS, younger people with higher incomes were more likely to experience a sharp drop in income between study rounds. While this contrasts with the finding that people with the lowest incomes were more likely to experience a fall in income at the start of the 1990s in Russia [10], it is consistent with the finding that the more wealthy new 'entrepreneurs' lost out more often in the 'rouble crisis' of 1998 [16] (although it is unclear whether the people who lost financially in this study were 'entrepreneurs'). There was no evidence in this study that people who experienced a drop in income were more likely to experience a decline in health, probably because these were relatively young and fit working people. It could also reflect the fact that the drop in living standards may have been relatively short-term, since incomes fluctuated widely between years [13].

Indirect support for the influence of socioeconomic position acting across the life course here comes from the associations between different socioeconomic variables and mortality. In this study, education was strongly associated with mortality. In Russia, socioeconomic position is strongly transmitted between generations [6] predominantly through education [25], suggesting that education is likely to reflect parental social class and associated childhood circumstances. Occupation in this study

was also associated with mortality, but the association was explained by education. In contrast, income was only weakly associated with mortality. Income during the study period is unlikely to reflect an individual's socioeconomic position through life for several reasons. Incomes have changed considerably since the transition, widening income inequalities were unrelated to education [6] and income has fluctuated considerably between years.

Consequently, education may be more closely associated than income with mortality because it reflects more closely socioeconomic position across the life course, particularly in childhood. Childhood circumstances are known to influence health in later life [176], particularly the risk of cardiovascular disease [80;176;177], and education has been shown to predict strongly several risk factors for CHD [164]. Cardiovascular disease is both the most common cause of death and the leading cause of the increase in mortality in Russia [3]. This explanation also fits with the proposal that education is protective of health because it reflects the material and cultural resources of the family of origin [176], and education has been shown to be associated with parental social class in Russia [22]. However, this is a tentative conclusion since there is no detailed information in this study about participants' early lives.

Education might also influence health by determining subsequent occupation and income, which themselves predict health and mortality[176]. However, in this study the association between education and mortality was largely independent of income and occupation; and occupational class differences in mortality were explained by education. This suggests that education did not influence mortality only because it predicted occupation and income. It also suggests that occupational risk factors or other exposures related to adult social class were not important in determining mortality.

The strong association between education and both mortality and earlier life experiences, in contrast to income, supports a life course effect. It is possible that factors associated with childhood and earlier life circumstances, as indicated by education, were important determinants of mortality. While the evidence is indirect, it would fit with the fact that the leading cause of death in Russia, and of the increase in

mortality, is cardiovascular disease[178], and this condition is known to be particularly strongly influenced by childhood socioeconomic conditions [80;177].

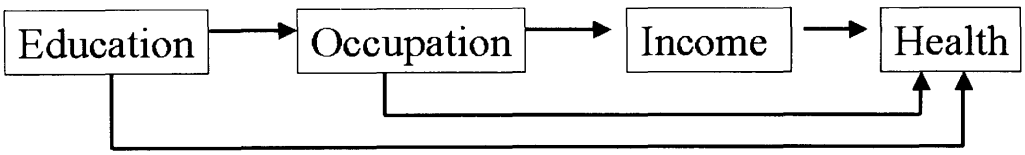
Overall, there is some evidence that socioeconomic differences in health, especially in relation to education, may reflect differences in health-related exposures across life. However, much of the evidence is indirect, and the relatively short duration of the study and the limited range of variables meant that it was not possible to study a full range of influences, especially those from early life.

8.7 Developing a causal model for the association between socioeconomic position and mortality

8.7.1 Introduction

In this thesis, I have demonstrated associations between different measures of socioeconomic position and self-rated health and mortality. Now I will attempt to put these associations in the context of a model, based on both findings from this thesis and other relevant research, to help guide the interpretation of these research findings.

Figure 8.1 Model of a pathway of associations between socioeconomic position and health (Lahelma et al[79])



I shall first consider a model of the association between socioeconomic position and health developed in a Finnish study by Lahelma et al [79] (Figure 8.1). This model considers the relationships between the same three key measures of socioeconomic position which were the focus of this thesis. Lahelma's study described a pathway whereby education predicted occupation, which in turn predicted income [79]. The

association between each of these socioeconomic measures and self-rated health followed this pathway, but each of the 3 socioeconomic variables also had an independent influence on health [79] . Similarly, findings from the Whitehall study of UK civil servants demonstrated that education had an influence on health through occupation and income, when the temporal sequence of these variables was taken into account [128].

8.7.2 Proposed model for the association between socioeconomic position, health and mortality

I have therefore expanded this model, and used additional information from the findings in this thesis and the literature to develop a more complex model for the association between socioeconomic position and mortality in Russia (Figure 8.2). This is partly because in Russia, as stated previously, occupation and education were not closely associated with income, as they were in Lahelma's study [79] and in many Western studies. The model accounts for the relationships between socioeconomic measures operating across the life course, and also incorporates other factors, for example early life influences, psychosocial and behavioural factors.

In this model I used mortality, rather than self-rated health, as the outcome. There were several reasons for doing so. Mortality is an objective measure, and therefore unaffected by potential cross-contamination between exposure and outcome; the mortality crisis in post-transition Russia is unique and important; and self-rated health predicts mortality incompletely, although it may form part of the pathway between socioeconomic position and mortality.

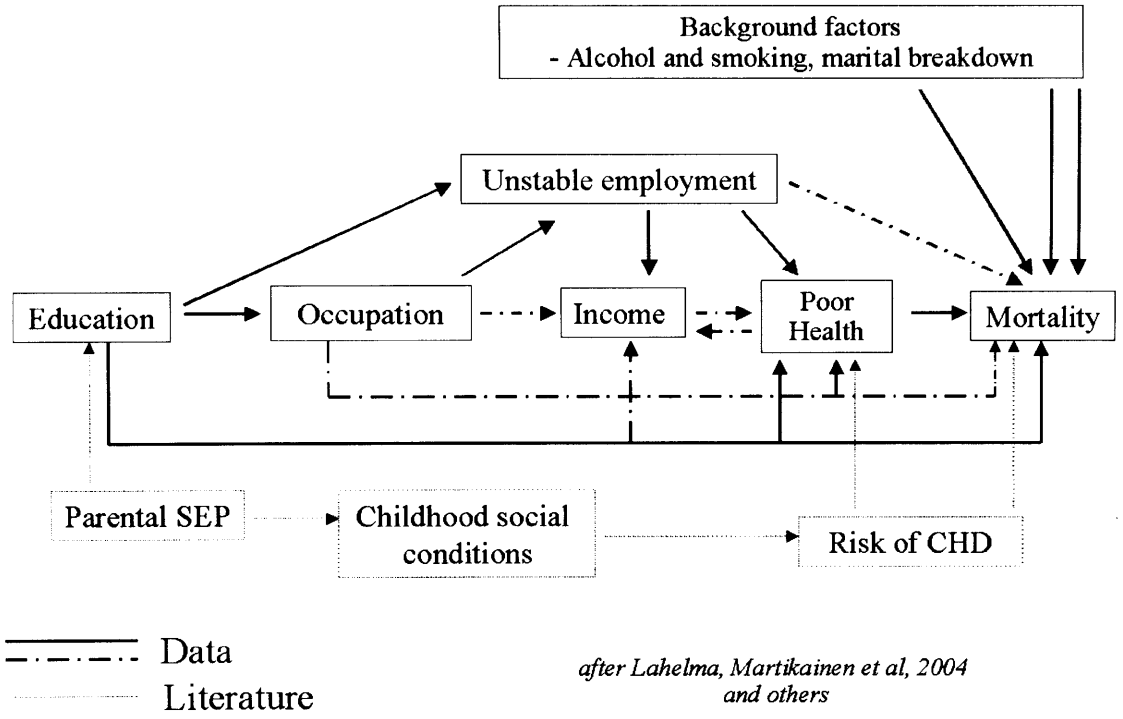
In the model, education determined occupation, but occupation only weakly predicted income. Education also weakly predicted income, independently of occupation. Education influenced mortality, partly through occupation and income, but partly independently of these variables. Occupation also influenced mortality, but only partly through income. Education and occupation also predicted exposure to unstable employment, which in turn predicted income.

Unstable employment influenced mortality (and self-rated health), although inconsistently. However, it mediates only a small part of the relationship between

socioeconomic position and mortality. In turn, a decline in health predisposed to a further reduction in income. The pathway between socioeconomic position and death was through a period of perceived ill-health in some cases, but not in others.

Alcohol, smoking and marital breakdown were important background influences on mortality but they did not act as mediators of the association between socioeconomic position and health.

Figure 8.2 Model of causal pathway between socioeconomic position and mortality in Russia (after Lahelma et al[79])



I expanded the model further using findings from the literature. For example parental social class predicts adult social class in Russia [6], predominantly through a pathway of education [25]. As mentioned previously, the strong association between education and parental social class [6] means that education is likely to reflect childhood social conditions. For example, Russian children from one parent families are less likely to have complete a higher education, for financial reasons [26]. There is evidence from other countries that childhood social class influences health[176], and particularly the risk of CHD in adulthood [177].

8.7.3 Limitations to the model

This model is clearly an oversimplification, but it also has a number of specific limitations. First, self-rated health is considered here only as a precursor to mortality, whereas it is likely to consist of other components, such as satisfaction.

Second, the model may overemphasise the role of employment. Although education and occupation predict insecure employment, and some measures of insecure employment predict mortality, the evidence for pathway between socioeconomic position and mortality via employment-related factors was weak.

Third, the model does not explain the full complexity of the web of causation. The limited range of both life course and psychosocial measures studied, as described earlier, may result in the underestimation of the influence of these causes. Finally, Russian society is unique, and including findings from research from other countries (due to the limited amount of research in Russia) may mean that the model does not fully capture the Russian situation.

Fourth, the model does not account for the possible presence of very short-acting risk factors for mortality, accounting for the rapid fluctuations seen in national mortality rates, which will be discussed further in a later section.

Overall, though, this model is a useful framework for understanding the association between different measures of socioeconomic position and health in a Russian context, and putting into perspective different "causes" acting at different life stages.

8.8 The relative importance of socioeconomic and other determinants of mortality in Russia

Although deaths in individual years and their causes were not studied, findings from this thesis contribute to the ongoing debate about the relative importance of alcohol and socioeconomic conditions in the Russian 'mortality crisis', which was taking place at the time as this study.

8.8.1 Overview

Education and health behaviours, especially alcohol and smoking, were significantly associated with to mortality in RLMS. The particularly strong association between education and mortality in Russia is consistent with the finding that people with the least education experienced the greatest increase in mortality during the transition[2;3;138]. Interestingly, the association between education and mortality in this study was independent of alcohol or smoking. This observation was similar to two other Russian studies [2;84], although it differed from some Western studies. The protective effect of education will be discussed further in Section 8.8.3.

The prevalence of alcohol consumption and binge drinking did not change over time during the period of RLMS (1994-2001), and in 1998 (the year of the 'rouble crisis') the prevalence of drinking alcohol once a week or more was actually lower than in other years. The stability during this period suggests that alcohol consumption plays a relatively weak role in the mortality crisis. Findings in this study were similar to a study in Novosibirsk, in which the prevalence of binge drinking did not change between 1989 and 1995[49]. Trends in drinking patterns amongst individuals here contrast with findings in ecological data, however, in which per capita alcohol consumption in Russia increased during the early 1990s [1], although in that study

alcohol consumption was derived indirectly from data on alcohol-related deaths and is therefore not reliable.

Smoking was an important cause of mortality in this study, but is unlikely to produce the short-term fluctuations in mortality seen during the Russian transition, since its prevalence was stable during the period of RLMS, and its effects on health are generally more long term. However, since smoking is associated with coronary heart disease [179] it could provide an elevated background risk on which short-term risk factors for cardiac disease are superimposed. This could help to explain in part the sharp increase in deaths from cardiovascular disease seen in Russia.

8.8.2 Population attributable risk fractions

A useful additional method of assessing the overall contribution of a given factor to health is to estimate the population attributable risk fraction (PARF). PARF is defined as the fraction of all cases in the exposed or unexposed group that would not have occurred if the exposure had not occurred. In this case I used PARF to estimate the size of the effects of health behaviours and education on mortality. This could also provide indirect information about the relative importance of these variables in the Russian mortality crisis.

Population attributable risk calculations (Table 8.3) showed that smoking accounted for 30% of male deaths in this study. The high PARF associated with smoking results from the combination of both a high prevalence of smoking and a high relative risk of mortality, and is not dissimilar to the indirect estimate of 30% of deaths accounted for by smoking in 1984 [57]. In women only 8% of deaths in RLMS were attributable to smoking. However, the higher prevalence of smoking in younger women suggests that in future the prevalence of smoking could increase amongst women of all ages, and smoking will therefore make an increasing contribution to female mortality.
Frequent alcohol consumption also made an important contribution to mortality, although less than smoking. Consuming alcohol more than once a week compared to once a month was implicated in 9% of male deaths and 2 % of female deaths. A PARF was not calculated for binge drinking, since in men mortality was similar in

binge drinkers and regular drinkers, and only a small proportion of women were binge drinkers.

Compared with a university education, an incomplete secondary education accounted for 11% of male deaths and 18% of female deaths, and a complete secondary education a further 11% of male deaths and 30% of female deaths.

In this study, health behaviours made a larger contribution to mortality than education in men. In contrast, education made a greater contribution to mortality than health behaviours in women. This was partly because smoking accounted for a smaller proportion of deaths, since fewer women smoked, but also because incomplete education accounted for a greater proportion of deaths in women. However, education was much more strongly related to age in women here and in other Russian studies[142]. Women with less education had a higher average age, and this could explain their higher mortality rate, and thus the greater contribution of low education to mortality in women.

Table 8.3 Population attributable risks of alcohol, education and smoking

	Population Attributable Risk Fraction (PARF) - %	
Variable	**Males**	**Females**
Health behaviours		
Current smoking	29.9	8.5
Alcohol more than once a week (vs once a month)	9.0	2.1
Education (vs university)		
Primary/incomplete secondary	*11.5*	*18.2*
Complete secondary	*11.3*	*30.0*
Total non-university education	22.8	48.2

Both smoking and education made a substantially greater contribution to mortality than weekly alcohol consumption in both men and women, and this supports Plavinski's findings where education made a greater contribution to mortality than alcohol in a cohort of men[2]. However, non-drinkers also had a high mortality (although a PARF was not calculated for this group), and if some non-drinkers were

former heavy drinkers, as is theoretically possible, alcohol could have made a greater contribution to mortality than is indicated in these data.

This analysis was based on the assumptions that the variables were correctly measured and recorded (limitations have been discussed previously), and that their effects were genuine and independent.

8.8.3 The role of education in the mortality crisis

Lower education was strongly associated with mortality in this study, and accounted for a considerable proportion of deaths. Education itself is unlikely to influence mortality, however, since it is generally fixed in early adult life, and therefore could not explain the rapid fluctuations in national mortality rates during the transition. The differential increase in mortality amongst the least educated in Russia shown elsewhere [3;180] suggests that education is likely to influence mortality by providing protection against the adverse events of the transition, rather acting as a determinant of mortality itself.

The mechanisms for the association between education, other measures of socioeconomic position, and mortality were discussed in Section 8.6. The protective effect of education here was largely independent of alcohol, smoking and material deprivation. The association was also independent of the psychosocial mechanisms studied here, although these were limited in range. The limited range of life course measures here did not offer an explanation, since the greater employment difficulties of people with less education did not influence the association between education and mortality. Evidence for a role of early life circumstances, which may be associated with education and may protect against heart disease [177], is indirect.

Overall, these data do not fully explain the protective mechanism of education during the social changes that influenced the 'mortality crisis'. There is clearly a need for further research, and possible avenues are described in Section 8.9.

8.8.4 Short term risk factors for mortality in Russia

The protective effect of education on health through guarding against the effects of rapid social change suggests that there may have been short-acting risk factors for mortality that operated during the period of the mortality crisis.

During the 1990s in Russia, sudden changes in macroeconomic indicators were paralleled by rapid fluctuations in life expectancy [44], and sudden deaths were common[143]. Elsewhere it has been shown that crises can be followed by sudden death. For example, immediately after the Aberfan disaster in Wales, mortality increased amongst the parents of the children who died [43].

In this study, the high prevalence of good or average health in the round preceding death, especially in men suggests that many deaths were either sudden or preceded by a relatively short illness. This concurs with what is known about the high rates of sudden death in Russia [143]. Amongst people who died relatively suddenly, causes of death may have been different in people who experienced a preceding period of perceived ill health. Individual causes of death were not recorded in RLMS, but these causes were likely to be typical of those in the general Russian population. Leading causes of death in Russia are cardiovascular disease, including sudden cardiac deaths, and external causes (e.g. accidents, poisonings, violent deaths), and these accounted for a high proportion of the increase in mortality during the transition [1]. These causes are likely to result in sudden death or a rapid-onset illness [1].

A case-control study of the determinants of mortality in men in Udmurtia, Russia also showed that for some causes of death, mortality may not be immediately preceded by ill health. Amongst men who died from external causes (accidents, violence or alcohol poisoning), relatives' report indicated that their health was similar to controls, indicating that men who died from external causes were likely to have been previously fit. However, the health of men who died from cardiovascular disease was more likely to have been reported as previously poor by their relatives than the health of controls [50] suggesting that these people had experienced poor health. The study is limited, though, since it did not differentiate between sudden cardiac deaths and

chronic deaths from cardiovascular disease, and by the proxy reporting of subjective health by relatives.

The high prevalence of average or good health close to the time of death amongst men who died and the high rates of sudden death in Russia mean that it is important to investigate whether there could be short acting risk factors that predict mortality. Possible candidate variables from this study are those that fluctuated in line with national mortality data and the national economic situation. These were labour market variables (payment in goods, compulsory leave and wage arrears), household income, satisfaction and optimism. (Conversely, as described previously, alcohol consumption did not fluctuate in this way.) Unfortunately, further analysis showed that there were insufficient numbers of deaths between individual study rounds to demonstrate any significant associations between these predictor variables and mortality in the following year.

8.9 Further research and research methods

Research findings from this thesis can be used to inform improvements in the design of RLMS, as well as more general guidance for future research in Russia and elsewhere.

Within RLMS

Studying mortality was not one of the original intentions of RLMS, and to my knowledge, data from RLMS has not previously been used in this way, even though it is a topic of major interest. In order to make the mortality data more complete, it would be useful to link records of participants to official sources of mortality data, rather than base deaths on the report of a family member. However this may not be practical with the current death certification system in Russia, which is not universally computerised. As a substitute, other ways of validating the mortality data could be used, such as visiting local population registers (also generally non-computerised) or revisiting households. In the future there will be a sufficient number deaths in RLMS to study deaths from individual causes. This will be another important addition to the

study, although again it is likely to be limited by a lack of validation of these deaths and their causes.

It would also be useful to include a wider range of objective health outcomes (such as presence of disease, either self-reported or doctor-diagnosed) in the whole study population, rather than in subgroups, as has been done so far. Measuring biological variables (such as blood pressure or blood chemistry) would also provide useful additional outcome measures.

The mechanisms through which socioeconomic position, particularly education, influences health are still not well understood. It would therefore be useful to study more covariates, such as a wider range of psychosocial measures. For example, perceived control has been shown to mediate the association between socioeconomic position and health [181], and has been shown to be improved by education [158]. Effort-reward imbalance at work has also been shown to influence the relationship between socioeconomic position and health [102], and would be interesting to study in the working population in this study. Better measures of social support and networks could be used, such as trust, or organisations and individuals relied on in times of trouble, that have been used in other studies[17].

More information about participants' earlier lives would be extremely valuable. Although this information would be retrospective, and therefore potentially inaccurate, objective measures such as parental occupation would be more reliable and relatively easy to collect. A particular area relevant to earlier life is resilience. Studies in Britain have shown that individuals with a higher social class in childhood not only have higher educational achievements [182], but also develop better protective psychosocial mechanisms [182;183], which in theory could provide resilience against adverse experiences and their health effects in adulthood. This could be particularly relevant in Russia. However, research in the field of resilience is still at an early stage.

Improving the coding and classification in the raw data of some of the existing measures (such as education, income, occupation and labour market variables) could potentially overcome some of the limitations in measurement described earlier in the thesis.

More careful checking of the consistency of the numbering of individuals within a particular household between rounds would aid the merging of the datasets from individual rounds of RLMS, and thus enable more individuals to be included in the final analysis.

Other population studies in Russia and elsewhere

The points above apply to other studies as well as RLMS. However, there are also more general issues.

First, it is of concern that self-rated health is widely used as a surrogate for mortality. Although self-rated health was associated with mortality in this study, as elsewhere [129], and it was stable during the study period (a time in which national economic variables and mortality rates fluctuated considerably), variables that were associated with self-rated health were not necessarily associated with mortality. This limits its use as a substitute for mortality.

Second, satisfaction is being studied increasingly frequently as an outcome measure, particularly by economists. These findings indicate that satisfaction closely reflects socioeconomic conditions, and is particularly sensitive to rapid changes. Satisfaction is therefore unstable over a short time scale, and this could limit its use as an outcome measure, especially in countries undergoing rapid social change.

Third, studying predictors of mortality over a very short time scale could provide important information about the determinants of the mortality crisis. However, this would require a panel study that included large numbers of subjects to give a sufficient number of deaths in each year. In this respect, RLMS is too small. A large study of short-term mortality in men of working age would be particularly useful, since this is the group in which the greatest increases in mortality occurred during the transition

Finally, the literature review showed relatively few published studies that compared directly the associations between different socioeconomic variables and health, and

findings in those studies were often inconsistent. More research is required in this area. It is likely that many other existing datasets contain information about different socioeconomic variables, and analysis of such data would be valuable in comparing the associations between different dimensions of socioeconomic position and health.

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