THE POOR HEALTH STATUS of Russia's economically active adult population—its human capital—challenges sustainable economic growth and social development. President Vladimir Putin, in his annual address to the Federal Assembly of the Russian Federation in May 2004 and more recently in the State-of-the-Nation Address on April 25, 2005, criticized the failure of health care reform to produce significant results, as evidenced by Russia's lagging behind many countries in key health indicators. Life expectancy in Russia at 66 years, he noted, is 12 years less than it is in the United States, 8 years less than in Poland, and 5 years less than in China—a situation President Putin attributed to "the high death rate in the working-age population."

Dying Too Young aims to heighten understanding of the nature and characteristics of non communicable diseases and injuries as the leading killers in the Russian Federation, its associated risk factors, and their social and economic implications. The study outlines specific options and offers recommendations for addressing this problem, and projects the health and economic gains that could result from a comprehensive program of action. Improving adult health would contribute to improved health status of the population, quality of life, labor productivity and sustainable economic growth in the country.

DYING TOO YOUNG *Addressing Premature Mortality and Ill Health Due to Non-Communicable Diseases and Injuries in the Russian Federation*

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Europe and Central Asia
Human Development Department
The World Bank

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PREFACE

I am deeply convinced that the success of our policy in all spheres of life is closely linked to the solution of our most acute demographic problems. We cannot reconcile ourselves to the fact that the life expectancy of Russian women is nearly 10 years and of men nearly 16 years shorter than in Western Europe. Many of the current mortality factors can be remedied, and without particular expense. In Russia nearly 100 people a day die in road accidents. The reasons are well known. And we should implement a whole range of measures to overcome this dreadful situation.

I would like to dwell on another subject which is difficult for our society—the consequences of alcoholism and drug addiction. Every year in Russia, about 40,000 people die from alcohol poisoning alone, caused first of all by alcohol substitutes. Mainly they are young men, breadwinners. However, this problem cannot be resolved through prohibition. Our work must result in the young generation recognizing the need for a healthy lifestyle and physical exercise. Each young person must realize that a healthy lifestyle means success, his or her personal success.

PRESIDENT VLADIMIR PUTIN
State-of-the-Nation Address
Federal Assembly of the Russian Federation,
The Kremlin, April 25, 2005

Russia's Medium-Term Program for Social and Economic Development 2005-2008 emphasizes integrating its economy into the world economy, raising competitiveness, and developing human capital. The poor health status of Russia's economically active adult population—its human capital—challenges sustainable growth. President Vladimir Putin, in his annual address to the federal assembly in May 2004 and more recently in the State-of-the-Nation Address on April 25, 2005, criticized the failure of health care reform to produce significant results, as evidenced by Russia's lagging behind many countries in key health indicators. Life expectancy in Russia, he noted, is 12 years less than in the United States, 8 years less than in Poland, and 5 years less than in China—a situation President Putin attributed to "the high death rate in the working-age population."

The factors that put human capital development at risk in Russia are well documented: (a) risk factors for cardiovascular disease (hypertension, high cholesterol, diabetes, obesity, and smoking); (b) alcohol abuse; (c) traffic accidents; and (d) HIV/AIDS. Reducing prime age mortality and controlling risk factors cannot be achieved through the acute medical care system alone—it will require a comprehensive approach with multisectoral policies and programs. Russia's Ministry of Health and Social Development (MOHSD) must take the lead, but success will be achieved only with the active collaboration of the Ministries of Economy, Finance, Education, Transportation, and other ministries, and the active participation of civil society, including private enterprises, nongovernmental organizations, communities, families, and individuals.

Over the last decade, the country has shown its willingness to change the health system to achieve better performance and outcomes, undertaking a review of its health financing and the relationships among citizens, service providers, and financiers and initiating health

care reforms in many regions. The country is aligning with international guidelines in some of its approaches to infectious disease control, specifically for tuberculosis and HIV/AIDS. There are signs of increasing commitment to control non-communicable diseases (NCDs) and injuries, the leading causes of death, illness and disability in the country. These developments provide a basis for cautious optimism and a rationale for decisive action in support of a health system that can achieve better outcomes.

This report assesses the factors associated with the onset of NCDs and injuries, as well as the demographic, financial and economic consequences of these conditions, summarizes relevant evidence and emerging lessons from international experience, proposes a comprehensive program for addressing this problem, and projects the health and economic gains that could result from such a program. It conforms to the World Bank's Country Assistance Strategy in the Russian Federation for 2003-2005, which recommends a focus on economic competitiveness and on mitigating social risks in Russia's regions

The report draws heavily on data from the World Health Organization, the United Nations, and the World Bank, as well as from scientific literature, the Russia Longitudinal Monitoring Survey (RLMS), and the 2003 National Survey of Household Welfare and Program Participation (NOBUS). Background assessments were also prepared on the demographic profile of the country, the relative importance of NCDs and injuries on health care costs, and the economic consequences of NCDs and injuries.

The primary audience is external: policy makers, senior analysts, program managers and their advisers in the Russian Government, private sector officials, and international organizations and nongovernmental organizations working on health issues in Russia. The report is intended to be a contribution to the debate on appropriate choices and instruments for health development in Russia. The issues, options, and recommendations are intended for discussion and do not constitute a position paper by the World Bank. A secondary audience is internal, particularly managers and staff of the World Bank addressing health, human development, and poverty reduction as well as managers and staff of sectors that affect health outcomes, such as the economic and financial, education, and transport sectors.

It should be clear, however, that the understanding of the Russian situation cannot be based entirely on current information from Russia and research results from western countries. This means that the understanding of the Russian situation outlined in this report is indeed provisional and that further research is essential to be able to get more definitive estimates of its causal factors. But in a world where there is a need to act without perfect data it should be seen as a start.

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http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/ECAEXT/0,,contentMDK:20661159~pagePK:146736~piPK:146830~theSitePK:258599,00.html

www.euro.who.int/observatory/ctryinfo/CtryInfoRes?language=English&Country=RUS

ABBREVIATIONS

AIDS	Acquired immunodeficiency syndrome
ALOS	Average length of stay
ASDR	Age-specific death rate
BAC	Blood alcohol concentration
BMI	Body mass index
CAS	Country Assistance Strategy
CDT	Carbohydrate-deficient transferring
CEE	Central and Eastern Europe
CHD	Coronary heart disease
CINDI	Countrywide Integrated Non-communicable Disease Intervention Program
CIS	Commonwealth of Independent States
CVD	Cardiovascular disease
DALY	Disability-adjusted life year
DOTS	Direct observed treatment, short course, for Tuberculosis
EMEs	Established Market Economies
EU	European Union
G-8	Group of Eight Industrialized Countries (Canada, France, Germany, Italy, Japan, Russia, United Kingdom, United States)
GDP	Gross domestic product
GNI	Gross national income
HIV	Human immunodeficiency virus
IEC	Information, education, and communication
IFC	International Finance Corporation
IMF	International Monetary Fund
LTC	Long-term care
MMA	Moscow Medical Academy
MOH	Russian Ministry of Health (until 2004)
MOHSD	Russian Ministry of Health and Social Development (after 2004)
NCDs	Non-communicable diseases
NGO	Non-governmental organization
NOBUS	National Survey of Household Welfare and Program Participation
OECD	Organization for Economic Co-operation and Development
PPP	Purchasing power parity
RLMS	Russian Longitudinal Monitoring Survey
SanEpid	Russian State Committee on Sanitary and Epidemiological Inspection
SRI	Science and Research Institute
TB	Tuberculosis
TMA	Tver Medical Academy
UGMADO	Urals Medical Academy of Additional Education
U.K.	United Kingdom
UN	United Nations
UNICEF	United Nations Children's Fund
UNAIDS	Joint United Nations Program on AIDS
UNDP	United Nations Development Program
U.S.	United States
USAID	U.S. Agency for International Development
VSL	Value of a statistical life
WHO	World Health Organization

Executive Summary

The poor health status of Russia's economically active adult population—its human capital—is imperiling sustainable economic and social development. What factors contribute to the excessive mortality, ill health, and disability in Russia, particularly among working-age adults? What are the demographic, social, and economic consequences of this phenomenon? Most importantly, what can be done to reduce these burdens?

This report shows that non-communicable diseases (NCDs) and injuries are the leading causes of death, illness, and disability in Russia, and assesses the factors associated with the onset of these conditions, the demographic, financial, and economic consequences of NCDs and injuries; summarizes relevant evidence and emerging lessons from international experience, proposes a comprehensive program for addressing this problem; and projects the health and economic gains that could result from such a program.

THE DEMOGRAPHIC DECLINE AND THE HEALTH DEFICIT

How do Russia's demographic decline and ill health burden compare internationally?

Russia is suffering a prolonged and debilitating demographic decline fueled by low fertility and high mortality. Some observers assess the decline as "devastation" and note that it is unprecedented among industrialized nations. The decrease in fertility and increase in mortality since the 1960s were exacerbated in the 1990s by the turbulent political and economic transition and an ensuing decline in the population's well-being. In recent years, prosperity has increased due to rapid economic growth, but demographic and health trends remain worrisome—even alarming.

Russia's current situation clearly exemplifies a reversal of the epidemiological transition as the economic stress of the past 15 years and a prolonged period of highly unhealthy lifestyles and environments not only halted progress in improving health status, but shortened life expectancy, particularly among working-age males. This situation defines a new pattern of the epidemiological transition that deviates from that experienced by a number of western countries where age-specific NCDs rates declined and life expectancy grew.

The shrinking of the population

Russia's population was 149 million in 1992; it declined by 6 million as of 2003 to an estimated 143 million. If current trends persist, the Russian population is expected to decline by over 30 percent over the next 50 years, as all measures of demographic processes show that Russia will undergo further dramatic changes in its population dynamics. The average annual population growth during 1990-2003 was -0.3 percent, and continued high mortality and declines in fertility are expected to lead to further negative population growth. Estimates suggest that Russia's population today would be 17 million higher if its age-specific mortality rates had followed the patterns experienced by the European Union-15 countries (EU-15) since the mid-1960s.

Low life expectancy due to high adult mortality

Analysts have described the country's mortality profile as the most puzzling aspect of the Russian transition. Poor data quality has been ruled out as an explanatory variable because demographic data are considered reliable: Russia's registration of vital events is nearly complete and its coding of broad categories of death is reasonably accurate.

Russia is one of few countries where life expectancy is falling. However, its situation is distinguished from other countries, such as several in sub-Saharan Africa, where a generalized HIV/AIDS epidemic is driving losses in life expectancy. Both the current low level of life expectancy and the recent declines were driven largely by increasing mortality among those of working age,

with a singular rise in mortality at young adult ages and with the greatest contribution from cardiovascular diseases and injuries.

Life expectancy in the former Soviet Union had nearly reached that of the United States by the early 1960s, but death rates increased significantly, particularly at adult ages, from 1965 to 1984. By 1980, the difference in life expectancy was nearly 8 years. After 1984 Russia experienced wide swings in life expectancy, while the European Union experienced steady increases. Russia mortality declined during the Gorbachev anti-alcohol campaign (1985-87), but its effects dwindled after its cessation. Furthermore, as the country entered a severe crisis associated with the sudden transition to a market economy, a dramatic deterioration ensued from 1990 to 1994. Life expectancy improved between 1995 and 1998, but the gains eroded following the 1998 financial crisis, and male life expectancy started falling steadily. Russia's total life expectancy at birth lags behind Japan's by as much as 16 years and the European Union average by 14 years.

The scale of Russia's demographic challenge is made apparent through examination of the World Bank's World Development Indicators. Although male life expectancy at birth is only about 2 years less than in Brazil or Poland, the probability that a 15-year-old Russian boy will die before he reaches 60 is over 40 percent, about 16 percentage points higher than in Brazil and double that of Turkey. Moreover, data from the World Health Organization (WHO) show that it is working-age mortality that has led reductions in life expectancy in Russia, while mortality among youth has dropped.

Life expectancy and economic development

A major determinant of a population's health is its country's level of economic development and may in part explain some of the differences in mortality rates. However, the World Development Indicators show that even when income differences are taken into account, Russian male adult mortality rates still substantially exceed those of countries with similar per capita incomes. Although the Russian economy has been growing strongly as a result of high oil prices for almost five years, life expectancy at birth has continue to decline.

Ill health and disability: Russian adults also experience lower *healthy* life expectancy, which can be expressed through the healthy life expectancy indicator, or HALE, a summary measure that captures the full health experience of a population to include mortality, morbidity, and adjustments for severity of illnesses. In other words, it expresses years of life spent in full health. The healthy life expectancy of males and females is much lower in Russia (less than 60 years) than in the United Kingdom, Germany, France, and Italy (more than 70 years). A healthy middle-aged cohort in Russia would have less than a third the chance of one in Sweden to survive into old age without disability.

Gender disparities: Russian women live approximately 14 years longer than Russian men. The longevity gap is significantly wider than in other G-8 countries, where it ranges between 5 and 7 years. The large difference by sex in Russia suggests that specific behavioral factors are implicated, rather than factors related to the external environment or adequacy of health care, which affect men and women to somewhat similar degrees. Two major factors behind this big gender gap are smoking and alcohol consumption, as these behaviors are very different between men and women—even those living in the same households. Although Russian women outlive Russian men, they are generally in worse health than women in Eastern and Western Europe.

Regional variations: Mortality rates and life expectancy in Russia vary greatly by region, in part because of regional differences in socioeconomic and health levels. The mortality rate of the economically active male population from region to region ranges from 3.8 deaths per 100,000 people to 17.8. Data for 2001 show that people in regions such as the Republics of Ingushetia and Dagestan and in Moscow have the longest life expectancy and live 18 years longer than those in low-income regions such as Republic of Tyva, Koryak Autonomous Okrug, and Komi-Perm Autonomous Okrug.

The Russian population is also aging

Russia's population structure is characterized by a shrinking proportion of youth and an expanding proportion of people 60 and above. Contributing to this phenomenon are continued very low levels of fertility and past higher fertility levels that produced compara-

tively larger cohorts. Two decades ago, youth aged 0-14 years constituted about a quarter of Russia's population, and those aged 60 years and above made up 14 percent of the total. Now, those aged 0-14 have dropped to 18 percent. With Russia's expected total fertility rates of between 1.1 and 1.3 children per woman of reproductive age for the years 2005-25, projections suggest that those aged 0-14 will remain at about 13 percent, and population growth rates will remain negative, averaging between -0.6 and -0.8. As a result, the proportion of persons aged 60 and over will become more than a quarter of the total. Unlike other G-8 countries, the rapid aging of the Russian population and growing dependency ratio are occurring at a lower level of GDP per capita.

DETERMINANTS OF THE DEMOGRAPHIC DECLINE AND THE HEALTH DEFICIT

Non-communicable diseases and injuries are the leading causes of death and ill health in Russia

Non-communicable diseases (NCDs) and injuries are the ten leading causes of death in Russia, accounting for 68 percent of deaths. In 2003, cardiovascular diseases, cancer, and injuries accounted for 78 percent of deaths and 15.2 million lost years of potential life among the working-age population (10.3 million among men and 4.9 million among women).

NCDs and injuries also cause much of the morbidity and disability among the Russian total population. Like HALE, "disability-adjusted life years" (DALYs) is a measure that captures mortality, morbidity, and the severity of disability. The 10 leading causes of death and ill-health also account for about 50 percent of DALYs lost among the Russian total population. These causes account for 40 percent of DALYs lost for the entire European region.

The mortality rates from NCDs and injuries in Russia are three and five times, respectively, those in the European Union. For 100,000 population, Russia had 605 deaths from NCDs in 2002, while the EU had 206 in 2001 (or latest data available). The same population size experienced 281 deaths in Russia from injuries while the EU experienced 58.

Cardiovascular disease: Russia's cardiovascular disease (CVD) death rate per 100,000 population in 2002 was 994—one of the world's highest. The comparable rates were 317 in the United States, 363 in Portugal, and 225 in Brazil. CVD accounts for almost 52 percent of deaths in Russia, compared to 38 percent in the United States, 42 percent in Portugal, and 32 percent in Brazil. Russia's high mortality among working-age men is mainly attributable to CVD. Such statistics led a 2004 World Bank report to conclude that Russia could gain 6.7 years in life expectancy by matching the European Union's CVD mortality rates.

Cancers: Cancer mortality rates in Russia are significantly above the EU-15 average. In addition, cancer in Russia is characterized by its extremely high lethality, with a high proportion of deaths within a year of first diagnosis of the disease (e.g., 56 percent for lung cancer and 55 percent for stomach cancer). Men in Russia die from cancer twice as often as women, but the cancer incidence rate among women is higher.

Traffic injuries: Traffic injuries include crashes involving motor vehicles, pedestrians, or cyclists. At 20.6 deaths per 100,000 population, Russia's traffic mortality rate is higher than that of other former Soviet states and nearly double that of the other G-8 countries at 11. This rate is even more remarkable considering that there are fewer automobiles per capita in Russia than in Western Europe. In 2004, more than 34,000 people in Russia died in road accidents, mostly working-age males.

Suicide: Russia's suicide rate is much higher than that of other European Union countries. The Russian suicide rate peaked in the early 1990s, particularly among middle-aged men. In 1994 the suicide rate for Russian men aged 50-54 was over six times that in the United States. It fell slightly between 1995 and 2002. Among the Central and Eastern Europe (CEE) and the Commonwealth of Independent States (CIS), Russian males aged 15-19 had the second highest suicide rate at 38.2 per 100,000 relevant population, surpassed only by Lithuania at 38.4.

Alcohol poisoning: A primary external cause of mortality is alcohol poisoning: death occurs when, for example, a healthy adult male of average weight consumes a

half liter or more of a strong beverage (40 percent alcohol) without food in less than an hour. This is a particularly acute and rapidly growing problem in rural areas, where it causes 128 deaths per 100,000 adult men. This rate is twice that of the country as a whole.

Violence: Russia's homicide rate increased rapidly during the 1990s and is now among the highest recorded anywhere. In 1999, close to 30,000 persons died from homicide in Russia. Furthermore, the average age of homicide victims is much lower than for most other causes of death, so it has a very negative impact on years lost. Alcohol abuse is closely related; the proportion of crimes committed by men and women while intoxicated in 2002 was about 30 percent and 12 percent, respectively. Victims of homicide are also usually intoxicated at the time of the crime. After 1998, with increased alcohol consumption among young cohorts, violent deaths began to rise. Increased levels of violence also adversely affect social and economic development.

The preventable risk factors for NCDs and injuries

Though risk factors may not cause disease, their presence increases the probability that one will develop. The mortality attributable to high blood pressure, high cholesterol, and tobacco is estimated to contribute to more than 75 percent of Russia's deaths. The same risk factors accounted for more than 46 percent of DALYs lost in 2002. However, in terms of ill health burden, alcohol abuse tops the list in Russia, accounting for 16.5 percent of DALYs lost.

Alcohol abuse: In addition to alcohol poisoning, the actual death determinant discussed above, alcohol abuse (heavy or binge drinking) is a major risk factor and public health problem in Russia. Adult per capita alcohol consumption in 1999 was 10.7 liters per adult in Russia versus 8.6 liters in the United States and 9.7 in the United Kingdom. Although these levels are not dissimilar, the key difference is that 75 percent of the alcohol consumed in Russia is spirits, whereas in the United Kingdom and the United States, 56 and 60 percent, respectively, is beer. Recent data from the Russian Longitudinal Monitoring Survey (RLMS) indicate that in 2002, alcohol consumption increased 14.5, 2.4, and 1.1 liters per year among men, women, and teenagers, respectively. In 2004, about 70 percent of men, 47 percent of women, and 30 percent of teenagers were drinkers. Russians in rural areas drink more alcohol of poorer quality than people in cities, as demonstrated by a long-standing tendency of higher morbidity due to alcohol poisoning among rural populations.

In an ongoing case-control study in Izhevsk (a city in the Urals), an interim analysis shows that, of 1,400 deaths from all causes among all male residents aged 25-54 years in 2003-2004, 18 percent were certified as alcohol related: mental disorders due to alcohol; alcoholic cardiomyopathy; alcoholic cirrhosis of the liver; and acute alcohol poisoning. However, this excludes the substantial proportion of deaths that are attributable to alcohol but arise from causes that do not explicitly imply alcohol: injuries, violence, and a wide range of illnesses. This risk factor may explain the mortality crisis in Russia more than any other as suggested by the results of this study.

Tobacco consumption: Tobacco is the only consumer product that eventually kills half of its regular users if they follow its manufacturers' recommendation. Associated with higher rates of CVD, many cancers, and chronic lung diseases, cigarette smoking is the single most preventable cause of disease and death in Russia. Russia has one of the world's highest smoking rates among men, and more Russian men smoke than European men—the ratio is 2 to 1.19. In 1998, 6 out of 10 male adults in Russia were smokers—more than twice the comparable rate in the United States and the United Kingdom. RLMS data indicate that while smoking prevalence among men decreased from about 65 percent in 2002 to 61 percent in 2004, the prevalence of smoking among women increased from 7.3 percent in 1992 to 15 percent in 2004. Lower smoking prevalence among older men reflects trends over time and higher death rates among long-term smokers as they age.

Drug Use: Illegal drug use has increased rapidly in Russia over the past 10 years. In early 2005, drug users were estimated to number 500,000, including more than 340,000 drug addicts in the lists maintained by public institutions. The number of persons registered in medical and prevention institutions with a diagnosis of drug abuse increased by a factor of 2.1. However, it is estimated that the actual number of drug abusers in the

country exceeds those officially registered by five to eight times. Injecting drug users are estimated to have 20-times higher risk of death than the general population, making it conceivable that a portion of Russian teenage mortality is connected to substance abuse. Injecting drug use is also the driving force behind the HIV/AIDS epidemic in Russia. Although HIV/AIDS is an infectious disease that shares certain characteristics with many NCDs, such as a long latency period, and affects predominantly young adults, it is not considered in this assessment.

Nutrition- and activity-related factors

Cholesterol, obesity, and hypertension should not be seen as separate, individual risk factors but as a matter of diet. High saturated fat (animal fat, hydrogenated vegetable fats) intake, high salt intake, low vegetable and fruit intake, and low intake of good (vegetable and fish) oils are the determinants of high blood cholesterol, high body weight, and high blood pressure among Russians. The WHO estimates that about a third of all CVD is due to poor diets and that better diets could lower the number of cancer cases by about 30-40 percent. It has been suggested that the decline in fruit and vegetable consumption in Russia can explain 28 percent of the increase in CVD mortality. Sedentary lifestyle aggravates the problem, as moderate, regular exercise improves both physical and mental well-being and reduces the risks of CVD, colon cancer, diabetes, and hypertension. A 2002 survey reports that 73 to 81 percent of adult men and 73 to 86 percent of adult women reported having low levels of physical activity in Russia.

High cholesterol: About 60 percent of Russian adults have higher than recommended cholesterol levels, and about 20 percent are at high risk and in need of medical attention. A study in St. Petersburg showed a significant decline in HDL (so-called "good") cholesterol to dangerously low levels across all men in the 20 to 69 age group, as well as for women.

Obesity: Adults who are overweight or obese are at risk of premature death and disability. Those with a body mass index (BMI, a common measure expressing the ratio of weight to height, calculated as $wt/[ht^2]$) of 25 to 29.9 are considered overweight, while those with a BMI of 30 or more are considered obese. Obesity has a substantial effect on longevity, reducing the length of life of the severely obese by an estimated 5 to 20 years. The latest (2002) Russian Behavioral Risk Factor Surveillance System results indicate that the prevalence of overweight adults aged 25-64 in various regions ranges from 47 to 54 percent for men and from 42 to 60 percent for women. RLMS data from 2000 found 33 percent of men and 30 percent of women overweight and that 12 percent of men and 28.5 percent of women were obese. However, self-reported data are often underestimated, especially the female obesity rates. According to data from Pitkäranta, Karelia Republic, in the 1990s and 2000, about 35 percent of women had BMI (measured) of 30 or more.

High blood pressure: High blood pressure, or hypertension, is a leading cause of death in Russia and the third-highest cause of morbidity as reflected by DALYs. Individuals with uncontrolled hypertension have a three to four times greater risk of developing coronary heart disease and a sevenfold greater risk of having a coronary event than those with normal blood pressure. About 34-46 percent of males and 32-46 percent of females in Russia suffer from hypertension, although these self-reports may be underestimates. More than 40 percent of males and 25 percent of females in Pitkäranta were not aware of their hypertension, suggesting the all-Russia self-reports are be low.

Diabetes: Complications from diabetes include blindness, renal insufficiency, and cardiovascular and neurological problems. While the incidence of diabetes in Russia is on par with the world average of 2.5 percent, this disease may be underdiagnosed there, with a majority of illnesses being registered under other, attendant diseases. WHO considers Russia among the top 10 countries in number of diabetics.

Other risk factors

Psychosocial stress: Psychosocial problems in Russia were increased by the drastic changes in the economic transition and reduction in the social safety net in the last 15 years. Stress, manifesting as depression and anxiety, can lead to incapacity, suicide, and other violence-related injuries, as well as the development of CVD and increases in CVD mortality.

Socioeconomic disadvantage: Low socioeconomic status has been shown to affect health outcomes in the

West. In Russia, two studies and the 2003 NOBUS survey found that people of lower socioeconomic status have higher mortality and are more likely to report bad health than people of higher status. Furthermore, people with the lowest socioeconomic status are more likely to report frequent consumption of hard alcohol and have greater problems accessing health care systems and following treatment regiments than richer people.

Road safety-related risk factors: A major risk factor is the lack of strict road safety measures similar to those in Europe and the United States, where improved road quality, better driver training, traffic rules, vehicle safety inspection, and road safety campaigns are common. Other risk factors are drivers' and pedestrians' widespread failure to observe safety rules, speeding, and drivers' widespread failure to wear seat belts. The rates of alcohol abuse make alcohol impairment an important risk factor in crashes. Inadequate post-crash emergency medical care is also a major risk factor in some Russian regions.

Work-related risk factors: Occupational risk factors include exposure to hazardous substances and lack of safety measures. The International Labor Organization estimates that about 6,000 fatal accidents, 118,000 disease cases, and 131,000 Russian deaths in 2001 were work related.

Interactions among risk factors

The relative risk of developing NCDs and suffering injuries increases sharply when various risk factors are combined. Multiple factors increase the risk of CVD mortality by five to seven times.

While there clearly are many open questions on the current health crisis in Russian, and there is much to be studied, the policy implications are clear: without a doubt tobacco, alcohol abuse, and some aspects of national diet and physical inactivity contribute significantly to premature mortality, ill health, and disability due to NCDs and injuries in Russia. These are also factors where effective and measurable interventions are available that generate benefits in years rather than decades, as shown in developed countries such as Finland and the United States.

WHAT ARE THE CONSEQUENCES OF THE DEMOGRAPHIC DECLINE AND THE HEALTH DEFICIT?

The unprecedented mortality upsurge Russia experienced in the 1990s is the product of a a long-term deterioration of the health of the population associated with a prolonged period of highly unhealthy lifestyles and adverse environments, aggravated by a difficult socioeconomic and political adjustment process. Russia's total population is expected to decline in the years ahead and will be accompanied by the aging of society as fertility rates remain under the replacement level. This has several important implications:

Fewer workers: If trends persist, the size of the Russian labor pool will continue to shrink—significantly—in the decades ahead. Furthermore, the population may decrease further as a result of the changing sex ratio that will probably accelerate fertility decline, resulting in an extreme sub-replacement fertility level. This presents a serious threat to Russia's development as the simultaneous decline in the working-age population and increase in the elderly population could have an adverse impact on the economy. According to IMF projections, a decrease in working-age population will reduce labor productivity and incentives for investment in human and physical capital, which will in turn reduce per capita GDP growth. Government budgets will tighten as tax revenues fall from shrinkage in the working-age population and the increasing needs and demands of an aging population. As the elderly population increases, the overall rate of saving and investment will decline as pensions, health care, and long-term residential care absorb more resources.

However, a healthy population of 65-75 year-olds may be a sizable untapped workforce, and, providing measures are taken to reverse the mortality trends and assuming lives lengthen overall, raising the retirement age would improve the medium-term solvency of pension systems. This change may require developing new relationships with older workers, including mechanisms to attract and retain them, especially knowledge workers.

The destabilization of families: The gender gap in life expectancy has led to instability in marriage and an

extremely high proportion of widows (the percentage of widows in Russia aged 30-44 is about four times that in the United States).

Growing regional disparities: Uneven fertility, mortality, population growth, and life expectancy in different regions and among social and ethnic groups could exacerbate existing disparities. Difficulties in providing equitable access to resources for the poor may give rise to social and political challenges, especially in a country as vast as Russia. This is an important policy consideration for any government, particularly when resources are scarce.

National security risks: The demographic and health crisis in Russia will present many challenges to national security: (a) the number of conscription-aged men will plunge rapidly in the decades ahead; (b) a growing percentage of the military budget will have to be allocated for the provision of medical, nutritional, and substance abuse programs for draftees and soldiers deemed medically unfit for duty; (c) long-term economic growth will erode without large cohorts of healthy and skilled young and middle-aged adults; and (d) if its vast territory is depopulated, instability could grow and the country could become increasingly difficult to govern.

Impact of NCDs and injuries on health care costs and the economy

The large contribution of NCDs and injuries to sickness and mortality in Russia raises two other serious economic issues. First, as many NCDs are chronic conditions requiring expensive medical treatment, to what extent is the Russian health system burdened with the increasing cost of treating NCDs and injuries? Second, to what extent does Russian society suffer economic consequences from premature mortality, ill health, and disability among its working-age adults?

High medical treatment costs: The 2003 health care cost estimates from two regions in Russia were analyzed and extrapolated to the national level for this study using US$13 billion, the widely accepted estimate of Russia's total health care expenditure, as a denominator, to determine the effect of NCDs and injuries on total health expenditures. The regions were the Chuvash Republic (an agricultural region) and Kemerovo Oblast (an industrial region). The most expensive medical conditions proved to be NCDs or injury related. The analysis identified the four most expensive groups of diseases and injuries as circulatory system diseases, respiratory diseases, external causes, and digestive system diseases. These four conditions account for more than 50 percent of Russia's total health expenditures and pose tremendous challenges to the health care system. In 2003, the most expensive group comprised circulatory system diseases—hypertension, ischemic heart disease, and cerebro-vascular disease—and cost the public health system US$2.7 billion (83 billion rubles), or 20.8 percent of total expenditures.

What effect has adult ill health had on the economic outcome of the population? The overarching answer from an assessment prepared for this study is clear: poor adult health negatively affects economic well-being at the individual and household level. If effective action were taken in Russia, improved health would play an important role in sustaining high economic growth rates at the macro-level.

The main findings of this assessment are:

The cost of absenteeism due to ill health: On average, 10 days per employee per year are lost due to illness in Russia, while in the EU-15 the average is 7.9 days. Sickness absence incurs a direct cost from benefits paid to absent employees and an indirect cost of lost productivity. The overall cost varies between 0.55 percent and 1.37 percent of GDP (annual absenteeism rates can be converted into a monetary value either by using the average wage rate, resulting in the lower value, or the GDP per capita, resulting in the higher value). This is a significant impact, given that the indicator fails to capture the many other ways ill health impacts the labor market. In particular, it does not capture the effects of reduced productivity and mortality.

The impact on the labor supply: Ill health also impacts labor supply because jobholders with chronic diseases or alcoholism are more likely than healthy individuals to either retire early or lose their jobs and draw on state pensions. While a hypothetical Russian male aged 55 with median income and other average characteristics would be expected to retire at age 59, chronic illness would lower his expected retirement age by 2 years. Similar results are obtained for females. Also, an individual who suffers from chronic illness has a significantly higher probability of retiring in the subsequent

year than the same individual free of chronic illness. This all means that chronic illness is a highly significant predictor of subsequent retirement in Russia. The lower the income of an individual in Russia, the more chronic illness affects the decision to retire. This implies that less-affluent people carry a double burden of ill health: first, they are more likely to suffer from chronic illness, and second, once ill, they are more likely to suffer worse economic consequences-less income-than rich people, tending to perpetuate socioeconomic disadvantage.

Job loss: Alcohol abuse, arguably an important factor in explaining the high adult mortality in Russia, significantly increases the probability of job loss.

The impact on the family: The death of a household member affects other household members' welfare and behavior in various ways. Alcohol consumption was found to increase by about 10 grams per day as a consequence of the death of an unemployed household member and by about 35 grams if the deceased had been employed. Also, the probability of suffering depression increased by 53 percent when controlling for other relevant factors. Chronic illness has also negatively affected household incomes, particularly during 1998-2002, when chronic illness contributed an estimated annual loss of 5.6 percent of per capita income.

WHAT STRATEGIES AND INTERVENTIONS PREVENT NON-COMMUNICABLE DISEASES AND INJURIES?

Some developed countries have implemented a range of effective strategies to prevent deaths and illnesses from NCDs and injuries. The research on effective policy measures and NCD risk factor interventions is growing steadily, enabling informed policy making. While the level of impact varies by strategy, local circumstances, and resource availability, the overwhelming evidence suggests that an integrated strategy is most effective. Such strategy incorporates all appropriate actions to reduce the burden of disease, including both population-based and high-risk prevention strategies. The North Karelia Project in Finland exemplifies an integrated strategy. Its results show that the effect of prevention efforts may occur in years rather than decades: measurable improvements appeared just 2-7 years after the elimination of risk exposure, even among people in older age groups.

The population-based strategy aims to change disease-related lifestyle choices, environmental factors, and their social and economic determinants in an entire population (e.g., information and communication programs addressing the risks of smoking and the value of smoking avoidance, excise and other taxes to reduce smoking, and restrictions on smoking in public places and on tobacco advertising). The main argument for this strategy is that it targets a high proportion of NCD morbidity and mortality: 5 percent of a population have very low exposure to risk factors and 25 percent have very high exposure. By targeting those with average levels of exposure, 70 percent of the population can learn to avoid risk. Furthermore, interventions for this large group are far less expensive than the intensive interventions needed by the high-risk group.

In the "high-risk strategy," individuals at high risk of developing selected diseases are identified, and actions are planned to reduce their disease burden through provider-based interventions (e.g., clinical interventions to treat and counsel individuals about risk factors for CVD—smoking, excessive alcohol consumption, hypertension, hyperlipidemia, diabetes and obesity—management of patients at high risk according to established clinical practice guidelines; and therapy for individuals once overt CVD has occurred). High-risk strategies pose a major task for health services, and their per-person costs can be high.

The government's role in disease prevention

From an economic perspective, government intervention is justified as a means to achieve a net improvement in social welfare, in terms of increased efficiency, and for reasons of equity through redistribution. Alternative government interventions, such as regulations, taxation, and public provision, need to be assessed to determine their costs and benefits, as sometimes governments lack the capacity to correct market failures. With regard to health, individuals cannot clearly perceive the costs of their actions to themselves or others because information is often incomplete or imperfect, justifying government intervention. Some argue that in the areas of behavior and lifestyle, a wider government role is justified when health benefits outweigh the curtailment or

modification of individual choices. In the case of NCDs, a strong case could be make for government intervention as a result of a widespread policy failure that has often ignored these conditions relative to communicable diseases.

As the etiology of most NCDs is complex, risk factors should be managed from multiple directions. The government's role in disease prevention is multifaceted and includes setting priorities, formulating policies, enacting and enforcing regulations, rallying constituencies for disease prevention, establishing infrastructure and institutions, and educating the public. Many disease-prevention efforts also require larger health system reform, for example, financial incentives to strengthen public health prevention and community-based intersectoral interventions to benefit the majority of the population.

Role of private employers

Private sector involvement is particularly important. The poor health of employees quickly affects a company's bottom-line and has a longer-term impact on profits. Businesses have a vested interest in supporting activities to improve employee health and can have a strong influence on their employees' behavior and make them aware of health risks in ways unavailable to the government. The involvement of major Russian companies, multinational corporations, and other stakeholders with experience in employee- and community-directed health programs will be critical in reducing NCDs and injuries.

IS RUSSIA DOING ENOUGH TO CONFRONT NON-COMMUNICABLE DISEASES AND INJURIES?

It is assumed that over the last three decades the Soviet health care system lagged behind that of western countries in terms of health care outcomes due to its inability to take full advantage of new medical knowledge and technological advances, including new treatment regimes and drugs. Ongoing health reforms were initiated in Russia during in the 1990s to address this situation, mainly focusing on financing and delivery of services. Although these reforms changed the health sector's legal and organizational structures and contributed important legislation for addressing NCDs, the public health system largely retained its infectious disease focus. Recently, the Russian government set up institutional structures to respond to NCDs and injuries, but it still needs greater institutional capacity to improve health promotion and disease prevention programs. Many health experts, including Russian government representatives, generally agree that the Russian health system and the Ministry of Health and Social Development (MOHSD) are not yet equipped to tackle NCDs and injuries effectively.

WHAT ADDITIONAL ACTIONS CAN RUSSIA TAKE?

MOHSD is preparing a federally targeted program to prevent and control premature death, ill health, and disability from NCDs and injuries. A well-defined and structured national program of population-based and clinical interventions to confront NCDs and injuries would help improve social welfare and contribute to sustainable economic growth by (a) bettering the health of the economically active population; (b) reducing labor supply and productivity losses from preventable deaths, illnesses, and disabilities from NCDs and injuries; and (c) minimizing regional disparities by reducing social risks for NCDs and injuries in the most vulnerable regions. A nationwide mortality reduction program should include three focus areas: (a) federal-level policies and strategies, (b) priority sub-programs in regions, and (c) measures to improve road safety and emergency services.

A. Federal Level Policies and Strategies

National subprograms must be defined in light of the magnitude of each health threat, the political commitment required to solve or manage it, and feasibility and cost-effectiveness. The support mechanisms required for success—legislative frameworks, institutional capacity, and federal oversight also need to be considered and developed.

B. Priority Subprograms in Regions

Support should be provided for the implementation of national priority programs in the regions but allowing for regional differences in health status and choosing region-specific, appropriate, effective interventions. Activities should include primary prevention (before problems arise) through population-based interventions

targeting alcohol, tobacco, and diet/physical activity and secondary prevention to control disease in its early stages and prevent progression through clinical interventions targeting individuals with high blood pressure, elevated cholesterol, and diabetes.

The subprograms should build on the Countrywide Integrated Non-communicable Disease Intervention (CINDI) Program experience and promote healthy behaviors by awarding "health promotion initiative grants" to stimulate innovative health promotion and disease prevention initiatives at the regional and municipal levels and to build capacity at these levels for implementing integrated approaches. Technical assistance should be provided to assess the capacity and readiness of various partners and organizations to undertake health promotion and prevention activities, to establish efficient organizational and managerial structures for health promotion, and to conduct process and outcome evaluation studies to measure federal program success.

C. Improved Road Safety and Emergency Services

The federal government should (a) ensure that an enforceable legislative framework is in place by reviewing and revising existing laws and reviewing and adjusting regulations that implement them; (b) formulate a national road safety strategy and subprogram, identifying risk factors as a basis for planning and improving effective prevention of injuries through a combination of education, regulation, enforcement, engineering, and technology; (c) establish mechanisms to forge links with public sector entities, industry, and NGOs; (d) identify dangerous road corridors for early action; (e) set standards and disseminate clinical protocols specifying procedures on clinical management of patients during emergency medical services on the road, while in transport, and in trauma centers and hospitals to reduce pre-admission death rates and disability from accidents; (f) create a national road accident database and establish/upgrade a management information system on road traffic accidents; (g) establish, implement, and maintain a robust monitoring and evaluation framework with indicators and national and regional targets; and (h) provide technical assistance to regions.

In turn, each region should develop its own road safety strategy and action program following the federal program. Regions should be responsible for implementing national laws, standards, and guidelines; implementing emergency medical services; and developing an inter-institutional emergency medical network, including the ambulance network and emergency communication system.

WHAT HEALTH IMPROVEMENTS COULD RESULT FROM AN INTENSIFIED PROGRAM OF ACTION?

To estimate the effect reductions in cardiovascular, digestive, and external causes of diseases could have on life expectancy in Russia, an assessment was conducted using the Multiple Decrement Life Table approach.

If mortality from preventable or treatable components of circulatory and digestive diseases and external causes were reduced in working-age adults in Russia, important improvements would result in life expectancy for both men and women. For example, life expectancy at birth for men could be improved by as much as 5 years by reducing CVD by 20 percent. The impact of reducing external causes of mortality (road accidents, intentional self-harm, and assaults) suggests another useful avenue for raising life expectancy, especially for those in middle age. The impact of reducing these diseases among men is more evident in adulthood.

WHO estimates also show that major improvements in healthy life expectancy can be expected by reducing major risk factors. The region that includes Russia, EUR-C, can expect to gain more than 10 years of HALE by reducing the 20 leading risk factors. This is a very important finding relative to economic development and cost-benefit analyses because increasing life expectancy but not healthy life expectancy would significantly burden the health system.

WHAT ARE THE POTENTIAL ECONOMIC BENEFITS OF MORTALITY REDUCTION IN RUSSIA?

Policies to reduce adult mortality would have a significant effect on the economy that may be seen by comparing three scenarios. The status quo scenario assumes

that 2002 levels of adult mortality from NCDs and injuries will remain constant until 2025. An optimistic scenario assumes that new policies would bring Russian mortality rates down to the current level among EU-15 countries: an annual rate of reduction of 4.6 percent for NCDs and 6.6 percent for injuries. An intermediate scenario assumes that new policies would achieve half the improvement of the optimistic scenario.

The main conclusion of an assessment prepared for this study is that the benefits would be substantial for the Russian economy as a whole, irrespective of how they are evaluated. This occurs despite the fact that the assessment concentrates only on the effect of mortality reductions, without considering the affect of morbidity reductions. The main findings are:

- The static economic benefits (i.e., valuing a year of life by one GDP per capita) of gradually bringing the adult NCD—and injury—mortality rates down to the EU-15 rates by 2025 are estimated to be between 3.6 percent and 4.8 percent of the 2002 Russian GDP.
- When a broader concept than GDP per capita is considered (measured by adding the value of changes in annual mortality rates using a "value of a statistical life" to changes in annual GDP per capita), the "welfare" benefits from achieving EU-15 rates by 2025 are estimated to be as high as 28.9 percent of the 2002 Russian GDP.
- The dynamic benefits of improving adult health, i.e., the effect on economic growth rates, are massive and growing over time: while in 2005 the difference in the per capita GDP between the status quo scenario and the most optimistic scenario is only US$105-324, by 2025 this difference would have grown to US$2,856-9,243.

Additional Estimates of the Macroeconomic Consequences of NCDs and Injuries in Russia

In addition to the economic assessment prepared for this study and discussed in the previous sections of this chapter, recent estimates undertaken by WHO (2005) also show a very dire picture. According to the WHO estimates, the Russian Federation will lose in 2005 US$11.1 billion of national income as a result of the impact of deaths from heart disease, stroke and diabetes on labor supplies and savings. This figure is estimated to increase to US$66.4 billion by 2015. The magnitude of the estimated loss in Russia is better appreciated when it is compared with the significant lower estimated losses in the United Kingdom: US$1.6 billion in 2005 and US$6.4 billion by 2015. As these losses accumulate over time because each year more people die, the estimated accumulated loss in Russia during the 2005-15 period amounts to US$303.2 billion as compared to only US$32.8 billion in the United Kingdom.

When these losses are translated into percentage reduction in GDP, WHO estimates that in 2005 1 percent of the Russian GDP was reduced, and by 2015 the percentage reduction in GDP would be over 5 percent of GDP, far higher than the estimated reduction of 1 percent of GDP in other countries such as Brazil, China and the United Kingdom. In large measure the estimated large losses in Russia are due to higher rates of CVDs (the leading killer of the Russian working-age population as discussed in chapter 3) than in other countries.

CONCLUSION

Reducing NCDs and injury-related mortality rates among Russian working-age adults will have a major macroeconomic and poverty reduction impact, regardless of how this is measured. Based on the results of the assessment conducted for this study, as well as the recent WHO estimates described above, the expected economic benefits are of a magnitude that easily outweighs the costs of health promotion and disease prevention programs. Given the significant positive effect on economic growth from investing in health (Barro 1997, Suhrcke at al. 2005b), governmental intervention is urgently needed in Russia to develop health-enhancing policies and programs to address the alarmingly high mortality rates among the working-age population. These efforts should be seen as key investments to help improve the general welfare of the population and secure sustainable economic growth in the future.

1

Chapter I. The Demographic Decline and the Health Deficit

Russia is suffering a prolonged and debilitating demographic crisis fueled by low fertility and high mortality. Some observers note that this demographic "devastation" is unprecedented among industrialized nations. The decrease in fertility and increase in mortality since the 1960s were exacerbated in the 1990s by the turbulent political and economic transition and a decline in the population's well-being that occurred soon after. In recent years prosperity has increased due to rapid economic growth, but current demographic and health trends remain unsatisfactory—even alarming. This chapter examines recent and projected fertility and mortality trends in Russia; assesses their impact on the size, growth, and structure of the population; and presents the challenges that will likely be posed to the country's general welfare during the next few decades.

A Framework for Understanding the Demographic and Health Conditions in Russia

Conceived by Omran in the mid-1960s (Omran 1971), the epidemiologic transition theory focuses on different societies' changing health, mortality, survival, and fertility over time and place, linking these effects to their socioeconomic, environmental, lifestyle, demographic, health care, and technological determinants and correlates (Box 1.1). This concept provides a useful framework for analyzing past patterns in the health of a population (McKeown 1985; Gribble and Preston 1993). It offers empirically tested explanations of the mechanisms operating on the transformations in a population's health and is open to adaptations as new evidence emerges. It does not purport to make predictions, but offers a coherent theory of past changes and patterns, and such theory can illuminate thinking about the future.

According to classical theory, countries transition with economic development from (a) primitive and poor societies with mainly infectious diseases to (b) increasing rates of chronic, noncommunicable diseases (NCDs) with "double burden of disease" to (c) increasing life expectancy with a primarily high burden of NCD and finally to (d) reduction of age-specific NCD rates. The last stage is illustrated by a number of Western countries. The increase in NCDs is classically explained by two developments: aging of the population and changes in lifestyles (especially in dietary and drinking habits, reduced physical activity, and smoking). Analysis of past changes does not support a single explanation for improvements in a population's health status. Neither higher income (and the related better nutrition and increased resistance against infections) nor increased benefit from specific professional interventions alone can satisfactorily explain historic declines in mortality. Rather, complex combinations of societal changes fed by new knowledge shape the health status of a population.

In line with the open nature of the health transition school of thought, updates to the classical model have been proposed periodically. These updates, while describing improvements in health conditions due to socioeconomic changes and medical advances, acknowledge uneven development resulting from several persisting and new health problems related to rapid unplanned urbanization, emerging and re-emerging infectious diseases, and increasing obesity linked to changes in nutrition and exercise. As Omran noted in revisiting the epidemiologic transition theory nearly 30 years after its publication, stagnation or reversal of the transition is possible during economic, political, environmental, or morbidity crises (Omran 1999). Indeed, the experience in Central and Eastern Europe since the early 1970s, when life expectancy began to plateau or even decrease, also confirms the omnipresent risk of counter-transitions (Mesle et al. 1996).

The current situation in Russia clearly exemplifies a reversal of the epidemiological transition as a prolonged period of highly unhealthy lifestyles and environments coupled by the economic stress of the past 15 years not

Box 1.1 The Factors Behind the Epidemiological Transition

During an epidemiological transition, long-term shifts occur in mortality, disease, and survival patterns. Several factors contribute to such transition, the most important of which include the following (Feachem et al. 1992):

- ***Demographic and health factors:*** Changes in fertility and mortality, along with changing disease and health patterns, are the main agents of the epidemiologic transition. This is inexorable as populations become older and live longer, and the numbers of adults and elderly increase. Largely as a function of changes in the age structure of a population, the absolute number of sick and dying adults and elderly has increased, implying a shift of the burden of death and disease from the younger to the older groups.

- ***Changes in risk factors:*** Though risk factors may not cause disease, their presence increases the probability that disease will eventually develop. Risk factors involved in the epidemiological transition include biological and environmental factors, as well as social, cultural, and behavioral (e.g., changing lifestyles) factors. Changes in the exposure to and the magnitude of risk factors, as well as risk-averting interventions, have altered age-specific morbidity and mortality rates. For example, improvements in nutrition, personal hygiene, and housing in Western countries during the 18th and 19th centuries contributed to the decline in overall mortality from infectious diseases and to the steady rise in life expectancy.

- ***Changes in health care practices:*** Health care improvements have caused changes in absolute and relative rates of ill health and death. Changes in access to, the use of, and the effectiveness of health services may influence an epidemiologic transition by affecting disability and mortality. For example, after World War II, the widespread use of antibiotics and the large-scale use of vaccines helped improve health dramatically across Europe.

Mortality, through its declining or rising trends, is the most fundamental force in the epidemiological transition. Fertility is a major co-variable, as it sets the pace of population growth when mortality reaches low levels (with modifications by net migration).

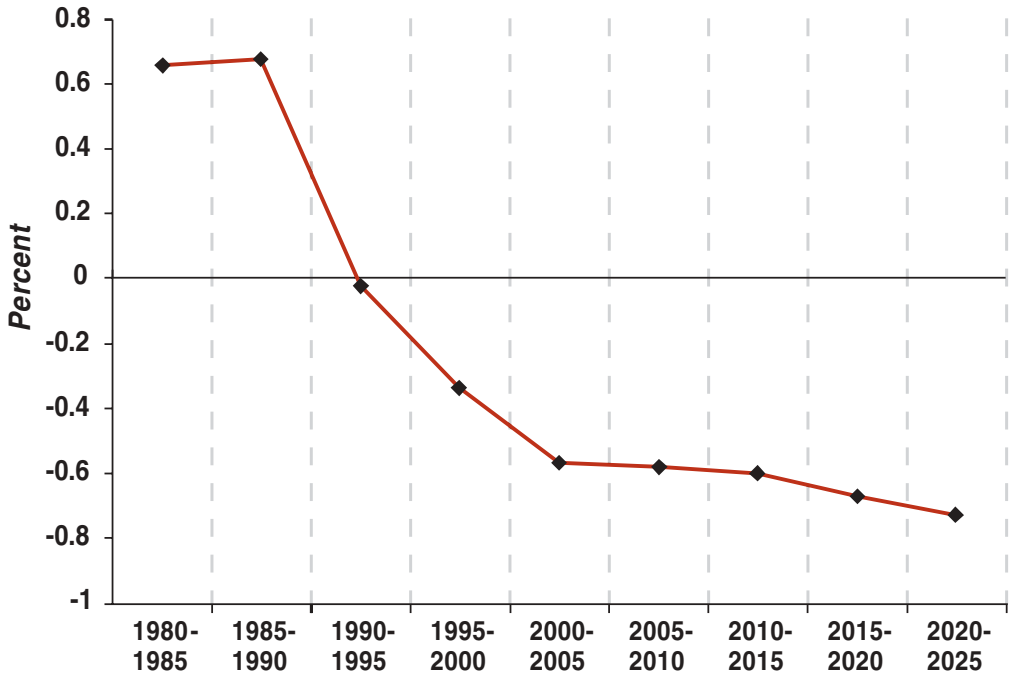
only halted progress in improving health status, but shortened life expectancy, particularly among working-age males. This situation defines a new pattern of the epidemiological transition that deviates from the experience in a number of western countries that is characterized by a reduction of age-specific NCDs rates and increasing life expectancy (Omran 1999, Murray and Bobadilla 1997; Kingkade and Arriagada 1997).

The Shrinking of the Russian Population

Russia's population was 149 million in 1992 but declined by 6 million as of 2003 to 143 million. If current low fertility and high mortality trends persist, this figure is expected to decline by over 30 percent during the next 50 years, as all measures of demographic processes show that Russia will continue to undergo dramatic changes in its population dynamics in the coming decades. The average annual population growth during 1990-2003 was -0.3 percent, and continued high mortality and declines in fertility are expected to lead to further negative population growth (Figure 1.1).

Overall, it is estimated that the population of Russia would be 17 million higher than at present if age-specific mortality rates in Russia had followed the patterns experienced by European Union-15 countries (EU-15) since the mid-1960s (Andreev 2005). This figure is comparable to the country's total lives lost in World War II (Andreev 2005).

Figure 1.1 Estimated Population Growth Rates, Russia, 1980-85 to 2020-25



Source: UN Population Database.

Box 1.2 The Global Context for Demographic Trends

Global demographic trends since the 1950s—notably declining fertility rates and increasing life expectancy, especially in developed countries—are expected to have major ramifications in the next several decades. Although fertility rates remain high in some global regions (Africa and the Middle East), in others (East Asia and Central and Eastern Europe), they have fallen below the replacement rate (2.1 births per woman of reproductive age). Simultaneous with declining fertility rates, global life expectancy has risen, especially in developed countries.

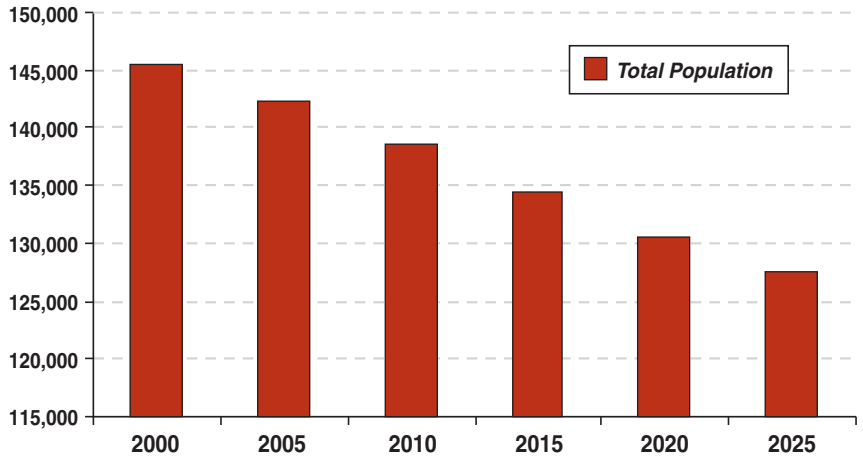
As a result of these trends, the rate of growth in the world's population is expected to decrease in the coming years. Worldwide annual population growth was 1.25 percent in 2003 but is projected to drop to 0.25 percent by 2050. In some Central and Eastern European (CEE) countries, populations are expected to decline by over 30 percent in the next 50 years.

Demographic trends also are expected to produce changes in the population structure by age groups. Currently, approximately 600 million people worldwide are aged 60 years and over. The global population will continue to age in the coming years, and the median age will increase from 27 in 2003 to 37 in 2050. The number of people 60 and over will double to 1.2 billion by 2025 and reach 2 billion by 2050. The vast majority of people 60 and over will reside in the developing world. The aging of the CEE population is expected to accelerate beginning in 2015, increasing economic and social demands on affected countries. The working-age population as a percentage of the entire population will start to decline dramatically in some regions before 2050, first in CEE and especially in Russia.

These trends, which are occurring in the context of the global demographic trends described in Box 1.2 (on page 3), will contribute to continued population shrinkage in the coming years.

The United Nations Population Division projects that Russia will lose approximately 18 million people between 2000 and 2025 (Figure 1.2). Box 1.3 explains the assumptions underlying these projections.

Figure 1.2.Estimates of Total Russian Population, 2000-2025 (millions)

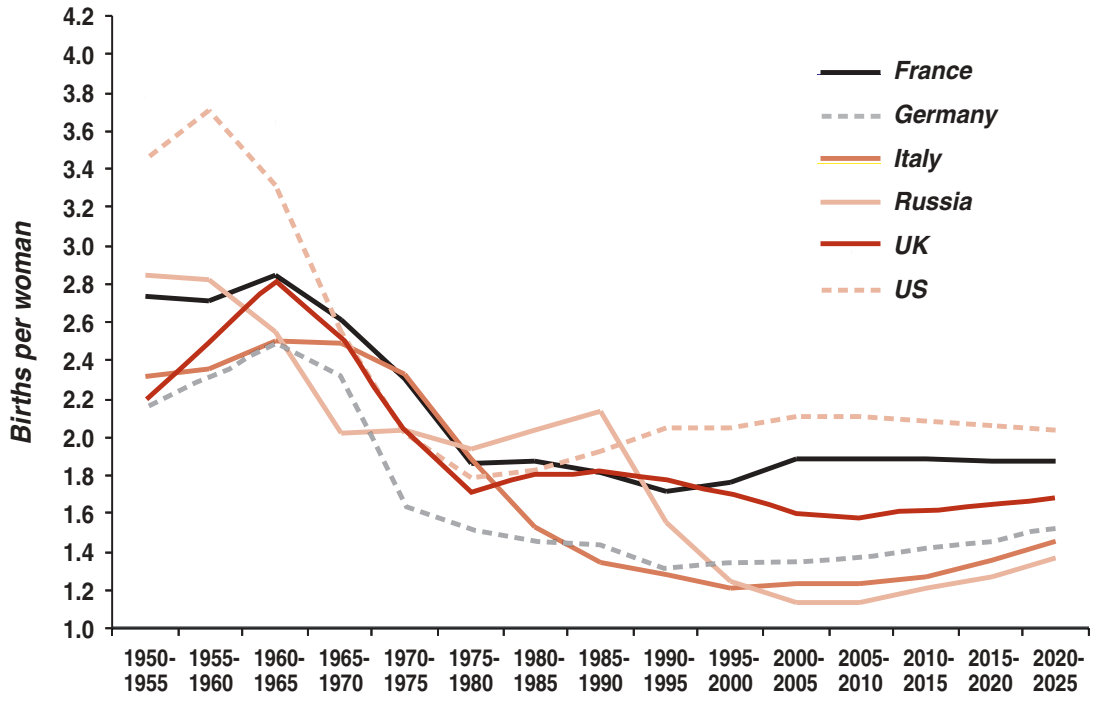


Source: UN Population Database.

Declining Fertility Rates

Russia is among many Western countries with fertility rates below the replacement level of 2.1 children per woman of reproductive age (Figure 1.3). In the early 1960s, Russia's total fertility rate stood at approximately 2.6. Its fertility rate dropped to about 2.2 in the late 1980s, fell below replacement in the early 1990s, and in 2000-2005, it was 1.1. Projections suggest that Russia's

Figure 1.3 Total Fertility Rates in Selected Developed Countries, 1950-2025



Source: UN Population Database.

Box 1.3 The Accuracy and Reliability of Demographic Projections

"Demographic projections" are conditional statements about the future, given a set of assumptions about the key population flow variables: fertility, mortality, and migration. If the computation is performed accurately, demographic projections provide a picture of the future based on assumptions. "Demographic forecasts," on the other hand, are analysts' statements on what the situation will most likely be in the future. Since no one can know with certainty what will determine birth rates in the next 10 years or of the emergence of an epidemic that would substantially raise mortality, forecasts have a high probability of being inaccurate. Projections, by their very nature, can never be inaccurate, since they are simply conditional statements based on some assumptions.

The United Nations (UN) Population Division produces population projections. In the latest set of projections (U.N. Population Database), the future population of each country is projected from an estimated population for July 1, 2005, a figure that in Russia's case is based on the most recent population data available (from a census or population register, updated to 2005) as well as available data on fertility, mortality, and international migration. To project population until 2050, the UN Population Division applies assumptions regarding future trends in fertility, mortality, and migration.

As the future is uncertain, the UN Population Division produces several projection variants, meaning that different combinations of assumptions are applied and different sets of projections are produced. The most commonly used of these variants is the medium variant, which assumes medium fertility and normal mortality and migration.

Fertility might be assumed to follow a path derived from models of fertility decline that are established on the basis of experiences for countries that saw falling fertility during 1950–2005. In Russia's case, fertility has been below 1.85 children per woman of reproductive age for some time. In this case, the assumption is that over the first 5 or 10 years of the projection period, fertility will follow the recently observed trends in Russia. After that period, fertility is assumed to increase linearly at a rate of 0.07 children per woman per year over each five-year period.

Projections under the normal mortality assumption are done on the basis of demographic models of change of life expectancy. These models produce smaller gains the higher the life expectancy already reached. The selection of a model for each country is based on recent trends in life expectancy by sex. These projections are done carefully: the 2004 revision, for example, incorporates for the first time a longer survival for persons receiving treatment with highly active antiretroviral therapy for HIV/AIDS.

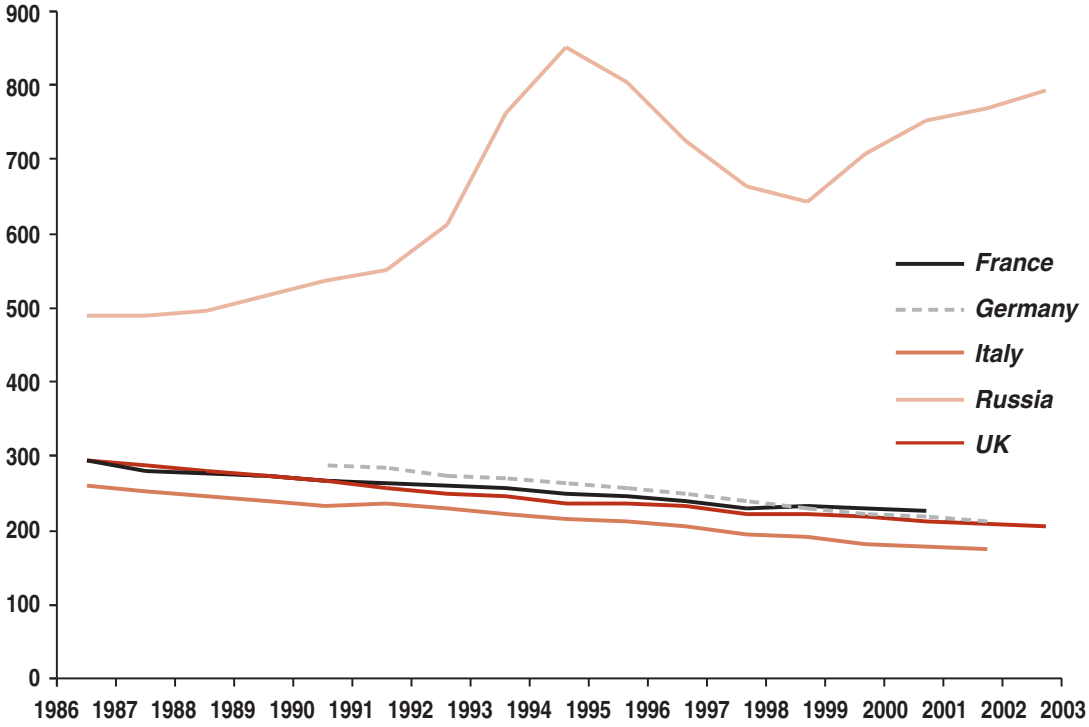
At the global level, projections of population size, for example, have tended to be quite accurate, with the error size at less than 3 percent. At the country level, errors can be larger, especially in looking at very long time periods. Also, errors can be larger for less-developed than developed countries and for larger countries. It is usually the case that fertility is overestimated, whereas mortality improvement has usually been underestimated (though not for Africa or the Commonwealth of Independent States [CIS]). The most important thing to remember for this report is that, by their nature demographic projections do not provide a forecast.

total fertility rate will remain below replacement beyond 2025. The crude birth rate (live births per 1,000 population) decreased dramatically from 14.7 in 1989 to 8.7 in 2000 but increased slightly to 9.7 in 2002.

As will be discussed in the next section, while many developed countries are experiencing low birth rates, Russia's death rate is unusually high, and it is the combination of these two rates that cause concern.

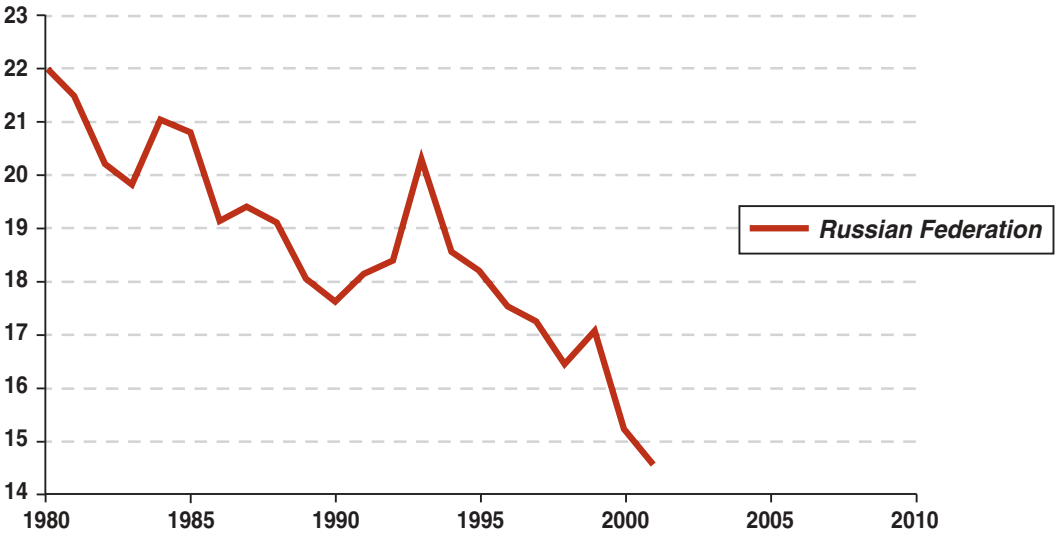
Figure 1.4 Standardized Mortality Rate from All Causes for People Ages 0-64, 1986-2001, Selected Countries

Deaths per 100,000 population



Source: WHO European Health for All Database.

Figure 1.5 Infant Deaths per 1000 Live Births



Source: WHO European Health for All Database.

High Mortality Rates

According to data from the World Health Organization's (WHO) European Health for All Database, the mortality rate from all causes of death in Russia is dramatically higher than that in any other G-8 country (Figure 1.4). Russia's standardized death rate in 1986 was about 1.6 times higher than for the rest of the group. This difference continued to grow, reaching a peak of about three times higher in Russia than in the other G-8 countries in the 1993-95 period. The large difference between Russia's standardized mortality rate and those of the other G-8 countries was holding as of 2002.

Mortality among Population Groups

Infant and Child Mortality

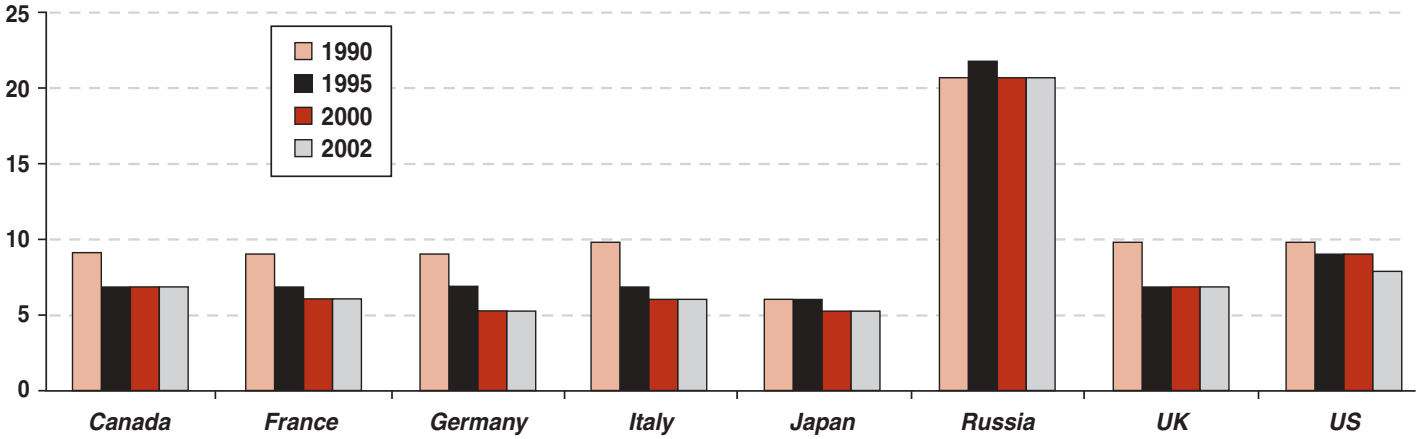
Although the infant mortality rate (an important indicator of quality of life in general and quality of medical assistance delivered to children under one year of age) in Russia has been declining (Figure 1.5), it remains higher than in any other G-8 country. Russia's 2003 infant mortality rate, 12.4 deaths per 1,000 births, is still three times those of France, Germany, and Italy. Also, despite a slight decline since the mid-1990s, mortality rates for children under age five are also significantly higher in Russia than in the other G-8 countries (Figure 1.6).

Maternal Mortality

The estimated maternal mortality ratio (the number of maternal deaths during a given period per 100,000 live births during the same period) in Russia was 31.3 in 2003, approximately six times the average ratio for EU countries of 4.9 (Figure 1.7, on page 8, shows the trends in the 1990s). According to Russian experts, 70 percent of maternal deaths are avoidable if measures are adopted to address leading causes of death, such as post-partum hemorrhage and sepsis after delivery (Sakevich 2002).

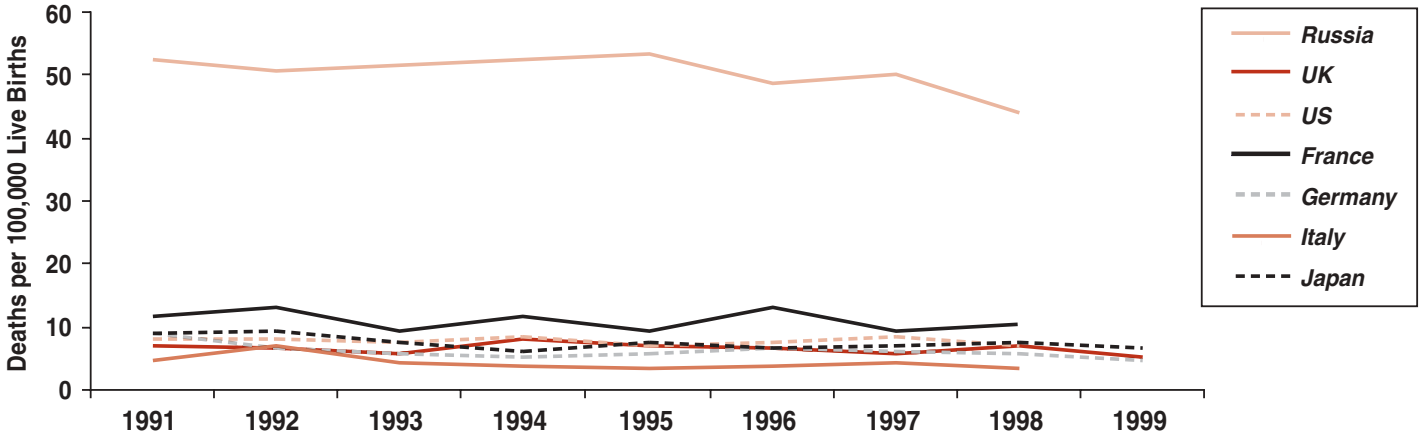
Data suggest that women in Russia are more at risk to undergo an abortion and to die from it than women elsewhere in Europe and Central Asia. Abortions accounted for 16 percent of Russian maternal deaths in 2003. Unlike other countries, where deaths due to the consequences of abortion performed outside medical institutions after 12 weeks of gestation involve predominantly young or unmarried women, half of the women who died in Russia were aged 30 to 40 years and had previous pregnancies (Zhirova et al. 2004). The leading cause of death was post-abortion infections (in 80 percent of the cases). Apparently, abortion is used as a primary method of birth control, for reasons that might include lack of awareness and limited access to effective methods of contraception (perhaps due to high costs or lack of availability) or doctors' preference for abortions over family planning methods (perhaps due to doctors'

Figure 1.6 Trends in Under-5 Mortality in Selected Countries, 1990-2002



Source: World Bank World Development Indicators 2004.

Figure 1.7 Trends in Maternal Mortality in Selected Countries, 1991-99



Source: World Bank World Development Indicators.

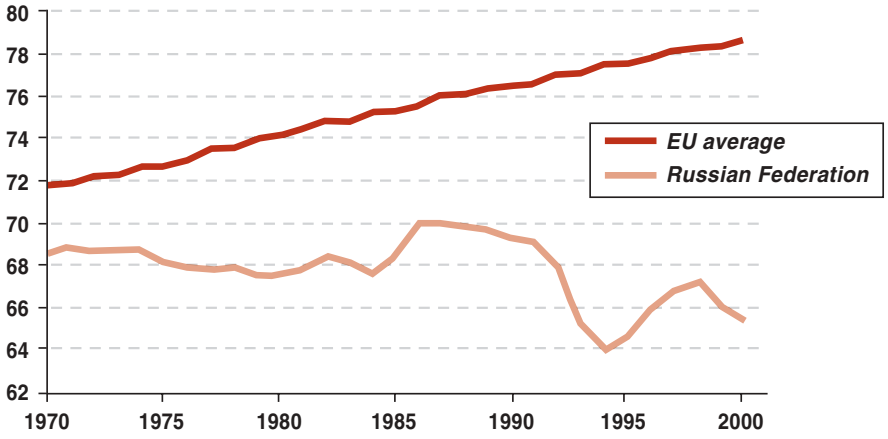
financial gains from abortions). Further understanding of the reasons for these high abortion rates would help in identifying and removing obstacles to the use of modern contraceptive methods that would contribute to reducing maternal mortality, improving women's reproductive health, and reducing secondary infertility, all of which in the long run may have a positive influence in overcoming the current demographic deficit.

Low life expectancy due to high adult mortality

Analysts have described the country's mortality profile as the most puzzling aspect of the Russian transition. Poor data quality has been ruled out as an explanatory variable because demographic data are considered reliable: Russia's registration of vital events is nearly complete and its coding of broad categories of death is reasonably accurate (Leon et al. 1997, Shkolnikov et al. 1997, 2001).

Russia is one of the few countries in the world where life expectancy is falling. However, the situation in Russia has specific features that distinguish it from other countries, such as several in sub-Saharan Africa, where a generalized HIV/AIDS epidemic is driving losses in life expectancy. Both the current low level of life expectancy and the recent declines were driven largely by increasing mortality among those of working age, with a singular rise in mortality at young adult ages, with the greatest contribution from cardiovascular diseases and injuries (Mesle 2002).

Figure 1.8 Life Expectancy at Birth, Russia and the European Union, 1970-2000

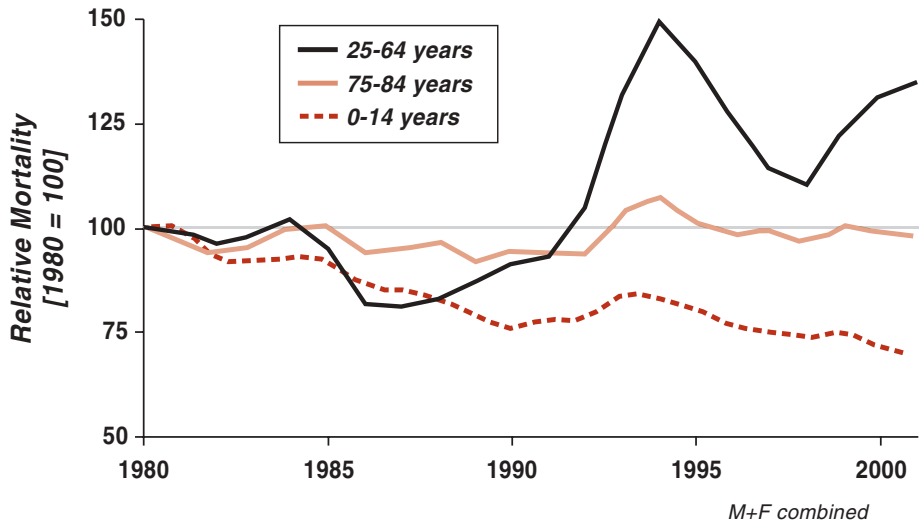


Source: WHO European Health for All Database.

After lagging far behind in the 1940s, the average life expectancy at birth for both sexes in Russia almost caught up with the most advanced Western countries in the 1960s (Vallin and Mesle 2001). By the early 1960s life expectancy in the former Soviet Union had nearly reached that of the United States, but death rates increased significantly, particularly among adults, thereafter. By 1980, the difference in life expectancy was nearly 8 years. As shown in

Figure 1.8, the post-1984 period was marked by wide swings in life expectancy. A reduction in mortality occurred during the Gorbachev anti-alcohol campaign (1985-87), but as the effects of the campaign dwindled, a dramatic deterioration ensued (1990-94) as the country entered a severe crisis associated with the sudden transition to a market economy (Shkolnikov et al. 1997, Shkolnikov and Nemtsov. 1997, Shkolnikov et al. 2001, Mesle 2002). Life expectancy improved by three years between 1995 and 1998, but the gains eroded following the 1998 financial crisis, and male life expectancy started falling steadily.

Figure 1.9 Mortality among the Working-Age Population in Russia Drives Fluctuations in Life Expectancy



Source: WHO European Health for All Database.

Currently, total life expectancy at birth in Russia lags behind that of Japan by as much as 16 years and the European Union average by 14 years. By 2002, life expectancy in Russia had fallen below 66 years, well below the 1965 peak. Russia is the first country in the history of modern nations to experience such a significant peacetime loss in life expectancy.

Changes in mortality rates among different age groups over the 1980-2000 period show unusually steep fluctuations in life expectancy. The trends shown in Figure 1.9 underline that it is mortality among the working-age group that has played a key role in reducing life expectancy in Russia, while the contribution of younger age groups to overall mortality has dropped.

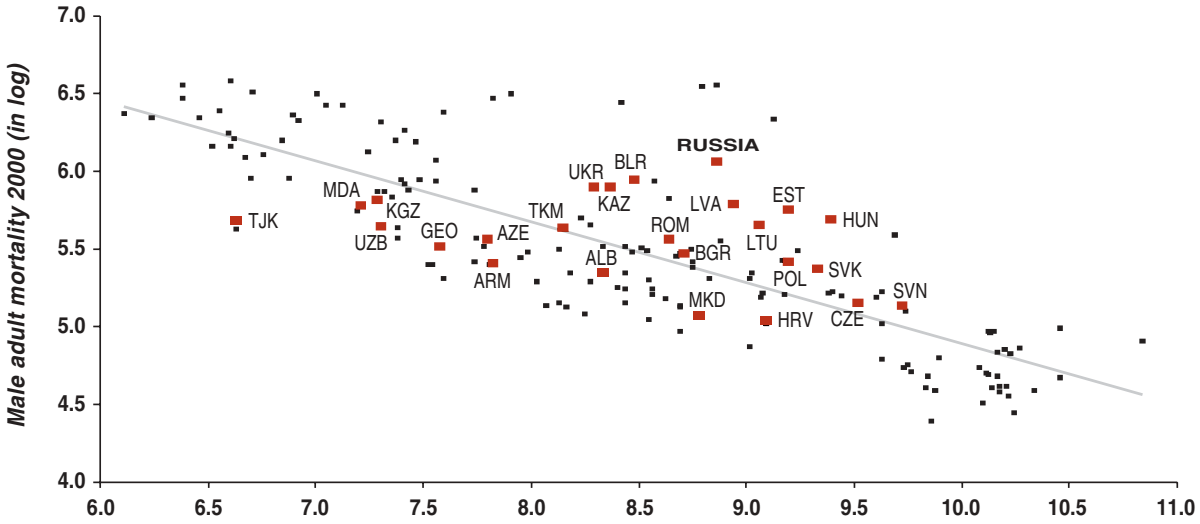
Mortality rates among the youth and young adults are particularly high in Russia. UNICEF has reported (2004) that Russians aged 15-24 have the highest mortality rate in Europe, with almost 36,000 deaths in this age group annually. The scale of this phenomenon in Russia is apparent in Table 1.1. It shows that, although male life expectancy at birth is about 2 years less than in Brazil or Poland, the probability that a 15-year-old Russian boy will die before he reaches 60 years is over 40 percent, about 16 percentage

Table 1.1 Life Expectancy and Adult Mortality in Selected Countries, 2000-2001

Country	Life expectancy at birth (2001)	Probability of dying between ages 15 and 60 (2000-2001, % males)	Probability of dying between ages 15 and 60 (2000-2001, % females)
Russian Federation	***66***	***42.4***	***15.3***
Japan	81	9.8	4.4
France	79	13.7	5.7
United States	78	14.1	8.2
Germany	78	12.6	6.0
United Kingdom	77	10.9	6.6
Denmark	77	12.9	8.1
Mexico	73	18.0	10.1
Poland	70	22.8	8.8
Turkey	70	21.8	12.0
Brazil	68	25.9	13.6
Kyrgyz Republic	66	33.5	29.9

Source: World Bank World Development Indicators.

Figure 1.10 Male Adult Mortality and Gross National Income per Capita in Selected Countries, 2000



Source: World Bank World Development Indicators.

Note: "PPP" is purchasing power parity.

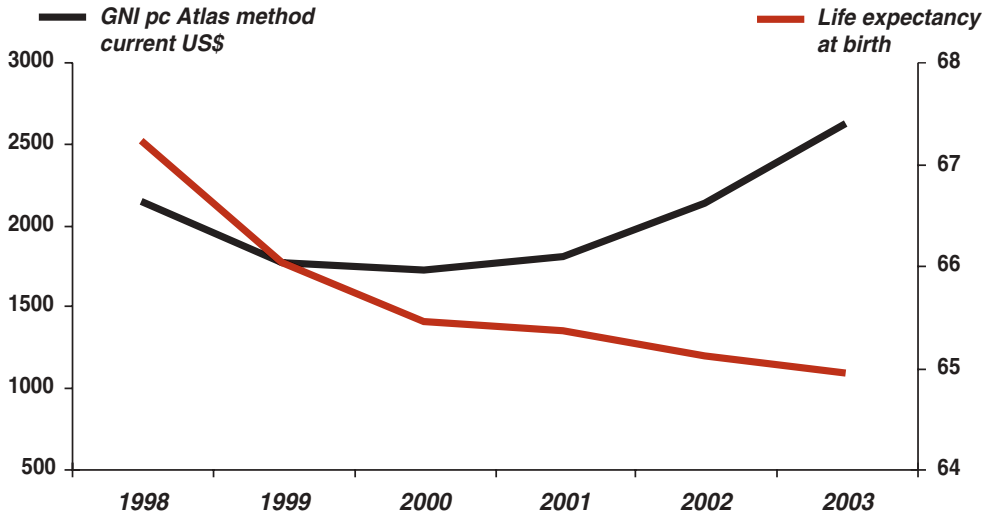
points higher than the rate in Brazil, double that of Turkey, and quadruple that of the United Kingdom.

Life Expectancy and Economic Development

A major determinant of a population's health is its country's level of economic development, which may in part explain some of the differences in mortality rates observed in Table 1.1. However, as Figure 1.10, shows, even when income differences are taken into account, Russian male adult mortality rates are still substantially higher than those of countries with similar per capita incomes.

And, as a result of high mortality rates among the adult population, life expectancy at birth in Russia has

Figure 1.11 Is Economic Growth Sustainable in Russia without Good Health?



Note:
When calculating GNI in U.S. dollars from GNI reported in national currencies, the World Bank follows the Atlas conversion method, using a three-year average of exchange rates to smooth the effects of transitory exchange rate fluctuations.

Source: World Bank World Development Indicators 2005/WHO/ERO HFA Database 2005.

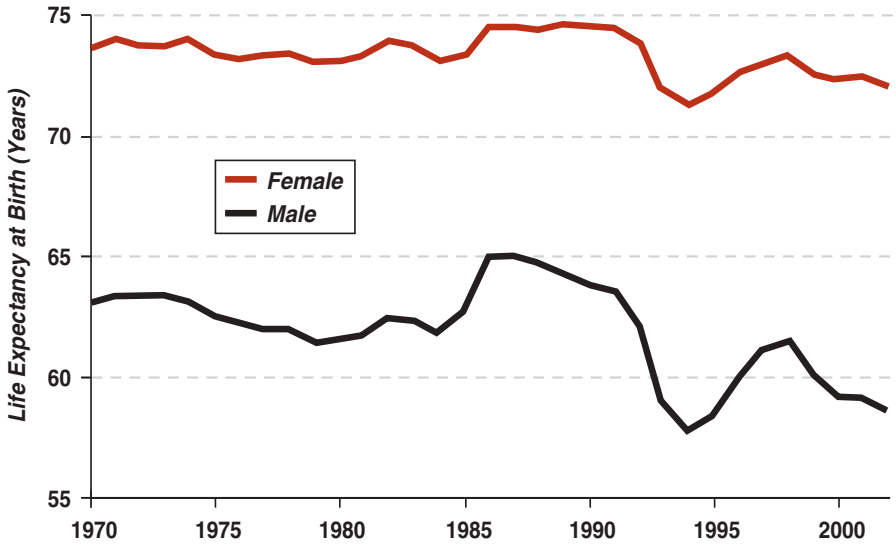
continued to decrease in recent years when the economy has been growing strongly on the back of high oil prices (Figure 1.11).

Gender Differences in Life Expectancy

Gender differences in life expectancy occur throughout the world. Women generally enjoy longer lives than men for a number of biological and socioeconomic reasons. In 2002, women in the United Kingdom lived 5.1 years longer than men; women in France lived 7.5 years longer; and women in Japan lived nearly 7 years longer. This gender gap in Russia was 13 years in 2002, almost twice the largest difference elsewhere. Life expectancy among Russian men peaked in 1964 at 65 years—not much different from other G-8 countries. In the late 1960s and throughout the 1970s, longevity stagnated or dropped for Russian men, but Russian women lived 5 to 10 years longer. By 1990, life expectancy had increased to 74 years for Russian women. During the transition years in the 1990s, the escalation of mortality rates affected both Russian men and women, but the size of the effect was greater for men: they lost 5 years of life expectancy between 1990 and 1994 while Russian women lost 2, keeping the gender gap in life expectancy at about 13 years. Recovery of life expectancy post-1995 has been slow for both men and women. In 2003, male life expectancy was only 58 years and that for females was 72 years. The gender gap in life expectancy is expected to persist in the coming years. As a result of the gender gap in mortality, the 2002 all-Russian population census showed that the sex ratio decreased after 1989 (the number of men per 1,000 women fell from 877 in 1989 to 872 in 2002) (Andreev 2005).

Figure 1.12 shows trends in life expectancy for Russian males and females separately. The large difference by sex suggests that specific behavioral factors are implicated, rather than factors related to the external environment or adequacy of health care, which affect men and women to somewhat similar degrees. As discussed in Chapter 3, two factors that may explain an important part of this exceptionally large gender gap are smoking and alcohol consumption, as these behaviors are very different between men and women—even those living in the same households.

Figure 1.12 Life Expectancy at Birth, Males and Females, 1970-2002



Source: WHO European Health for All Database.

Life expectancy in Russia for males and females at 60, 65, and 80 years of age is also quite low compared with that at the same ages in other G-8 countries (Table 1.2 on page 12). Furthermore, projections for the next 25 years indicate that although Russia will experience improvements in life expectancy in these three age groups, these figures will remain below those expected for Russia's G-8 partners.

Regional Disparities in Mortality and Life Expectancy

Mortality rates and life expectancy in Russia vary greatly by region, in part because of regional differences in socioeconomic and health levels. The mortality rate of the economically active male population ranges from 3.8 deaths per 100,000 people in the region with the lowest rate to 17.8 deaths in the region with the highest—a nearly fivefold differential (Table 1.3 on page 12). For women, the regional differential is even greater.

Table 1.2 Life Expectancy at Ages 60, 65, and 80 in Russia and Selected Countries, by Gender, 2000-2005 and 2025-2030

	AGE 60				AGE 65				AGE 80			
	2000-05		2025-30		2000-05		2025-30		2000-05		2025-30	
Country	M	F	M	F	M	F	M	F	M	F	M	F
Russia	13.5	18.7	16.2	21.4	11.1	15	13.2	17.5	5.8	6.8	6.5	8.2
Ireland	18.3	22.4	20.1	24.6	14.6	18.3	16.3	20.3	6.3	8.2	7.3	9.6
Italy	19.5	24.3	21.2	26.0	15.8	20.0	17.3	21.6	7.0	8.9	7.8	10.2
Canada	20.3	24.5	21.9	26.1	16.5	20.3	17.9	21.8	7.5	9.6	8.3	10.7
France	20.0	25.5	22.1	27.3	16.3	21.2	18.1	22.9	7.2	9.8	8.3	11.2
Germany	18.9	23.7	21.6	26.2	15.2	19.5	17.7	21.8	6.7	8.8	8.1	10.5
Japan	21.4	27.0	23.9	31.1	17.4	22.6	19.7	26.5	7.8	10.8	9.3	14.1
United Kingdom	19.4	23.2	21.6	25.9	15.6	19.2	17.6	21.6	7.1	9.0	8.2	10.6
United States	19.5	23.9	21.7	26.1	15.9	19.9	17.8	21.9	7.3	9.8	8.3	11.0

Source: UN Population Database.

Table 1.3 Regional Variation in Mortality Rates for the Economically Active Population, 2000

Deaths per 100,000 population

	Mortality Rates	
	Men	Women
Russian Federation's mortality rate	11.5	3.0
Region with the highest mortality rate	17.8	7.2
Region with the lowest mortality rate	3.8	1.3
Median mortality rate	11.4	2.9

Source: Goskomstat 2000.

Note: Men aged 16 to 59; women aged 16 to 54.

Average life expectancy at birth varies by region as well. Data for 2001 show that people in regions such as the Republic of Igushetia and Dagestan and in Moscow have the longest life expectancy and live 18 years longer than those in regions with the shortest, such as Republic of Tyva, Koryak Autonomous Okrug, and Komi-Perm Autonomous Okrug (Table 1.4).

Chapter 4 provides details of observations indicating that the mortality crisis in Russia seems to be concentrated in the least developed regions (with the exception of some republics in the Caucusus which have the country's longest life expectancy) and mainly affects an underclass of young and middle-aged men with limited educations and vocational skills, who are often unem-

Table 1.4 Regional Variation in Average Life Expectancy at Birth in Russia, 1999-2001

	AVERAGE LIFE EXPECTANCY								
	1999			2000			2001		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Region with the longest life expectancy	73.35	68.10	78.57	74.01	68.57	79.03	74.6	70.05	79.08
Region with the shortest life expectancy	56.00	50.72	62.10	56.14	50.41	62.98	56.48	51.06	62.78

Source: Goskomstat 2003.

Table 1.5 Human Development Index for Selected European Countries, 2002

Country	Index
Russia	0.795
United Kingdom	0.936
Germany	0.925
France	0.932
Italy	0.920

Source: UNDP Human Development Indicators.

ployed or do manual work, live in urban areas, and come from incomplete families, often with migrant or ethnic minority backgrounds.

Impact of Life Expectancy on Human Development

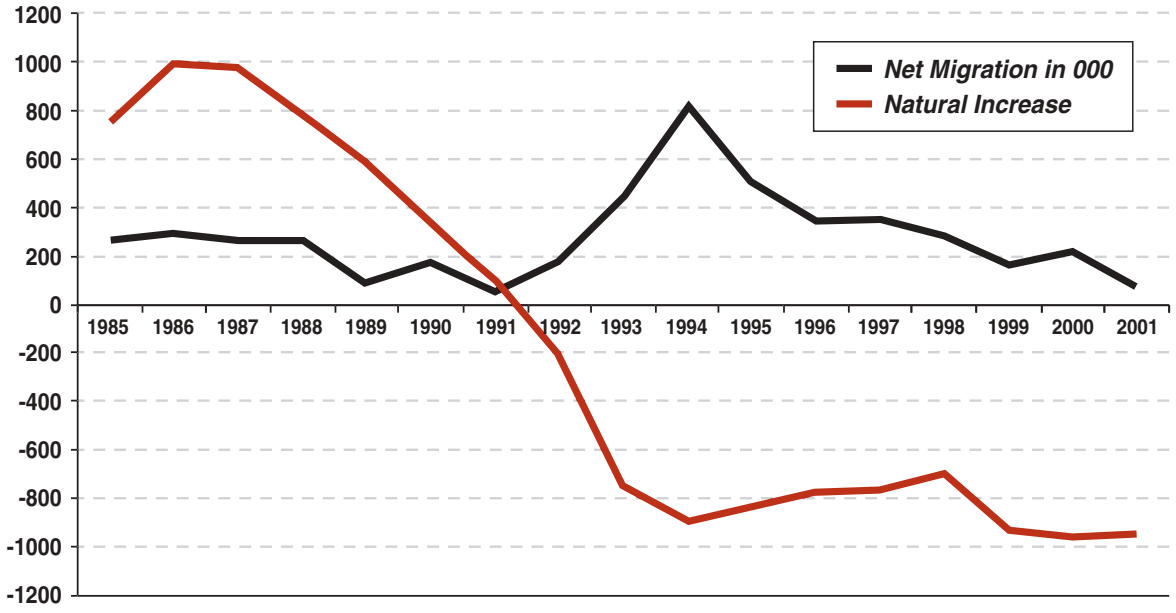
Russia lags behind European countries in terms of its human development index[1] (Table 1.5), in part due to the low life expectancy of its population. As shown by Barro (1991), based on panel data of around 100 countries for the 1960-90 period, the impact of overall life expectancy on economic growth is substantial. The results from the Barro study imply, other things being equal, that a rise in life expectancy from 50 to 70 years (about 40%) would raise the economic growth rate by 1.4 percentage point per year. Jamison et al. (2004), using data from 53 countries also found that improved health status as measured by the survival rate of males between 15 and 60 years of age accounted for one-tenth of growth over 1965-90.

[1] The Human Development Index, developed by the United Nations Development Program (UNDP), is a composite statistical indicator using life expectancy at birth, adult literacy, and real gross domestic product (GDP) per capita in purchasing power parity (PPP) in U.S. dollars.

Population Migration

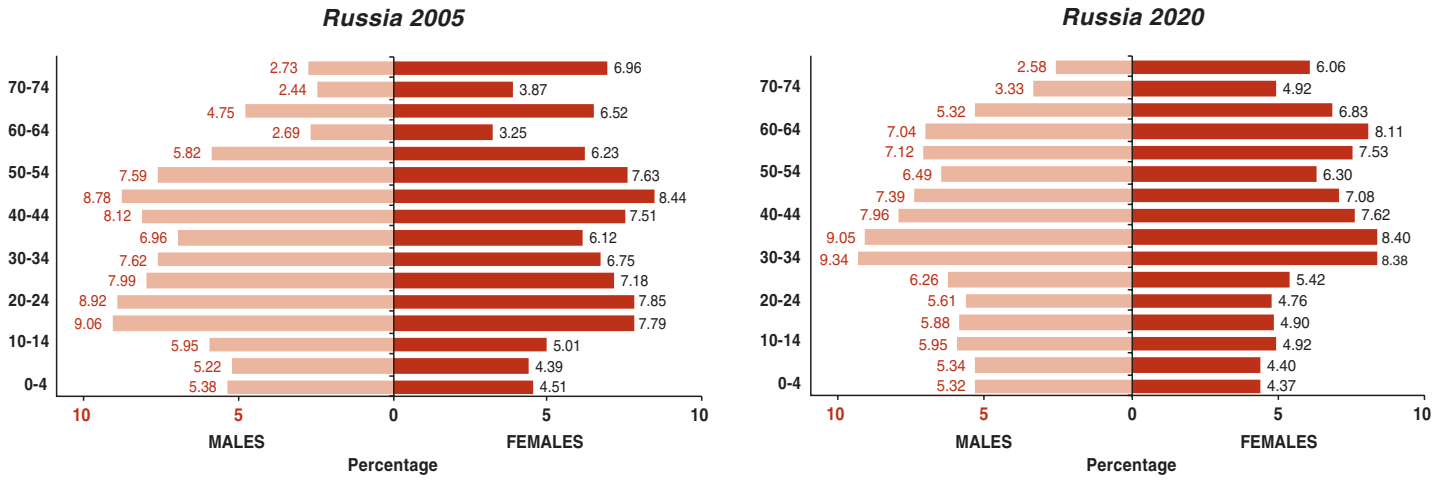
Statistics on migration patterns in Russia show that migration's role in its population dynamics has been important, but its role in offsetting the negative growth in population size has been of significance only for limited periods in the past 25 years. Prior to 1992, migration was relatively low, averaging less than 130,000 persons between 1985 and 1992. The transition years experienced a very rapid increase in population migration such that net migration increased rapidly from about 176,000 persons in 1992 to a peak of 800,000 persons in 1994 and remained at levels slightly above those of pre-transitional years until about 1999 (Figure 1.13).

Figure 1.13 Net Migration, 1985-2002



Source: Heleniak (2005), citing material from Goskomstat.

Figure 1.14 The Population Structure, 2005 and 2020



Source: UN Population Database.

At the same time, the peak in the natural increase of population (excess of births over deaths), which had occurred in the mid-1980s, experienced a very rapid decline up to the mid-1990s when the trend seems to have leveled off at a deficit of about 600,000 people a year. Data show that prior to 1992, before the return migrations of Russians and Russian speakers from the former Soviet Union swelled, net migration made only a limited contribution to the natural population increase, which averaged about 800,000 a year for the years 1985-90.

It is clear, then, that net migration made an important difference in population dynamics in the mid-1990s, when the natural increase of population reached the bottom; migration was highest at this time. However, the mid-1990s migration levels have reverted to pre-transitional years; and without the positive natural increase of population of the mid-1980s, the alleviation in population deficits has been considerably reduced.

The Aging of the Population

A country's population structure by age groups is directly influenced by fertility and mortality trends. A country with high fertility rates will generally have a large proportion of its population in the lower age groups. Falling fertility rates add progressively smaller proportions of lower age groups to a population.

As shown in Figure 1.14, Russia's population structure is already characterized by a shrinking youth base and an expanding proportion of the population aged 60 and over. Two factors, (a) continued very low levels of fertility and (2) past higher fertility levels that produce comparatively larger cohorts, combine to result in a disproportionately high number of older persons in comparison to younger ones.

Two decades ago, youth aged 0-14 years constituted about a quarter of Russia's population, and those aged 60 years and above were only about 14 percent of the total. Now, those aged 0-14 have dropped to 18 percent—a level nearly equal that of the population 60 and over. Projections suggest that given Russia's expected total fertility rates of between 1.1 and 1.3 children per woman of reproductive age for the years 2005-25, persons aged 0-14 will remain at about 13 percent, population growth rates will remain negative averaging between -0.6 and -0.8. As a result, the proportion of persons aged 60 and over will increase to more than a quarter of the Russian population. The extreme and rapid aging of the Russian population is occurring at a low level of GDP per capita (Eberstadt 2005).

The U.N. Population Division uses an aging index to measure how fast a population is aging by comparing, over time, the number of persons 60 and over to that of 100 young people aged 0-14 years. In 1990, the ratio in

Russia was approximately 0.7-that is, there were 70 people aged 60 and over for every 100 persons aged 0-14 years. In 2015, the ratio will rise to 1.55—that is, there will be 155 people aged 60 and over for every 100 persons 0-14. By 2050 the ratio will rise to 2.0—there will be 200 people aged 60 and over for every 100 aged 0-14 (Figure 1.15).

Total Dependency Ratios

Dependency ratios give a rough estimate of what the potential social support needs or burden of dependency is in a particular country. The main assumption embodied in this measure is that everyone aged over 65 and those under 15 are likely to be dependent on those in the 15-64 age group, who are likely to be working adults. Total dependency ratios are calculated as a ratio of the sum of the population aged 0-14 plus that aged over 65 to the population aged 15-64; the ratios are presented as number of dependants per 100 persons of working age (15-64).

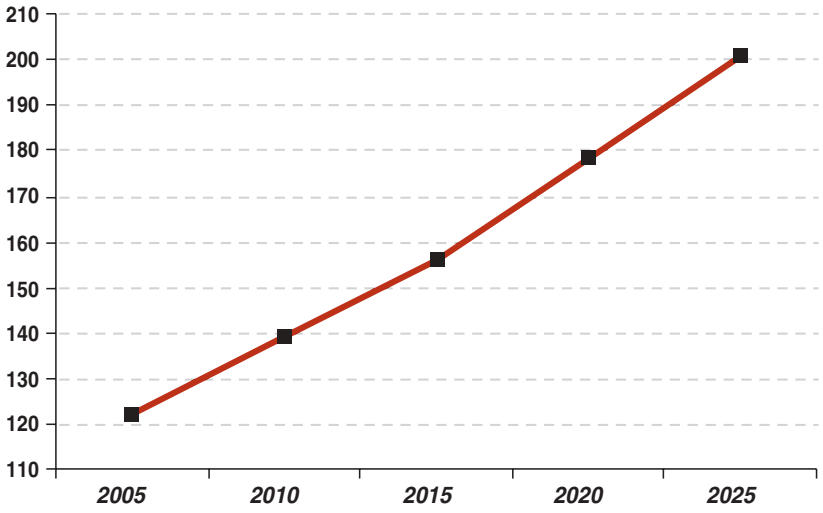
Data for the two decades before 2000 show that dependency ratios in developed countries remained more or less flat, ranging between 45 and 55 dependents per 100 people aged 15-54. Russia's total dependency ratio up until 1995 was in the middle of the range, i.e., between 48 and 50. The projected trend for developed countries after 2005 is for significant increases in their total dependency ratios caused mainly by the increase in the proportion of the population in the 65-plus-age bracket. Japan, one of the world's oldest societies, is projected to see its total dependency ratio rise by about 50 percent in the next 20 years. Russia, on the other hand will see its total dependency ratio fall to below 40 in 2010 (from 50 in 1995), but then the ratio will accelerate to exceed 50 in 2025, an increase of about 30 percent in a 15-year period, at a lower per capita income level than in other G-8 countries.

What are the Consequences of the Demographic Decline and the Health Deficit?

The unprecedented mortality upsurge Russia experienced in the 1990s is the product of a a long-term deterioration of the health of the population associated with a prolonged period of highly unhealthy lifestyles and adverse environments, aggravated by a difficult socio-economic and political adjustment process (Cornia 2002, Mesle 2002). Russia's total population is expected to decline in the years ahead and will be accompanied by the aging of society as fertility rates remain under the replacement level. This has several important implications:

Fewer workers. If trends persist, the size of the Russian labor pool will continue to shrink significantly in the decades ahead. But population decrease may also result from the changing sex ratio that will probably lead to a new fertility decline in the future—an extreme sub-replacement fertility level (Andreev 2005). This presents a serious threat to Russia's development as the corresponding decline in the share of working-age adults due to high mortality and the increasing proportion of elderly people could adversely impact the economy.

Figure 1.15 Aging Index: Number of Persons Aged 60 Years and Over Compared to That of 100 People Aged 0-14 Years, 2005-25



Source: UN Population Database.

According to IMF projections (IMF 2004), a decrease in working-age population will reduce labor productivity and incentives for investment in human and physical capital, which will in turn reduce per capita GDP growth. Government budgets will be squeezed as tax revenues fall because of a decline in the size of the working-age population and an increase in the needs and demands of an aging population. As the elderly population rises, the overall rate of saving and investment in a society will decline as more resources need to go to pensions, health care, and long-term residential care.

However, a healthy population of 65-75 year-olds may be a sizable untapped workforce, and, providing measures are taken to reverse the mortality trends and assuming lives lengthen overall, increasing the retirement age becomes an option to ensure the medium-term solvency of pension systems. This situation may also require the development of new work relationships with older people, including developing mechanisms to attract and retain older workers, especially knowledge workers (Drucker 1999).

The destabilization of families. The gender gap in life expectancy has led to instability in marriage and an extremely high proportion of widows (the percentage of widows in Russia at ages 30-44 is about four times the share in the United States).

Growing regional disparities. Uneven fertility, mortality, population growth, and life expectancy in different regions and among social and ethnic groups could exacerbate existing disparities. Difficulties in providing equitable access to resources for the poor may give rise to social and political challenges, especially in a country as vast as Russia. This is an important policy consideration for any government, particularly when resources are scarce.

National security risks. From a national security point of view, the demographic and health crisis in Russia will present many challenges (Twigg 2004): (a) the number of men around conscription age will plunge rapidly in the decades ahead; (b) a growing percentage of the military budget will have to be allocated for the provision of medical, nutritional, and substance abuse programs for draftees and soldiers that are deemed medically unfit for duty; (c) long-term economic growth will depend on large cohorts of healthy and skilled young and middle-aged adults; and (d) if its vast territory is depopulated, instability could grow and the country could become increasingly difficult to govern.

2

Chapter 2. The Burden of Ill Health and Disability

Ill health and disability measures have been developed to capture the full health status of a population and supplement mortality measures. This chapter assesses the estimated years that Russians can expect to live without disability or in less than full health, as compared with experiences in other countries. These measures add to the mortality information given in the previous chapter to enable a closer examination of the number of healthy, productive years people have and, subsequently, of prospects for economic growth.

Healthy Life Expectancy

Morbidity data contain important information not evidenced by mortality data alone. The World Health Organization (WHO) uses healthy life expectancy (HALE) as a summary measure of health to capture the full health experience—not just mortality—of a population (WHO 2002a). HALE is most easily understood as lifespan in full health, i.e., without disability.

In considering data on healthy life expectancy, one finds larger differences between Russia and Western Europe than in considering data on life expectancy alone. In 2002, HALE at birth in the European region (where overall health levels are among the world's highest) ranged from 73.4 years in San Marino to 54.4 in Turkmenistan. The range for males was from 72.1 in Iceland to 51.6 in Turkmenistan; for females it was from 75.9 in San Marino to 56.4 in Tajikistan (WHO European Health for All Database). Compared to other developed countries, Russia has one of the lowest healthy life expectancy rates. Table 2.1 shows that in Russia, HALE is 64 for females, about 10 years less than in France and Germany, but only 53 years for males, 16 and 18 years less, respectively, than in the United Kingdom and Italy. Russia's gender gap is one of the widest in HALE worldwide and reflects the sharp increase in Russian adult male mortality in recent decades.

These data portend a difficult future, not only for aging Russians themselves, but also for an economy that needs a productive workforce and will likely rely on older working adults to economically support those who cannot work. The differences for men, who comprise the larger portion of the workforce, are particularly skewed.

While a lower life expectancy is usually associated with a lower HALE, large variations exist in HALE at different age groups. As shown in Table 2.2 on page 20, the difference in HALE is especially pronounced for healthy life expectancy at age 20. In addition, data on healthy life expectancy reveal that both Russian women and men bear an enormous burden of ill health, particularly during their working-age years. Male healthy life expectancy is consistently lower in Russia than in either Eastern or Western Europe at ages 20, 40, and 65. The largest difference for males occurs at age 20 between Russia and Western Europe, and the smallest difference at age 65 between Russia and Eastern Europe. The pattern reflects higher mortality rates for Russian men at younger ages. The gap in life expectancy between males and females in Russia is largest at younger ages but converges to European averages later in life.

Table 2.1 Healthy Life Expectancy (HALE) at Birth in Russia and Four European Countries, 2002

Country	Males	Females	Total
Russia	53	64	59
United Kingdom	69	72	71
Germany	70	74	72
France	69	75	71
Italy	71	75	73

Source: WHO European Health for All Database.

Table 2.2 Life Expectancy and Healthy Life Expectancy at Ages 20, 40, and 65 in Russia, Eastern Europe, and Western Europe, 2000

		AT AGE 20		*AT AGE 40*		*AT AGE 65*	
Sex	**Country/Region**	**e(x)**	**h(x)**	**e(x)**	**h(x)**	**e(x)**	**H(x)**
Male	Russia	41.9	36.7	22.4	17.3	11.4	6.7
	Eastern Europe	49.1	41.9	26.6	20.5	12.7	8.3
	Western Europe	54.5	50.4	31.2	27.6	15.0	12.5
Female	Russia	54.2	40.6	31.1	18.5	15.2	5.8
	Eastern Europe	56.8	44.5	32.8	22.7	15.9	9.3
	Western Europe	60.2	53.7	36.0	30.3	18.1	14.0
Female-male gap	Russia	12.3	3.0	8.7	1.2	3.9	-0.9
	Eastern Europe	7.6	2.6	6.2	2.2	3.3	1.1
	Western Europe	5.7	3.3	4.8	2.7	3.1	1.5

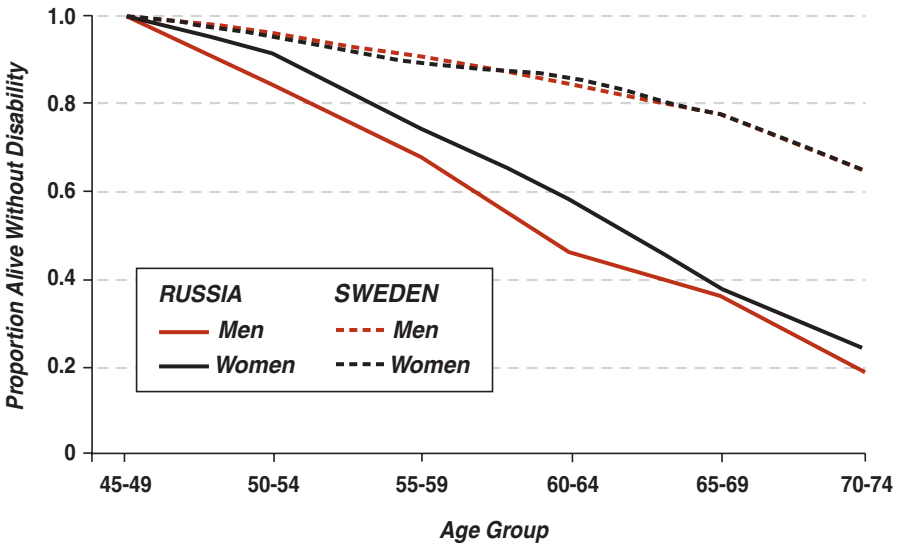
Source: Adapted from Andreev, McKee, Shkolnikov 2003.

Note: Health expectancy is calculated by Sullivan's method (Sullivan 1964; Robine et al. 1993). The expression "e(x)" means life expectancy, and "h(x)" means healthy life expectancy.

The rapid decline in healthy life expectancy in Russia is mainly due to the high probability of death for men and to poor health for women. Russian men aged 40, for example, have 10.3 years less of healthy life expectancy than Western European men. Russian women in this age group have 11.8 years less of healthy life expectancy due to poor health than Western European women.

Although the stress of the 1990s transition has affected the health status of the Russian population, particularly among men, the exact psychological pathways have not been established. While Russian women survive longer than men, they are generally in worse health than women in Eastern and Western Europe.

Figure 2.1 Russia and Sweden Survival without Disability at Different Ages



Source: Adapted from Bobak et al. 2004.

Comparison of Disability Levels

The 2003 NOBUS (National Survey of Household Welfare and Program Participation) survey estimates the number of disabled people in Russia at more than 9 million or about 7 percent of the population (NOBUS 2003; Baskakov and Yenenko 2005). In looking at the rates of disability in communities in Russia and Sweden, Bobak et al. (2004) compared official life table data, self-rated health status, and physical functioning surveys measuring limitations in everyday activities (e.g., shopping, bathing, walking). The results paint an alarming picture of disability in middle-aged and older men and women in Russia. The combination of high mortality and high disability leads

to a large difference between the two countries in the estimated number of years without disability in people in their late 40s to mid-70s. They also show that the problem of disability affects more people in their prime working age, with likely impacts on economic outcomes at the individual and aggregate levels.

For both men and women, the 2004 Bobak study reports that health and physical functioning declined much faster in Russia than in Sweden. Figure 2.1 depicts the proportion of people ages 45-49 to ages 70-74 both alive and without disability relative to people ages 45-49. In 25 years, 65 percent of healthy middle-aged Swedish men but only 17 percent of Russian men would be alive without disability; for women, the comparable figures are 65 percent of Swedish women versus 22 percent of Russian women. A healthy middle-aged cohort in Russia would have less than a third the chance that Swedes have to survive into old age without disability.

Figure 2.2 sharply contrasts the total survival and survival without disability to age 70-74 in cohorts without disability in Russia and Sweden. The most striking differences between these countries stem primarily from the high death rate for Russian men and high disability rate for Russian women.

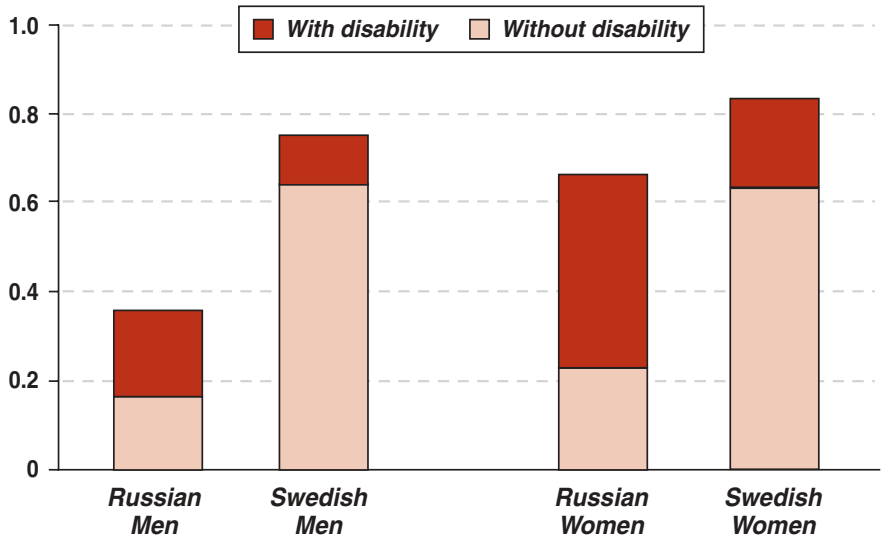
Data from the Russia Longitudinal Monitoring Survey, which has been conducted annually since 1992, also indicate that rating one's own health as less than good became more common in all age groups during the 1990s (Palosuo 2003). However, according to data from the 2003 NOBUS survey, women in all age groups report a worse self-health assessment than men (while the average self-health assessment among men was 3.16 points in all respondents on a 5-point scale, it was as low as 2.96 for women). Given the lower life expectancy and HALE among men, these surprising results are explained by psychological and behavioral factors: women are more concerned about their health than men, more often seek medical advice and care, and do not neglect their diseases until they reach an advanced stage (Korkhova 2001).

In another study, Plavinski, Plavinskaya, and Klimov (2003) examined the association between social factors and the sharp increases in mortality and morbidity in Russia in the 1990s. They found that men in lower socioeconomic groups were most affected by the increases in mortality and ill health. The most pronounced differences were among people with the lowest level of education. Furthermore, these patterns held for heart diseases and deaths from cancer. There was no recorded increase in mortality throughout the 1990s among men with university degrees.

Policy Implications

This chapter adds the burden of ill health and disability in Russia to the mortality information in the previous one to offer a fuller picture of health trends and their implications for working-age adults and the future of the economy. This chapter also clarifies that the challenge for Russia is not only to increase life expectancy by reducing mortality but also to help people stay healthy into older age. Indeed, it is clear from the European data that with improved health behaviors not only do people live longer, but their quality of life is

Figure 2.2 Russia and Sweden: Total Survival and Survival without Disability to Age 70-74 in Cohorts without Disability at Age 45-49



Source: Adapted from Bobak et al. 2004.

also improved by the reduction of sickness and disability at the end of life. A response in Russia would also need to include regular monitoring of indicators such as HALE by gender, age, region, and social groups for a better understanding of the population's health status.

It is widely accepted in the research community that the exceptionally high levels of mortality and ill health in Russia are not an artifact of poor data. Much work has been done to shed light on what factors contribute to the high levels of mortality and ill health among these working-age adults. The low levels of life expectancy and healthy life expectancy, as well as high disability levels, are driven primarily by the high level of mortality and ill health among working-age adults, particularly males. Chapters 3 and 4 examine the primary causes of the high level of mortality among working-age adults—non-communicable diseases and injuries—and their associated risk factors.

3

Chapter 3. Determinants of the Demographic Decline and the Health Deficit

The rise of noncommunicable diseases (NCDs) and injuries presents a major challenge to global development, as it threatens countries' economic and social well-being. NCDs are a set of chronic diseases, including among others cardiovascular disease, cancer, chronic respiratory diseases, mental disorders, and diabetes, that are characterized by a long latency period, prolonged clinical course, and debilitating manifestations. As NCDs usually have long incubation periods, with symptoms appearing after 5 to 30 years of exposure to lifestyle and environmental risk factors, the future disease burden will be determined by the prevalence of key risk factors occurring today coupled with the aging of a population. However, as will be discussed later in this report, acute alcohol consumption plays a major role in accelerating the onset of NCDs and contributing to the increase in mortality due to external causes in Russia. Evidence from different countries indicates that reversal of risk factors even late in life reduces NCD risk (especially for cardiovascular diseases [CVDs] and diabetes) within a relatively short period (2-5 years).

This chapter reviews the NCDs and injuries that cause most of the deaths and ill health in Russia on the bases of estimates of mortality data (death is still the most extensively and reliably recorded vital event in Russia) and of disability-adjusted life years (DALYs). This chapter also presents a detailed assessment of Russia's three leading killers: CVD, cancer, and injuries.

Deaths and DALYs Lost Attributable to Leading Causes

The relative burden of NCDs and injuries as leading causes of morbidity and mortality is now larger than that of infectious diseases. The distribution of the 10 leading causes of death in Russia in 2002 is presented in Table 3.1. It shows that NCDs and injuries account for 68 percent of total deaths. In 2003, among the working-age population, CVDs, cancer, and injuries accounted for about 78 percent of deaths and 15.2 million lost years of potential life (10.3 million among working-age men and 4.9 million among women of the same age)

Table 3.1 Deaths and DALYs Lost Attributable to the 10 Leading Diseases and Injuries, 2002

Rank	Cause	Total deaths	Total %	Rank	Cause	Total DALYs lost	Total %
1	*Ischemic heart disease*	711,571	29.6%	1	*Ischemic heart disease*	5,472,308	13.9%
2	*Cerebrovascular disease*	533,675	22.2%	2	*Cerebrovascular disease*	3,930,367	10.0%
3	*Poisonings*	66,930	2.8%	3	*Unipolar depressive disorders*	1,574,695	4.0%
4	*Self-inflicted injuries*	59,015	2.5%	4	*Violence*	1,459,927	3.7%
5	*Trachea, bronchus, lung cancers*	58,899	2.4%	5	*Self-inflicted injuries*	1,297,152	3.3%
6	*Violence*	47,461	2.0%	6	*Road traffic accidents*	1,292,752	3.3%
7	*Road traffic accidents*	44,580	1.9%	7	*Poisonings*	1,272,366	3.2%
8	*Stomach cancer*	44,557	1.9%	8	*Alcohol use disorders*	1,258,936	3.2%
9	*Colon and rectal cancers*	38,141	1.6%	9	*Hearing loss, adult onset*	765,988	1.9%
10	*Cirrhosis of the liver*	37,426	1.6%	10	*Tuberculosis*	700,997	1.8%
	ALL CAUSES	2,405,721	100.0%		*ALL CAUSES*	39,409,946	100.0%

Source: WHO-EURO (2005). The European Health Report (http://www.euro.who.int/eprise/main/who/progs/ehro5/home).

Table 3.2 Cause-Specific Adult Mortality Rates, Age 15-64

Deaths per 100,000 population

	Russia	EU-15	Russia's death rates as % of EU-15
NCDs	605	206	294%
Injuries	281	58	484%

Source: WHO Mortality Database.

Notes: Russian rates refer to 2002; EU-15 rates to 2001 or latest available. The EU-15 average is population weighted.

(Oganov and Maslennikova 2005). CVDs (heart attack, myocardial infarction, acute coronary syndrome, congestive heart failure, stroke, kidney disease, and peripheral vascular disease) alone account for over half of all deaths. Infectious, respiratory, and parasitic diseases account for less than 10 percent of all deaths.

As shown in Table 3.2, the mortality rates from NCDs and injuries in Russia are dramatically higher than those in the European Union countries: about 3 and 5 times, respectively.

Like HALE, which was discussed in the previous chapter and is based on life expectancy at birth plus an adjustment for time spent in poor health, disability-adjusted life years, or DALY, is an indicator used to supplement mortality data as it captures the full disease burden. DALYs are calculated by summing the years of life lost due to premature death (defined as the difference between the actual age of death and the life expectancy at that age in a low-mortality population) and the years of productive life lost because of a disability (Murray 1993; Murray and Lopez 1993).[2]

Table 3.1 shows that in 2002 the Russian population lost an estimated total of 39.4 million DALYs due to all causes. The NCDs and injuries account for close to 50 percent of DALYs lost from all causes. This table also

[2] More specifically, DALYs lost to mortality are calculated by summing the discounted value of years lost to premature death across all causes and age groups. DALYs lost due to disability are based on the incidence and duration of various types of disability multiplied by a severity weight that accounts for the severity of the disability. Total DALYs result from the sum of DALYs lost to mortality and disability, adjusted by a discount rate so that future years of healthy life are valued at progressively lower rates and by age group weightings so that years of life lost at different ages are given different relative values.

Table 3.3 Regional Variation in Mortality Rate by Cause of Death, 2000

Deaths per 100,000 population

	Infectious and parasitic diseases	Tuberculosis	Cancer	Cardiovascular Diseases	Diseases of respiratory system	Digestive tract diseases	Accidents, poisoning, and injuries
Russian Federation Maximum	25.0	20.6	205.5	849.4	70.5	44.6	219.9
Region with the highest mortality rate	92.2	80.3	282.2	1,338.4	134.0	564.2	444.7
Region with the lowest mortality rate	4.7	2.3	56.9	198.6	9.3	9.7	37.3
Median mortality rate	22.9	19.0	189.8	719.6	66.3	43.4	53.8

Source: Goskomstat (2000).

shows that injuries cause considerably less burden overall among the 10 leading causes; however, they are very relevant for some population groups, particularly the young. Most NCDs and injuries are largely preventable, as their main risk factors are well known and their occurrence can be influenced by the implementation of tested public health interventions (Beaglehole and Yach 2003).

Regional variations. Rates of mortality due to NCDs and injuries vary significantly by region in Russia as shown in Table 3.3. In the less-developed regions, with the highest mortality, the rates for NCDs and injuries are much greater than the infectious diseases and tuberculosis rates, and the rate for CVDs is much greater than those for any other diseases and injuries.

Mortality Projections Due to NCDs and Injuries

Table A1 in Appendix A provides the projected numbers of deaths caused by 12 major categories of diseases (plus conditions related to pregnancy) in Russia over the 2000-2025 period if year 2000 age-specific death rates (ASDRs) had remained the same. Overall, three categories of diseases—CVDs, cancer, and injuries-are expected to cause between 80 and 90 percent of deaths by 2025, up from 68 percent in 2002. Table 3.4 summarizes estimates for total mortality from these categories for six chosen time intervals to be between 2.2 and 2.6 million deaths per year, resulting in a net reduction of the population of up to 4.7 million by 2030. Overall, due to the population's aging as discussed in chapter 1, the contribution of NCDs and injuries to total mortality in Russia would continue to grown unless comprehensive prevention activities are undertaken to reduce the prevalence of the key risk factors for these diseases.

The Leading Individual Causes of Death

Information on the existing and growing burden of NCDs and injuries in Russia is still mainly based on mortality data, which cannot adequately reflect disease outcomes in terms of the burden of ill health and disability on individuals, health systems, and society as a whole. The mortality caused by Russia's three leading killers—CVDs, cancer, and injuries—is discussed in this section.

Table 3.4 Estimated Mortality from NCDs and Population Reduction, 2000-2030

Years	Estimated mortality from NCDs	Reduction in population size
2000-2005	2,194,000	-4,059,000
2005-2010	2,260,000	-4,052,000
2010-2015	2,390,000	-4,072,000
2015-2020	2,515,000	-4,411,000
2020-2025	2,518,000	-4,590,000
2025-2030	2,630,000	-4,715,000

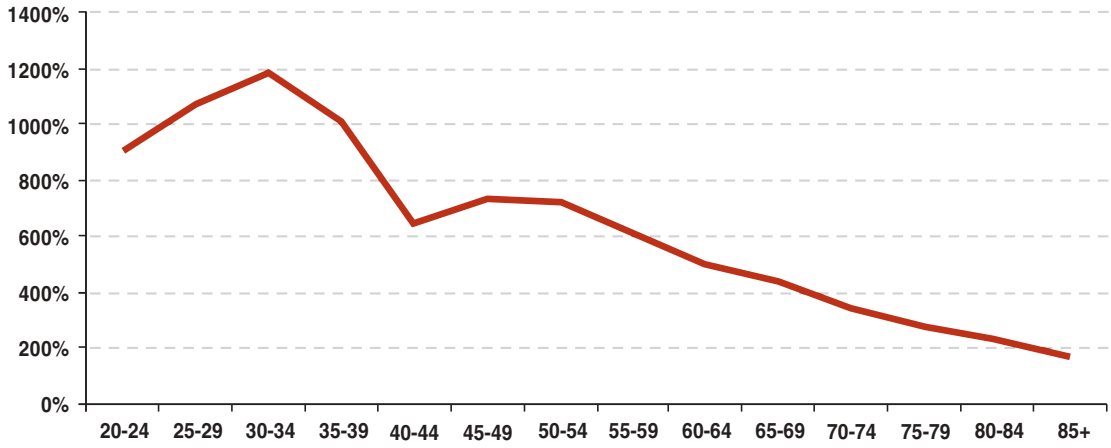
Source: Bakilana 2005. Calculations on the basis of WHO data and UN Population Database.

Diseases of the Circulatory System

Diseases of the circulatory system, a group of diseases that affect the heart, brain, and circulatory system, primarly include cerebrovascular accidents or stroke and coronary heart diseases (CHDs). The most important modifiable risk factors, termed primary risk factors, that can independently produce clinical complications due to cardiovascular arteriosclerotic diseases are dietary intake, failure to treat hypertension, high cholesterol, and smoking. In Russia, alcohol consumption does not seem to be associated with reduced risk of diseases of the circulatory system, and its abuse is plausibly the main explanation for their observed fluctuations since the mid-1980s (details are in chapter 4). Other risk factors like obesity, diabetes, and sedentary lifestyle contribute to circulatory disease morbidity and mortality in conjunction with primary risk factors.

Russia's cardiovascular disease (CVD) death rate per 100,000 population in 2002 was 994—one of the world's highest. The comparable rates were 317 in the United States, 363 in Portugal, and 225 in Brazil (WHO Global Infobase Online, 2005). CVD accounts for almost 52 percent of deaths in Russia, compared to 38 percent in the United States, 42 percent in Portugal, and 32 percent in Brazil. Russia's high mortality among working-age men is mainly attributable to CVD. Such statistics led a 2004 World Bank report to conclude that Russia could gain 6.7 years in life expectancy by working to match the European Union's CVD mortality rates (World Bank 2004a, p.29).

Figure 3.1 Cardiovascular Disease Mortality Rates in Russia as a Percentage of Swedish Rates

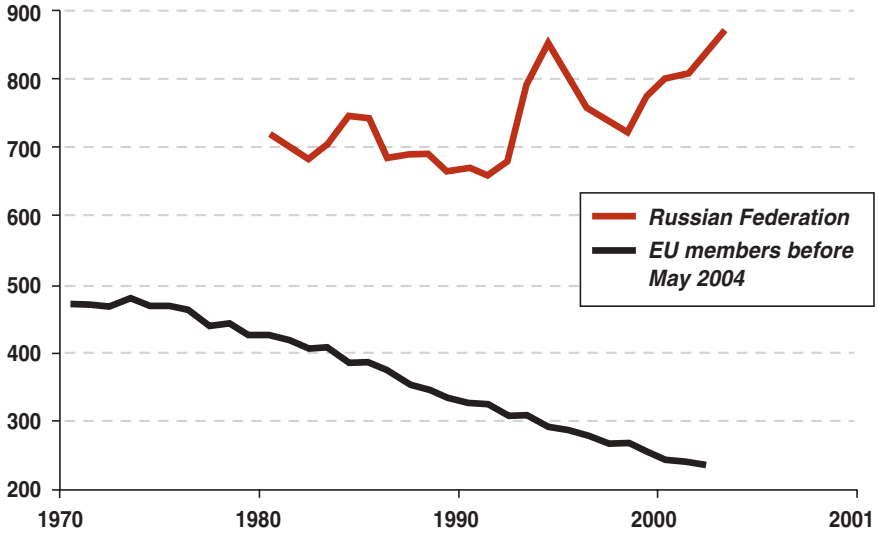


Source: WHO Mortality Database.

The social consequences of this high toll of avoidable mortality are great. Despite a widely held view that NCDs primarily impact people beyond retirement age, a crucial aspect of the Russian situation is the young age at which people are affected. Although stroke and CHD are more often prevalent among people over 60, working-age Russians are also affected. The Novosibirsk Stroke and Myocardial Infaraction Registries in the age groups of 25 and 64 years showed that stroke and CHD rates are somewhat similar (about 4 and 3 cases per 1,000 population of these ages, respectively) (Suslina 2005). Moreover, it was estimated that diseases of the circulatory systems account for 30 percent of all deaths among working-age Russians. Figure 3.1 illustrates this point by displaying the ratio of mortality in Russia from CVD in different age groups to that in Sweden (Suslina 2005). While the death rate is two- to three-times higher in older ages, it is a remarkable 12 times higher at 30-34 years.

Figure 3.2 Trends in Standardized Death Rates from Diseases of the Circulatory System in Russia and EU-15 Countries

Per 100,000



Source: WHO/EURO HFA Database.

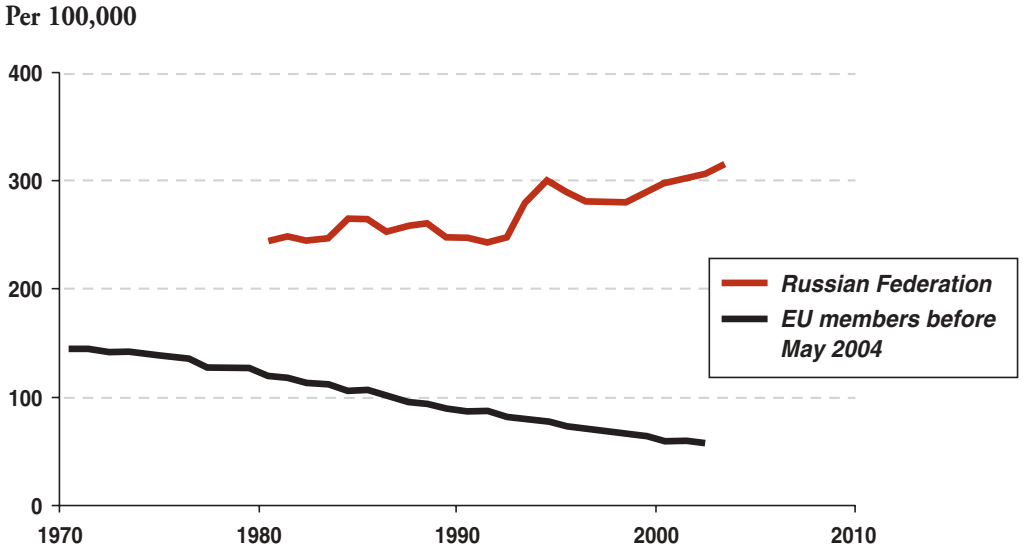
Note: "CIS" is Commonwealth of Independent States.

Figure 3.2 shows Russia's increasing trend in death rates of diseases of the circulatory system against the EU-15's decreasing trend. This figure clearly shows that contrary to most other developed countries the rate in Russia is rising.

Figure 3.3 shows a similar increasing trend in the standardized death rate from cerebrovascular diseases in Russia and a decreasing trend in the EU-15 countries (albeit a less pronounced decrease than seen in figure 3.2). The death rate from

cerebrovascular diseases in Russia at 306 per 100,000 population is about five times that of the EU-15 countries (62 deaths per 100,000). In Russia, acute stroke leads to 35 percent of deaths; the European Stroke Council believes it is possible to decrease this indicator to 20 percent or lower (Suslina 2005).

Figure 3.3 Trends in Standardized Death Rates from Cerebrovascular Diseases in Russia and EU-15 Countries, All Ages



Source: WHO/EURO HFA Database.

Cancer

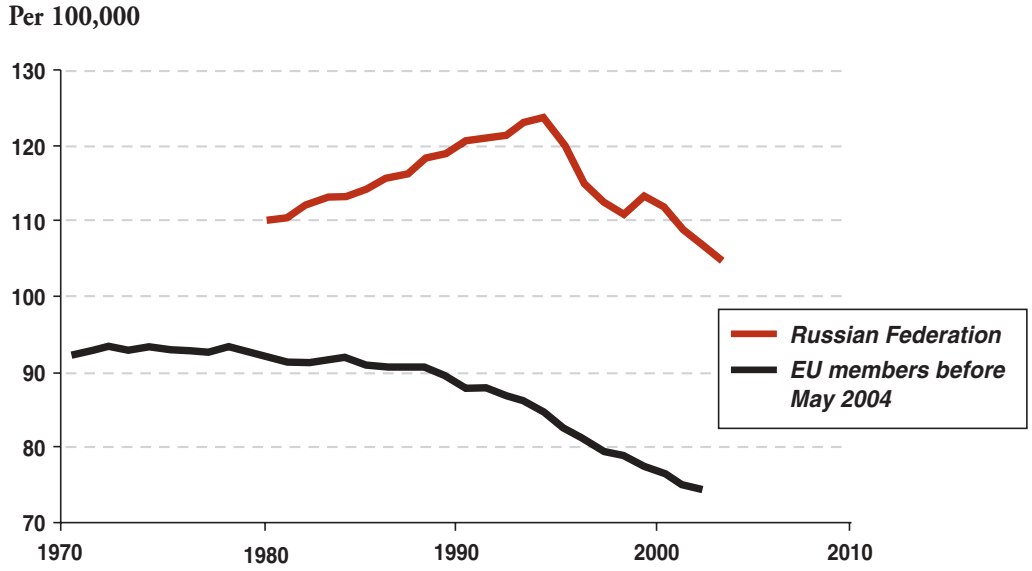
Cancer is a group of diseases characterized by the uncontrolled growth and spread of abnormal cells. Many cancer deaths are preventable, either corresponding to tumors susceptible to primary prevention (such as those associated with smoking) or susceptible to screening and early treatment (like cervical cancer). Diet (including alcohol use) is an extremely important factor in terms of both cancer prevention and cancer risk.

Cancer mortality rates in Russia are significantly above the average of the EU-15 countries (Figure 3.4). In addition, cancer in Russia is characterized by its extremely high lethality, with a high proportion of deaths within a year of first diagnosis of the disease (e.g., 56 percent for lung cancer and 55 percent for stomach cancer) (Goskomstat 2004). Men in Russia die from cancer twice as often as women, but the cancer incidence rate among women is higher. Cancer deaths reduce the average life expectancy in Russia by about 2 years.

Cervical Cancer. The cervical cancer mortality rate per 100,000 women aged 0-64 in Russia is far higher that the rate of the EU-15 countries (Figure 3.5 on page 30), which show a lower and steadily decreasing trend.

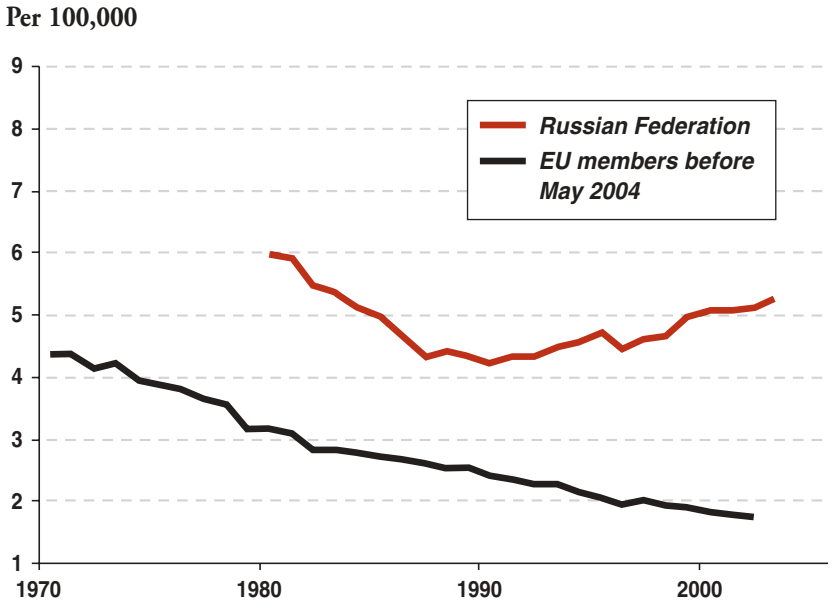
Lung Cancer. Russia's mortality rate per 100,000 population for cancer of the trachea, bronchus, and lungs ranged from 34.5 deaths in 1980 to 36.5 in 2002 with a

Figure 3.4 Trends in Standardized Death Rates for All Malignant Neoplasms (Cancer) Combined for Ages 0-64, in Russia and EU-15 Countries, 1980-2002



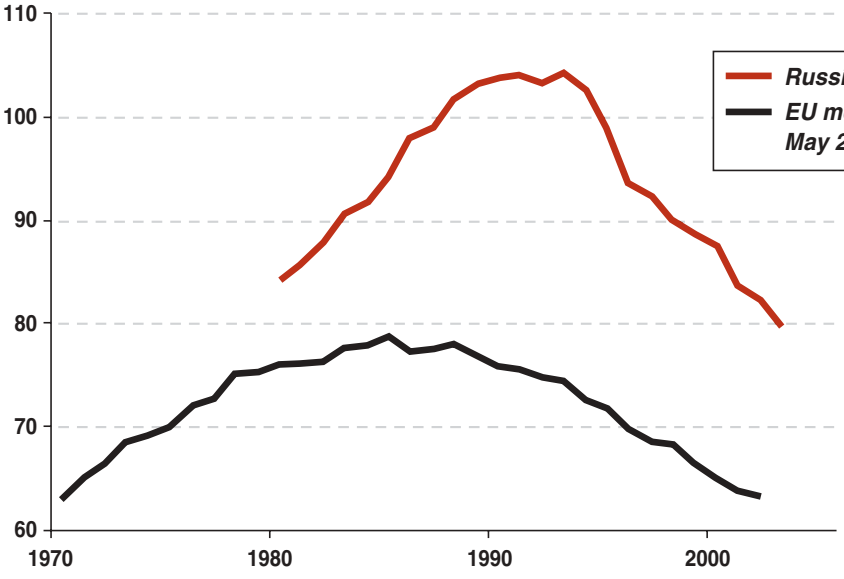
Source: WHO/EURO HFA Database.

Figure 3.5 Trends in Standardized Death Rates for Cervical Cancer for Women Aged 0-64 in Russia and EU-15 Countries



Source: WHO/EURO HFA Database.

Figure 3.6 Trends in Standardized Death Rates for Trachea, Bronchus, and Lung Cancer in Russia and EU-15 Countries, Males, All Ages, 1980-2002



Source: WHO/EURO HFA Database.

peak of over 45 deaths in the early 1990s. These mortality rates are quite similar to those reported for European countries, where the rates for these cancers were 35.6 in 1980 and 35.7 in 2002. WHO data show a small difference between lung cancer death rates in Russia—25.9 per 100,000 people aged 0-64—and EU-15 at 21.8 and 20.3, respectively. Figure 3.6 indicates a declining trend in standardized death rates for lung cancer among males of all ages in Russia and in the EU-15 countries. However, the incidence of lung cancer is related to the cumulative effect of smoking over people's life spans, and age-period-cohort analyses show that the downward trend in Russia's death rates from lung cancer is partly due to a cohort effect (i.e., the individuals contributing to the peaks reached the age of 65, when age-specific death rates are highest for lung cancer). It is expected that the favorable-looking trend will soon reverse (Shkolnikov et al. 1999).

Injuries, Poisoning, and Violence

Injuries cause more than 5 million deaths annually worldwide. They are classified as either unintentional or intentional: intentional ones are caused by deliberate violence, and unintentional ones by events such as traffic accidents, falls, fires, asphyxiation, drowning, accidents involving firearms, and other external causes. Although the discussion that follows focuses on injuries that result in death, the number of deaths is small in comparison to the number of survivors of violence and injuries, many of whom spend weeks in hospitals and are often permanently disabled.

The excessive death rate among Russian adult men is significantly influenced by the impact of external causes. Death rates due to these causes are estimated at 463 per 100,000 among men or about five times the rate for women (97 per100,000). In Russia, as discussed later in this chapter, younger age groups suffer disproportionately from injuries.

Traffic injuries: Traffic injuries include crashes involving motor vehicles, pedestrians, or cyclists. At 20.6 deaths per 100,000 population, Russia's mortality rates due to traffic injuries compare unfavor-

Table 3.5 Mortality Rates Due to Motor Vehicle Traffic Injuries in Selected Countries, 1998-2002

Per 100,000

Country	Mortality rate due to motor vehicle traffic injuries
Russian Federation	20.6
Commonwealth of Independent States (12) average	15.1
France	12.6
Italy	12.0
European Union (25) average	11.0
Ireland	10.4
Germany	8.8
Finland	7.5
Netherlands	6.6
United Kingdom	5.7
Sweden	5.5

Source: WHO 2005.

Note: Data are 1998-2002 or latest available.

By a second and more meaningful measure, fatalities per 10,000 vehicles, Russia's rate of 12.2 is exceptionally high: 50 percent higher than the second highest (the Republic of Korea at 8.2) among the reporting countries.

The severity of road accidents is often measured by the proportion of fatalities to serious injuries. Here, Russia is similar to the other transition countries, with an index of 0.12—that is, for every eight people injured in road accidents, one is killed. But Russia's index for the severity of accidents is 5 to 10 times higher than that in most developed countries (which may result partly from poor registration of road crashes not leading to deaths or injuries).

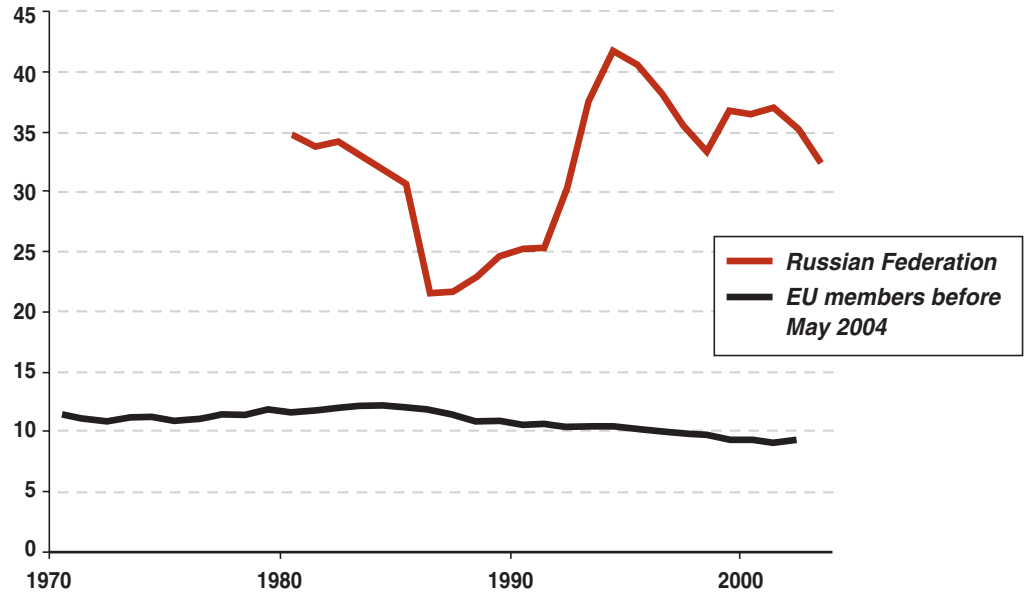
However the problem is measured, Russia clearly has a serious problem of road fatalities and injuries. The Transport Strategy for the Russian Federation, in which developing safety standards for transport operations is seen as one of the principal spheres of government responsibility, recognizes this problem.

Suicide. Figure 3.7 shows the standardized death rates from suicide and self-inflicted injury for all ages

ably with other G-8 countries at 11 (Table 3.5). This nearly double rate is even more remarkable considering that there are fewer automobiles per capita in Russia than in Western Europe. Russia's traffic mortality rate is also higher than that of other former Soviet states. In 2004, more than 34,000 people in Russia died in road accidents. Most of these deaths occurred among males of prime working age. Driver factors are the major cause of road accidents—alcohol intoxication, lack of discipline, and aggressive driving. In addition, nearly half of all motor vehicle-related deaths in Russia victimize pedestrians, not drivers or passengers.

Figure 3.7 Trends in Standardized Death Rates for Suicide and Self-Inflicted Injuries in Russia and EU-15 Countries, Ages 0-64, 1980-2002

Per 100,000



Source: WHO/EURO HFA Database.

per 100,000 people, comparing Russia with the EU countries for the period 1980-2002. Russia's suicide rate is much higher than in the EU countries. The Russian rate peaked in the mid-1990s, particularly among middle-aged men. By 1994 the suicide rate for Russian men aged 50-54 was over six times that in the United States (139 and 22.5 deaths per 100,000 population, respectively). It then fell slightly between 1995 and 2002. In all the Central and Eastern Europe and CIS countries, Russian males aged 15-19 had the second highest suicide rate at 38.2 per 100,000 relevant population, barely surpassed by Lithuania at 38.4.

Alcohol Poisoning

An important external cause is accidental alcohol poisoning: death occurs when, for example, a healthy adult male of average weight consumes a large amount (half liter) of vodka or a similarly strong beverage (40 percent alcohol) without food in less than an hour. Alcohol poisoning is one of the most alarming phenomena related to alcohol abuse in Russia (Tremil 1997); this is a particularly acute and rapidly growing problem in rural areas, where the death rate is 128 per 100,000 among adult men. Largely due to the poorer quality of alcohol, the death rate in rural areas is twice that of the country as a whole.

The observed changes in death rates from suicides and alcoholism in Russia appear to be linked with the social and economic turmoil of recent years. For example, between 1995 and 1998, a period of relative well-being, deaths rates from these causes decreased in both urban and rural areas, while they started to grow continuously after the 1998 crisis.

Violence

The homicide rate in Russia increased rapidly during the 1990s. It is now about 20 times higher than in Western Europe and among the highest recorded anywhere in the world (Chervyakov et al. 2002). In 1999, for example, close to 30,000 persons died from homicide in Russia. As the average age of homicide victims is much lower than for most other causes of death, it has a very negative impact on the number of years lost. Also, alcoholism is closely related to crime, as it prompts risk taking and aggressive behavior, and extreme violence is seen as a way to resolve problems. Furthermore, the proportion of crimes committed by men and women while intoxicated in 2002 was about 30 percent and 12 percent, respectively. In a majority of cases, victims of homicide are also often intoxicated at the time of the crime (Chervyakov et al. 2002). Gorbachev's 1984-1988 anti-alcoholism campaign produced a decline in mortality due to violent deaths, particularly mortality from homicide and road traffic accidents, but with the increase in alcohol consumption among young cohorts, violent deaths began to rise again after 1998 (Shkolnikov and Nemtsov 1997; Mesle 2002). Increased levels of violence not only add to the increasing mortality burden, particularly among the young, but it adversely affects social and economic development.

Injuries among Youth

The rate of violent deaths among young Russians is alarming, as all forms of violent deaths are rising dramatically among Russians aged 15-29. The proximal causes of violent deaths seem to be the use of alcohol and illegal drugs. In 2001, over 41,000 people in Russia died of alcohol poisoning. This number likely includes some teenagers, as more and more teens are reporting having been drunk: an increase of 18 percent between 1993 and 2002 (UNICEF 2004). Figure 3.8 shows injury mortality rates in Russia as a percentage of rates in Sweden and clearly illustrates Russia's high burden of injury mortality among the young compared to Sweden's.

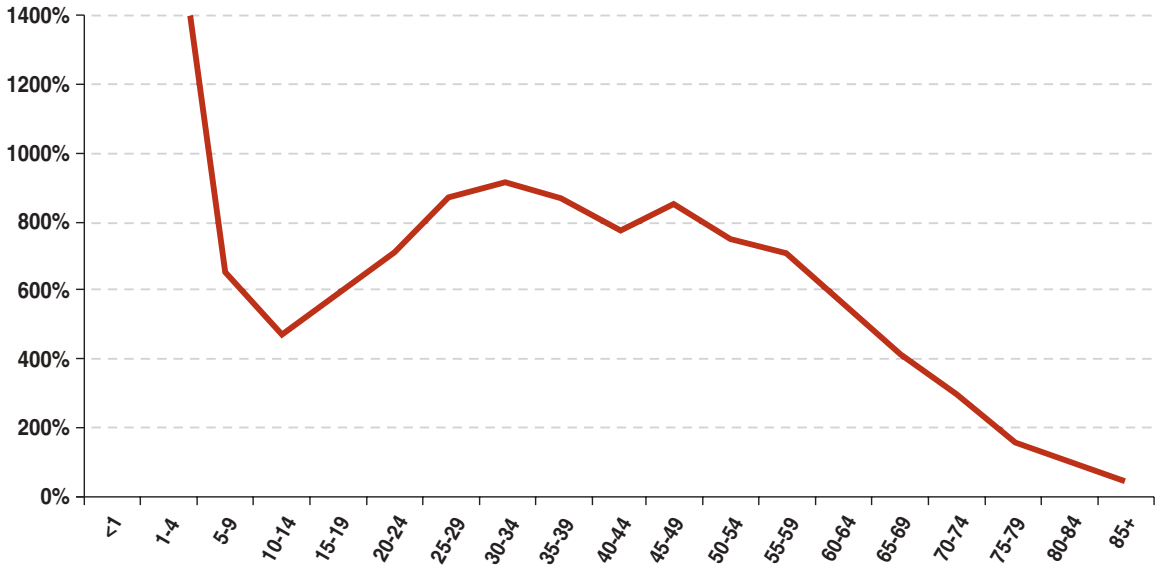
Russia's young people are its future adults, and youths' health patterns, unless redirected, will largely be carried through life. Young people's health issues are largely rooted within the country's social conditions. UNICEF cites poverty, unemployment, insecurity, and substance abuse as the social determinants of health (2004). Russian anthropologists and sociologists think that a poor social adaptation to urbanization and migration may have caused young people to rely on unhealthy substances, such as alcohol and smoking, to relieve stress. At least one report indicates that the lack of a social network, which existed in the past, coupled with the pressures from growing expectations (bolstered by the media), is prompting young people to turn to crime, violence, and suicide (Abdullaev 2004).

Policy Implications

The vast majority of Russia's burden of disease and mortality is caused by (a) NCDs, such as cardiovascular

diseases and cancer and (b) injuries due to motor vehicle accidents, suicide, and other external causes. Young adults in Russia are hit hardest. Nearly 7 of 10 Russians today die from CVDs or injuries. NCDs are generally not curable once they develop, and most become chronic conditions. However, many are preventable, and people with NCDs can continue to lead normal, productive lives if the condition is diagnosed early and managed correctly. Furthermore, well-recognized and inexpensive interventions to screen for and control NCDs exist and are widely applied in most developed countries. Effective interventions could start soon to improve the health of Russian adults, without having to wait for the next generation. This is highly relevant, as Russian policy initiatives often emphasize interventions for the young. More importantly, if NCDs are not managed correctly, they lead to costly hospitalizations, the need for long-term care, and the loss of productivity and income. Policy discussions that involve the efficiency of the health system and health services will of necessity increasingly have to include the prevention and management of NCDs. Their treatment and long-term management is already a major cost in middle-income and developed countries.

Figure 3.8 Injury Mortality Rates in Russia as a Percentage of Swedish Rates



Source: WHO Mortality Database.

There is a misconception that NCDs and injuries affect the rich and not the poor, but their prevalence is actually higher in less-developed regions and among low income groups, for two reasons. First, the poor are more likely to be exposed to the risk factors leading to NCDs (alcohol abuse, smoking, physical inactivity, high fat/high carbohydrate diet without fruits and vegetables, obesity, stress, and high blood pressure). Second, the poor are less likely to have access to the medical care that alleviates the consequences of NCDs. Also, NCDs potentially impoverish those on the low income groups both because of the high costs of treatment and because of decreased productivity from ill health. Given Russia's high regional disparities, substantial improvements in the population's health could be achieved by targeting its less-developed regions.

This all means that Russia faces a major challenge associated with the growing NCD and injury burden: institutional realignments are required because effective approaches to deal with this challenge demand an interdisciplinary approach and interventions that span different sectors. Developed-country experience suggests that prevention policies and interventions are more affordable and effective when they are oriented to the population at risk of illness and injury rather than solely at individuals who are already ill or disabled. As it will be discussed in Chapters 7 and 8, reaching the source of the problem requires new capacities and skills in the areas of regulation; information management; education and communication; mobilization and management of community-based and nongovernmental organizations; and working across sectors, including the private sector. Health services will also need to significantly improve to better manage chronic health problems as well as acute ones. Treatment adherence and long-term follow-up will become major issues; lastly, patients must be involved in their own health care management.

4

Chapter 4. What Are the Major Risk Factors for NCDs and Injuries?

Risk factors are defined as any attribute or characteristic of an individual or exposure to an element that increases the likelihood of developing a disease or injury. Though risk factors may not cause disease, their presence increases the probability that it will develop. This chapter discusses the main preventable risk factors for noncommunicable diseases (NCDs) and injuries in Russia to lay a foundation for a discussion on reducing those risk factors.

Major Individual Health Risk Factors

The mortality attributable to 10 leading risk factors in Russia in 2002 is shown in Table 4.1. The first three—high blood pressure, high cholesterol, and tobacco-are estimated to contribute to more than 75 percent of the country's deaths. The table also shows the DALYs (disability-adjusted life years, defined in the previous chapter) lost attributable to the same risk factors. In this case, the top three risk factors—alcohol, high blood pressure, and tobacco-account for more than 46 percent of DALYs lost in 2002.

Alcohol Abuse

Alcohol can benefit as well as harm individuals. In many countries drinking alcoholic beverages is a pleasurable part of social life and is seen as cardio-protective (OECD 2003). Alcohol use in Russia is closely tied to social norms, and heavy drinking constitutes a major public health problem.

Official statistics indicate that during 1965-87, the prevalence of alcoholism rose in Russia to a level of 2,008 per 100,000 population. The morbidity from alcoholic psychoses (a good measure of morbidity from alcoholism) also rose in the 1960s and 1970s, and began to decrease in the 1980s due in large part to Gorbachev's 1985 anti-alcohol legislation that limited alcohol sales and raised the legal purchasing age to 21. However, alcohol consumption decreased only 26 percent despite a 63 percent decrease in alcohol sales: the consumption of unregistered alcohol, including moonshine, nearly doubled, and increases were also seen in substance abuse and related poisoning, especially among the youth. The law was repealed after three years,

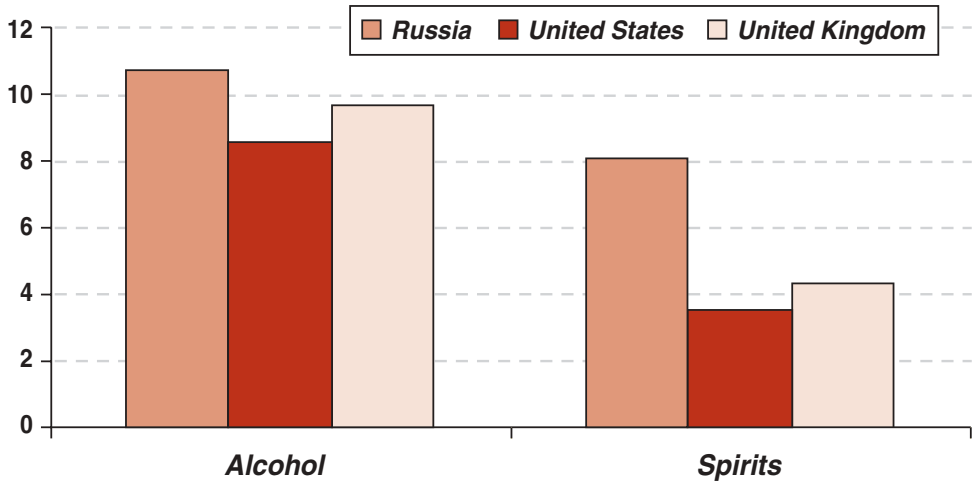
Table 4.1 Deaths and DALYs Lost Attributable to 10 Leading Risk Factors, 2002

Rank	Risk factor	Total Deaths %	Rank	Risk factor	Total DALYs %
1	*High blood pressure*	35.5	1	*Alcohol*	16.5
2	*High cholesterol*	23.0	2	*High blood pressure*	16.3
3	*Tobacco*	17.1	3	*Tobacco*	13.4
4	*Low fruit and vegetable intake*	12.9	4	*High cholesterol*	12.3
5	*High BMI*	12.5	5	*High BMI*	8.5
6	*Alcohol*	11.9	6	*Low fruit and vegetable intake*	7.0
7	*Physical inactivity*	9.0	7	*Physical inactivity*	4.6
8	*Urban outdoor air pollution*	1.2	8	*Illicit drugs*	2.2
9	*Lead*	1.2	9	*Lead*	1.1
10	*Illicit drugs*	0.9	10	*Unsafe sex*	1.0

Source: WHO-EURO (2005). The European Health Report (http://www.euro.who.int/eprise/main/who/progs/ehro5/home).

Figure 4.1 Per Capita Alcohol Consumption in Russia, US, and UK, 1999

Liters per adult



Source: WHO 2003a.

although morbidity was minimal and alcohol consumption dropped while it was in effect.

With the liberalization of alcohol sales and relaxation of administrative controls, an increased morbidity trend from alcohol psychosis occurred. Surveys show a substantial increase in alcohol consumption between 1992 and 1994 consistent with a sharp price reduction. Alcohol consumption rose by 25 to 30 percent as the price dropped by 58 percent during this period. Researchers estimate the price elasticity of demand for alcohol to be -.36. A reduction in alcohol consumption and a relative rise in the price of alcohol were observed between 1994 and 1996.

Adult per capita alcohol consumption in 1999 was 10.7 liters per adult in Russia versus 8.6 liters in the United States and 9.7 liters in the United Kingdom (Figure 4.1). Although these levels are not dissimilar, the key difference is that 75 percent of the alcohol consumed in Russia is spirits, whereas in the United Kingdom and the United States, 56 and 60 percent, respectively, is beer. Recent data from the Russian Longitudinal Monitoring Survey (RLMS) indicate that in 2002, alcohol consumption for all groups increased: 14.5, 2.4, and 1.1 liters per year among men, women, and teenagers, respectively. In 2004, about 70 percent of men, 47 percent of women, and 30 percent of teenagers were drinkers (RLMS 2005). In rural areas Russians drink more alcohol of poorer quality than people in cities as demonstrated by a long-standing tendency of higher morbidity due to alcohol poisoning among rural populations.

However, due to the lack of participation of alcoholics and heavy drinkers in population surveys, as well as underreporting, data from self-reported alcohol consumption in Russia among men and women is considerably less than reported in official statistics. Using biological markers of alcohol drinking (e.g., carbohydrate-deficient transferring (CDT)) to determine the alcohol-associated risk, a study in Russia's Karelia Republic in 1997 found CDT values both among men (about 37 percent) and women (about 18 percent), indicating heavy alcohol consumption (Laatikainen et al. 2002a). The respective rates in Finland in the same year were 9.6 and 9.4 percent. Evidence from epidemiological surveys reported by the Russian Ministry of Health (MOH) in the 1990s suggests that the prevalence of habitual drunkenness is about 20 percent of the population in several regions of the country.

Alcohol abuse contributes to a large proportion of deaths among working-age males. Some estimate that between a quarter and a third of all adult male deaths may be directly related to alcohol abuse (McKee 2005; MOH 1994).

Alcohol may also affect mortality through violent death, as discussed in chapter 3. The Russian MOH reported sample survey results in the 1990s showing that alcohol was implicated in 50 percent of deaths from accidents, poisonings, and injuries. There is also a strong direct correlation between mortality from cirrhosis of the liver and per capita consumption of alcohol: it is estimated that 30-50 percent of all cases of such cirrhosis are due to alcohol abuse. In alcoholics, mortality from cancer of all sites is 25 percent higher than in the general population. Binge drinking, common in Russia, leads to increased cardiovascular disease (CVD) mortality, particularly sudden cardiac death (scientific evidence indicates

that alcohol abuse can injure the myocardium and cause a dangerous arrhythmia (Leon et al.2005). Indeed, one study found a significant increase in deaths from alcohol poisoning, accidents, violence, and CVD on Saturdays, Sundays, and Mondays that were associated with binge drinking on weekends (McKee et al. 1998). Among other behaviors that compound the alcohol problem in Russia are drinking alcoholic substances not intended for consumption, such as perfume and medicine, and days-long binging (McKee 2005).

Today a very high proportion of deaths at working ages in Russia are attributable to causes of death that explicitly involve alcohol. In an ongoing case-control study in Izhevsk (a city in the Urals), an interim analysis shows that of 1,400 deaths from all causes occurring among all male residents aged 25-54 years in 2003-04, 18 percent were certified by a medical expert as having one of four causes that explicitly specify alcohol: mental disorders due to alcohol; alcoholic cardiomyopathy; alcoholic cirrhosis of the liver; and acute alcohol poisoning (Leon et al. 2005). This 18 percent, however, is a minimum in this age group, as it excludes the substantial proportion of deaths attributable to alcohol but arising from causes that do not explicitly imply alcohol, such as injuries and violence as well as a wide range of illnesses, including respiratory and cardiovascular disease. The results from this study suggest that this risk factor may explain the mortality crisis in Russia more than any other.

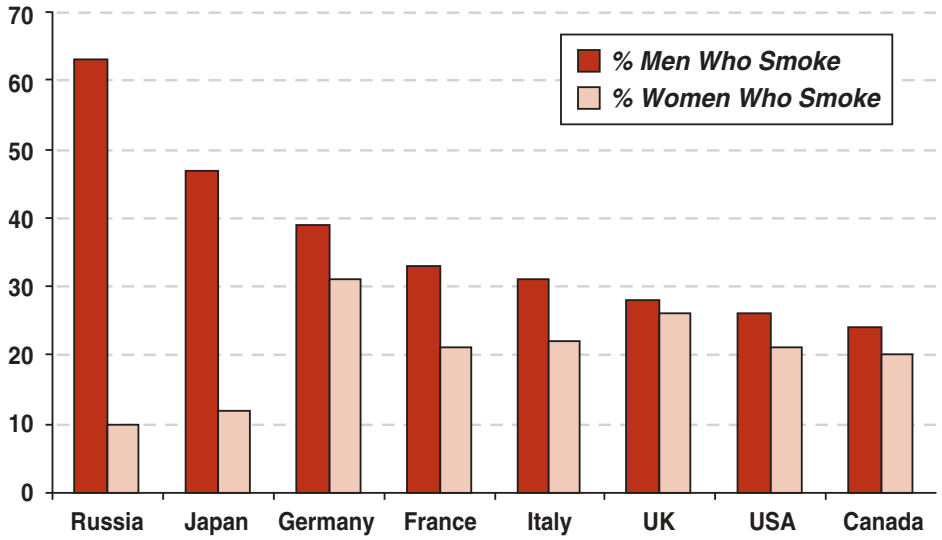
In terms of morbidity, the prevalence of mental disorders in heavy users is twice as high as in the general population, and morbidity with temporal disability is 1.5 times higher among alcohol abusers than among moderate drinkers. Other problems associated with alcohol abuse are alcoholic gastritis in 95 percent of alcoholism cases, ulcers, and alcoholic cardiomyopathy, which results in cardiac failure to various degrees.

Use of Tobacco

Tobacco is the only consumer product that eventually kills half of its regular users if they follow its manufacturers' recommendation (Beaglehole and Yach 2003). The WHO estimates that 300,000 deaths worldwide are attributable to smoking every year (with 100,000 caused by cancer), more than the number of deaths caused by traffic accidents, use of illegal drugs, and suicide combined. Peto et al. (1994) estimate that smoking accounted for 30 percent of all male deaths (42 percent in the age group 35-69) and 4 percent of all female deaths (6 percent in the age group 35-69). Gerasimenko and Demine (2001) have shown that smoking shortens life expectancy by 6.7 years for men and 5.3 years for women.

Associated with higher rates of CVDs, many cancers, and chronic lung diseases, cigarette smoking is the single most preventable cause of disease and death in Russia. The prevalence of smoking among Russian adults is shown in Figure 4.2. Russia has one of the world's highest rates of smoking among men: more Russian men smoke than European men—the ratio is 2 to 1.19. In 1998, 6 out of 10 male adults in Russia were

Figure 4.2 Smoking Prevalence among Adults in Selected G-8 Countries



Source: Shafey, Dolwick, and Guidon 2003.

Note: Data are from 2000, except for Russia (1990s), Canada and the United Kingdom (2001), and Italy (2002). Data cover the population aged 20 and older except for Germany (18-59), France and USA (18+), Italy and Canada (15+), and the United Kingdom (16+).

Table 4.2 Percentage of 15-Year-Olds and Adults Who Smoke in Selected Countries, 2003

	15-year-olds	Adults
Russia	15.8	36
Germany	27.5	35
Ireland	15.8	31
United Kingdom	17.7	27
France	19.8	27
Italy	16.1	25

Source: WHO 2003a.

smokers—more than twice the comparable rate in the United States and the United Kingdom. Recent RLMS data indicate that while smoking prevalence among men decreased from about 65 percent in 2002 to 61 percent in 2004, the prevalence of smoking among women increased from 7.3 percent in 1992 to 15 percent in 2004—a more than 100 percent increase over a 12-year period (RLMS 2005). Lower smoking prevalence among older men reflects trends over time and (much) higher death rates among long-term smokers as they grow older (McKee et al. 1998).

The percentage of 15-year-olds who smoke in Russia is reported to be less than the percentage in some European countries even though the percentage of adults who smoke is higher (Table 4.2). This rate has also increased in Russia since the 1990s, particularly in girls (Gilmore and McKee 2004a). These smokers, especially men, generally reported initiating their smoking habit before 18 years of age and sometimes even in childhood (Gilmore et al. 2004). Since smoking is an addictive behavior, the prevalence of young smokers is indicative of future adult patterns.

While the average daily number of cigarettes smoked among men has hovered near 16 during the 1992-2004 period, among women and teenagers a pronounced increase is observed: from 8 to 11, and from 8 to 9.4, respectively.

Drug Use

Over the last 10 years illegal drug use has increased rapidly in Russia. At the beginning of 2005, drug users were estimated to number 500,000, including more than 340,000 drug addicts in the lists maintained by public institutions (Cherkesov 2005). The number of persons registered in medical and prevention institutions with a diagnosis of drug abuse increased by a factor of 2.1. However, it is estimated that the actual number of drug abusers in the country exceeds those officially registered by five to eight times (Cherkesov 2005). Injecting drug users are estimated to have 20-times higher risk of death than the general population, making it conceivable that a portion of Russian teenage mortality is connected to substance abuse (UNICEF 2004). Injecting drug use is also the driving force behind the HIV/AIDS epidemic in Russia (although HIV/AIDS is an infectious disease that shares certain characteristics with many NCDs, such as a long latency period, and affects predominantly young adults, it is not considered in this assessment. For additional information see World Bank 2003b).

Nutrition- and Activity-Related Factors

Dietary intake, cholesterol, obesity, and hypertension should not be seen as separate, individual risk factors. In fact, it is question of certain major problems in the diet: intake of high saturated fat (animal fat, hydrogenated vegetable fats), high salt intake, low vegetable and fruit intake, and low intake of good (vegetable and fish) oils. These aspects of diet, coupled with a sedentary lifestyle are the determinants of high blood cholesterol, high body weight, and high blood pressure among Russians. Thus, these factors should be tackled as a whole—as nutrition- and activity-related factors.

Food intake. Dietary intake in Russia is characterized by a diet high in animal fat and salt, and low in fruits and vegetables. RLMS data for 2004 indicate that fat intake in Russia is much higher than the recommended level of 30 percent of total energy intake for all age groups (the percentage rates are 32.2, 33.9, and 31.3 among children 0-17, adults 18-59, and elderly 60 and over, respectively). Consumption of most foods has fallen, with the exception of bread and potatoes (Hawkes 2004). Among the poor, consumption of milk, diary products, fruit, vegetables, fish, and meat is less than the average intake, while their consumption of bakery products and potatoes is high. Protein intake, which was showing a slow decrease until 2000, has been increasing slowly since then. The decline in fruit and vegetable consumption in Russia is estimated to explain 28 per-

cent of the increase in CVD mortality (Brainerd and Cutler 2004). Food accounts for over 70 percent of household expenditures of the poor and 35 percent of the richest 10 percent.

The importance of food in lowering the burden of disease is often not fully appreciated. Along with smoking and sedentary lifestyles, a diet high in fats and sugar and low in vegetables and fruits is a major cause of CVDs, obesity, and cancers. The WHO estimates that about a third of all CVDs are due to poor diets and that better diets could lower cancer cases by about 30-40 percent. Evidence from North Karelia, Finland, shows that in the years 1972-92, mortality from blood pressure and CVDs dramatically fell following a successful program of good diet (see box 7.1, p. 61).

High cholesterol. Different epidemiological studies (including MOH 1997) in several regions in Russia indicate that about 60 percent of adults have blood cholesterol levels above those recommended (200 mg/dL and 5.2 mmol/L), and about 20 percent have levels that put them at high risk and in need of medical care (250 mg/dL, 6.2 mmol/L). Among men in the 20-54 age group in selected cities, about every sixth one (16 percent) suffers from marked hypercholestrolemia. A study in St. Petersburg showed a significant decline in HDL (so-called good) cholesterol to dangerously low levels across all men in the 20 to 69 age group, as well as for women (Plavinski et al. 1999).While Russia's blood cholesterol levels are not particularly high compared to Western averages, strong evidence points to the crucial basic role of blood cholesterol. International experience, even from neighboring countries—Finland and Poland—shows how changes in a population's CHD rates seem to follow closely its general blood cholesterol level.

Obesity. Adults who are overweight or obese are at risk for premature death and disability. Those with a body mass index (BMI) of 25 to 29.9 are considered overweight, while those with a BMI of 30 or more are considered obese.[3] Fontaine et al. (2003) reported that obesity has a substantial effect on longevity, reducing the length of life of people who are severely obese by an estimated 5 to 20 years, while Olshansky et al. (2005) found that the substantial rise in the prevalence of obesity and its life-shortening complications (i.e., diabetes) in the United States pose a threat to the steady rise in life expectancy observed in the modern era. One study has attributed severe obesity to a 12-fold increase in mortality among 25- to 35-year-olds as compared to lean individuals (PAHO 2003). Being obese also elevates an individual's risk for Type 2 diabetes, heart disease, and certain cancers (breast, prostate, and colon). It similarly is associated with an elevated risk for nonfatal but debilitating conditions affecting the skin, respiratory systems, musculoskeletal systems, and fertility (WHO 2004a). In addition, obesity is stigmatized in society, so overweight individuals may suffer psychological stress relating to low self-esteem (PAHO 2003).

Russian men are much less likely to be obese than men in the United States. In 2000, 12 percent of Russian men aged 25-64 were obese, compared with 25 percent of U.S. men in 2001. Russian and U.S. women are closer at 28.5 percent and 24.7 percent, respectively. The latest (2002) Russian Behavioral Risk Factor Surveillance System results indicate that the prevalence of overweight among adults aged 25-64 in various regions of Russia ranges from 47 to 54 percent for men and from 42 to 60 percent for women (CINDI 2004). However, self-reported data are often underestimated, especially the female obesity rates. According to data from Pitkäranta, Karelia Republic, in the 1990s and 2000, about 35 percent of women had a BMI (measured) equaling or more than 30 (Laatikainen 2000).

This means that although obesity can be ruled out as a primary cause of the mortality crisis in Russia, it can still have a large negative effect on individual and population health as it is related to high blood pressure, high cholesterol, and diabetes. However, the prevalence of obesity has been rising in industrialized countries and can be expected to do likewise in Russia as its people adopt Western lifestyles. In fact, from 1993 to 2000, obesity in Russia increased slightly for both men and women. The trend in obesity prevalence has risen by about 10 to 40 percent in the majority of European countries over the past 10 years (OECD 2003).

[3] BMI, a common measure expressing the ratio of weight to height, is determined by a mathematical formula in which a person's body weight in kilograms is divided by the square of his or her height in meters (i.e., wt/[ht^2]).

While genetic predisposition for obesity is a key determinant, especially after adoption of Western lifestyles, two major lifestyle influences merit mention: urbanization and women entering the workforce. Urbanization changes diets and leads to a more sedentary lifestyle for many. Working women are likely to depend on convenience foods—for themselves and their families—that are typically low in nutrients and high in fat.

Economic and financial impact studies on treating the morbidity and mortality associated with high cholesterol, increasing obesity, and related NCDs report that the cost of medical therapy to screen and reduce cholesterol levels is at least US$10,000 per life year saved (McKinlay 1993). The direct medical costs of obesity are estimated at US$40 billion in the United States alone (Posten and Foreyt 1999), and it accounts for almost 4 percent of DALYs lost in the European Union. Because treatment is so expensive and often unaffordable, prevention through dietary modification and increased physical activity is the cost-effective way to combat overweight's contribution to the rapid rise of NCDs.

Hypertension. Hypertension or high blood pressure (systolic blood pressure above 140 mm Hg or diastolic blood pressure above 90 mm Hg) is a major risk factor for cardiovascular diseases. About 50 percent of people who have a first heart attack and about 66 percent of people experiencing a first stroke have blood pressure above 160/95 mm Hg (Hellermann et al. 1997). Globally, 26 percent of the adult population has hypertension (Kearney et al. 2005), and of these only 30 percent may be aware of their condition (NHLBI). Hypertension has been identified as the leading risk factor for death and is ranked third as a cause of DALYs lost (Ezzati et al. 2002). Hypertension is preventable, though, and early detection and treatment are critical: large trials indicate that a 5 mm Hg reduction in diastolic pressure corresponds to a 21 percent reduction in heart disease risk (Magnus and Beaglehole 2001).

High blood pressure is clearly the greatest contributor to the onset of CVDs, Russia's leading killer. It is closely related to high salt intake and other aspects of diet (and to alcohol intake and obesity). The 2002 Russian Behavioral Risk Factor Surveillance System study found that prevalence of hypertension in the male population ranged from 34-46 percent for males and from 32-46 percent for females. These figures, however, may underestimate the problem as they are based on self-reported data. According to data (with measurements) from Pitkäranta, Karelia Republic, 57 percent of men and 55 percent of women had blood pressure above 140/90 mm Hg and/or treatment for hypertension. With the higher cut-off point of 160/95 mm Hg, the respective rates were 30 percent and 38 percent. More than 40 percent of males and 25 percent of females were not aware of their hypertension. This lack of awareness clearly affects the self-reported figures on hypertension prevalence (Laatikainen 2000).

Treatment of high blood pressure includes behavior changes and drug therapy. The best approach for instigating these activities is a combination of population-based and intensive, targeted strategies for primary prevention. Physical activity, a low-salt diet, moderate alcohol consumption, potassium supplementation, modification of eating habits, and weight loss are proven as effective interventions (Whelton et al. 2002). Interventions to reduce hypertension may be combined with those for lowering blood cholesterol level, because these conditions are interrelated and affected by similar factors, such as diet, stress, and obesity.

Sedentary lifestyles. Russians are increasingly adopting a sedentary lifestyle more typical of industrialized economies (Table 4.3 illustrates the relationship between modern lifestyles and low physical activity). From 2000 to 2002, 73-81 percent of surveyed men and 73-86 percent of women aged 25-64 reported having low-levels of physical activity (CINDI 2004). They reported that they engage in less than 20-30 minutes of rigorous exercise fewer than five days a week. This is an alarming statistic, since lack of physical exercise increases risks for most NCDs. Moderate physical activity, for example, performed on most days of the week can substantially reduce the risk of dying from CVD and can reduce the risk of developing colon cancer, diabetes, and high blood pressure. In addition, regular exercise confers the immediate benefits of mood improvement and a sense of well-being and helps prevent weight gain (U.S. CDC 2004). Both physical and mental health can also help reduce accidental injuries and suicides due to depression.

Physical inactivity alone is estimated to account for 3.5 percent of the DALYs lost in Europe (WHO 2005a). This is significant, because it is a risk factor that can be

Table 4.3 The Link between Modern Lifestyles and Low Physical Activity

Location or activity	Modern lifestyle	Impact related to obesity
Transportation	Rise in car ownership. Increase in driving shorter distances.	Decrease in walking or cycling.
At home	Increase in the use of modern appliances (microwaves, dishwashers, washing machines, vacuum cleaners). Increase in prepared and processed foods and ingredients. Increase in television viewing, and computer and video game use.	Decrease in manual labor. Increase in consumption of convenience foods that contribute to obesity. Decrease in time spent on more active recreational pursuits.
In the workplace	Increase in sedentary occupational behaviors due to technological advances.	Decrease in physically demanding manual labor.
Public places	Increase in the use of elevators, escalators, and automatic doors.	Decrease in daily physical activity patterns, such as climbing stairs.
Urban residency	Increase in crime in urban areas.	Prevents women, children, and elderly people from going out alone for exercise and leisure activities.

Source: AOA 2005.

cost-effectively averted by individual effort, since moderate and regular physical activity can be integrated into daily routines. However, individual effort needs the support of public health policies that emphasize and promote physical activity. For example, in Sweden and Netherlands, where bicycle riding and walking are popular, obesity is less common than in car-bound societies such as the United States, Canada, and the United Kingdom (PAHO 2003).

Diabetes. Diabetes is a group of diseases that share high blood sugar levels due to an absolute or relative insulin deficiency. Insulin-dependent diabetes mellitus, or Type 1 diabetes, may appear at any age, is seen most frequently in children and adults under age 30, and requires insulin; its most common cause is the destruction of pancreatic cells. The most common form of diabetes is noninsulin-dependent diabetes mellitus, or Type 2, which usually appears after age 40; it is generally associated with obesity, genetic factors, and modern lifestyles characterized by a sedentary life, dietary factors (such as excessive simple carbohydrates), and stress.

Diabetes was the sixth leading cause of death worldwide for older adults in 2002 and affected at least 171 million people in 2000 with an annual attributable mortality close to 3.2 million (WHO 2004a). But the burden doesn't stop there: people with diabetes are at higher risk for heart disease, blindness, kidney failure, lower-limb amputations, and other chronic conditions such as nerve and dental diseases (ADA 2003). They are two- to four-times more likely to suffer heart attack and stroke, and between 50 and 80 percent of them die of CVDs.

The WHO considers Russia to be among the top 10 countries ranked by number of diabetics (WHO 2004a). At more than 3 percent, the prevalence of diabetes in Russia is only slightly higher than the world average of 2.5 percent. It is estimated that nearly half of U.S. diabetics are unaware of their life-threatening condition—and this may be the situation in Russia.

Table 4.4 (on page 42) compares the prevalence of diabetes in Russia with its prevalence in other G-8 countries. As a percentage of total population, its estimated prevalence is comparable to that in other European countries except Italy, and it is substantially below that of Japan and North America.

Reported mortality from diabetes in Russia (10.2 deaths per 100,000 population) is only about half that in other countries (19-21 deaths per 100,000 population), but this difference can be explained by the 16.5 percent registration rate. Diabetes mellitus is frequently attended

Table 4.4 Prevalence of Diabetes Cases in G-8 Countries, 2000

Country	Number of cases	Percentage of population
Ireland	86,000	2.2
France	1,710,000	2.9
United Kingdom	1,765,000	3.0
Russia	4,576,000	3.2
Germany	2,627,000	3.2
Japan	6,765,000	5.3
United States	17,702,000	6.1
Canada	2,006,000	6.4
Italy	4,252,000	7.4

Source: Derived from Wild et al. 2004.

by other pathological disorders, including diseases of the circulatory system (66 percent), diseases of digestive organs (32 percent), kidney diseases (20 percent), and respiratory diseases (15 percent). A more common diagnosis, disease of the cardiovascular system, is the likely principal cause of death even among diabetic patients in Russia. In any case, with the increasing trends in population aging, unhealthy diets, obesity, and sedentary lifestyles, more people are expected to develop diabetes at a younger age in transition economies, such as in Russia.

Other risk factors

Psychosocial Stress

Mental well-being goes hand in hand with good physical health. Stress is the most commonly reported cause of sickness absence and a major cause of incapacity in developed economies. A high level of stress is also positively related to the development of CVD. Psychosocial stress in Russia is likely brought on by the substantial changes in the economy and an erosion of the social safety net in the last decade.

Estimates of the impact of psychosocial stress on mortality in Russia vary, but Brainerd and Cutler believe stress may explain a quarter of the increase in mortality (2004, p. 37). Economic reforms in the 1990s changed the lives of virtually every Russian citizen. Minimum wages in Russia have fallen dramatically: to less than 6 percent of the average wage by 2000. The change in the minimum wage as a share of the average wage is negatively and significantly related to the change in mortality for all causes and strongly negatively related to the increase in CVD deaths. Also, throughout much of the 1990s, the minimum wage in Russia was far below the "subsistence minimum" calculated by the government in determining poverty rates. And today the average Russian confronts an unpredictable future, a psychosocial factor influencing health.

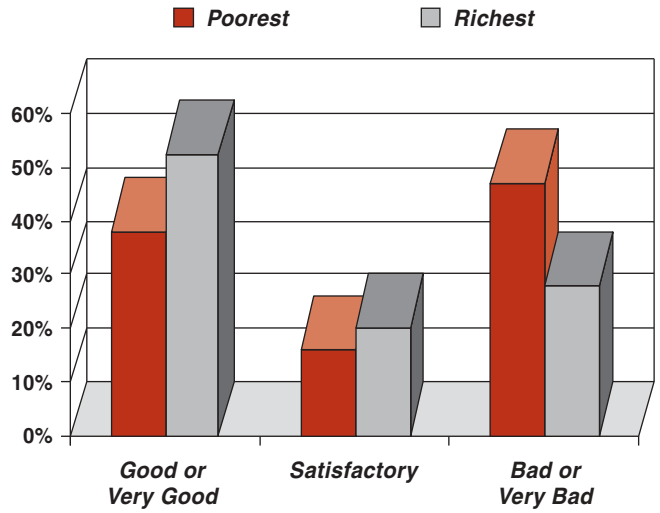
Socioeconomic Disadvantage as a Risk Factor

Plavinski, Plavinskaya, and Klimov (2003) examined the association between social factors and the increase in mortality in Russia in the 1990s and found that men in lower socioeconomic groups were most affected by the sharp increases in mortality. Several health risk factors are associated with the onset of major causes of death and disease in Russia and are prevalent among the poor, increasing the burden of illness and disease in low-income groups. Since risk factors are synergistic in their effect, the relative risk of developing NCDs and suffering injuries increases sharply when various risk factors are combined.

Ivaschenko (2003) examined the impact of poverty and public expenditures in Russia and found both variables to be significant in explaining observed variations in longevity across regions and over time. This finding must be interpreted with caution, though, because the investigators did not control for the quality of expenditures: additional expenditures may have been made on activities ineffective in improving health outcomes. The need is to do better by focusing on effective policies and programs, and, in that context, increasing public expenditures on health as necessary.

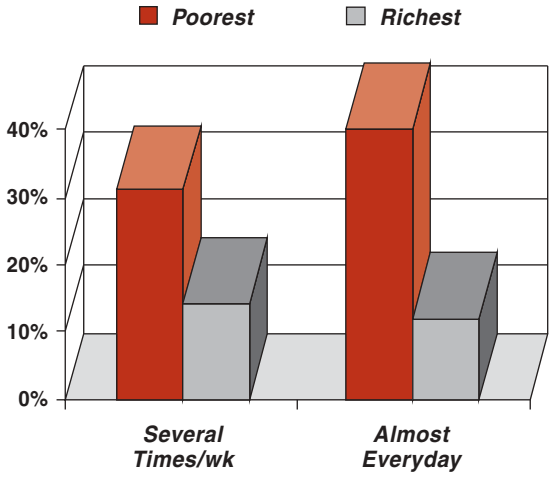
The concept of inequalities in health outcomes, which is commonly acknowledged in Western European countries, is less commonly discussed in Russia. Russia's very large regional variations in health status, noted earlier, are related in part to socioeconomic factors. Russian adults living in the most affluent region in 2001 could expect to live on average 20 years longer than those in the poorest region. And again, the gap may be widening: men in the most affluent region gained approximately three years in life expectancy between 1990 and 2001, while men in the poorest region made no gains.

Figure 4.3 Russians' self-reported health status, by consumption quintile, 2003



Source: NOBUS Survey, 2003.

Figure 4.4 Russians' self-reported use of hard alcohol, by consumption quintile, 2003



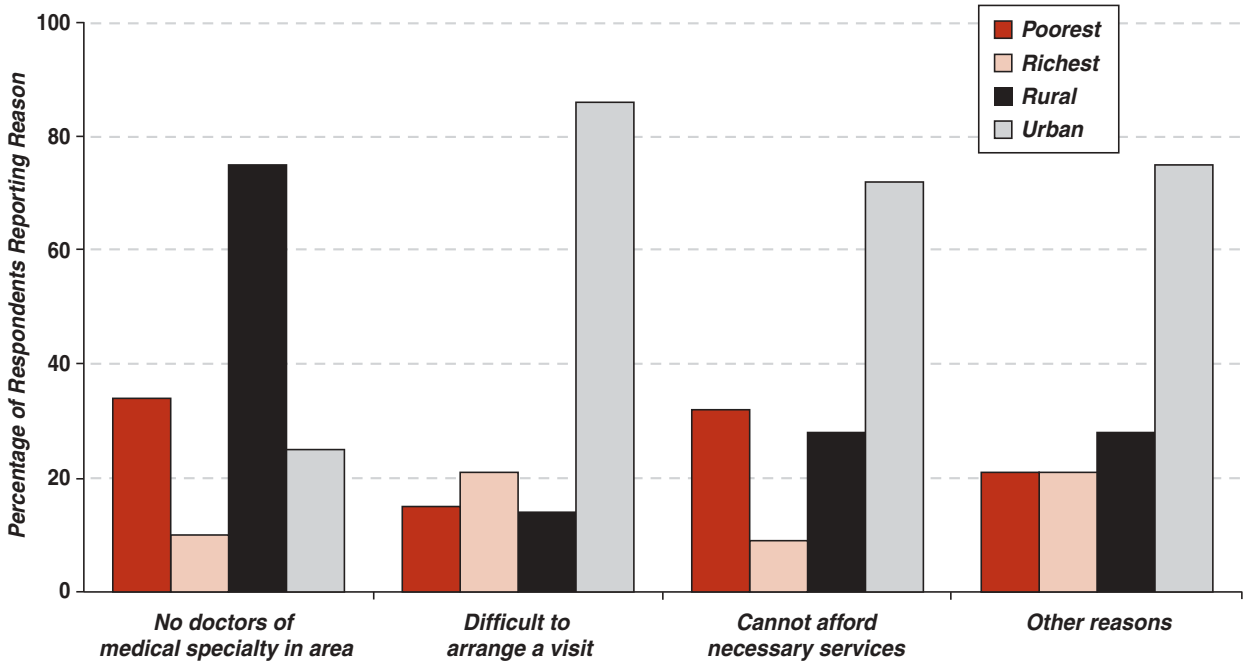
Source: NOBUS Survey, 2003.

Furthermore, the NOBUS survey found that individuals in the poorest quintiles in Russia were more likely to self-report bad or very bad health status than men in richer quintiles (Figure 4.3).

The NOBUS survey also found that individuals in poorer quintiles were more likely to report frequent consumption of hard alcohol than those in richer quintiles (Figure 4.4).

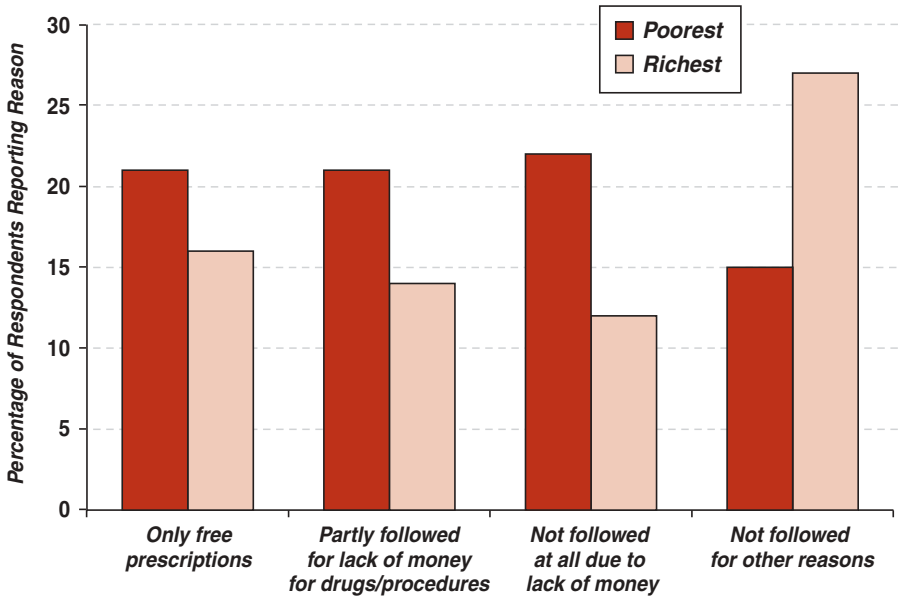
NOBUS data additionally show that poor people have greater problems accessing health care than richer people. The percentage of respondents in the poorest quintile who reported they could not afford necessary

Figure 4.5 Self-Reported Reasons for Not Seeking Health Care, by Consumption Quintile, 2003



Source: NOBUS 2003.

Figure 4.6 Self-Reported Reasons for Not Following Prescribed Treatment, by Consumption Quintile, 2003



Source: NOBUS 2003.

services was more than three times the percentage of respondents with that report in the richest quintile (Figure 4.5 on page 43). Those in the poorer quintiles were also three times as likely to report the lack of a local specialty doctor as a reason for not seeking care. Rural respondents reported particular problems with the availability of medical specialists.

Lastly, almost 75 percent of households in the NOBUS survey reported that they had completely followed prescribed treatment following a visit to the physician. The remaining 25 percent gave several reasons for not doing so (Figure 4.6). These data indicate what could be anticipated: poorer people are more likely to face issues related to the affordability of health care.

Road safety-related risk factors

As noted in Chapter 3, standardized death rates from traffic accidents are much higher in Russia than Europe. Alcohol impairment is an important factor in crashes and contributes significantly to crash injury (as crash risk starts to rise sharply at levels of 0.04 gram per deciliter [g/dl]), legal blood alcohol concentration [BAC] limits set at 0.10 g/dl allow triple the risk of 0.05 g/dl). Failure to use seat belts and child restraints more than doubles the risk of serious and fatal injury, but the National Survey of Household Welfare and Program Participation (NOBUS)[4] found that a high portion of drivers do not wear seat belts. In some regions, the prevalence of Russians refusing to wear seat belts is close to 50 percent for men and 33 percent for women. This cultural trait of a "long-held contempt for safety rules" was observed by a researcher at Russia's Institute of Ethnology and Anthropology (Abdullaev 2004) and may contribute to the high injury death rate. Pedestrians, cyclists, and motorized two-wheel-vehicle users also bear a disproportionate share of the injury burden and are at a high risk of crash injury. Finally, inadequate post-crash care, particularly pre-hospital care offered by a well-established ambulance and communication network and medical teams, is a major risk factor in some regions that contributes to injury, disability and death.

Worksite Safety

The occupational environment often presents a considerable risk to the health of employees. Exposure to an unfavorable occupational environment results in fatal injuries, nonfatal injuries, and work absences. Data show an increased risk of developing cancer in some industries (e.g., ferrous and nonferrous metallurgy and asbestos-textile production; MOH 1994). Relevant 2001 data are in Table 4.5. Creating and sustaining a preventive safety and health culture at the workplace would help to reduce the number of work-related deaths, ill health, and disability each year.

Interaction among Risk Factors

The synergistic effect of several health risk factors acting on any individual has been mentioned previously but bears repeating. The relative risk of developing NCDs

[4] Performed in 2003, NOBUS included a sample of about 44,500 households and is representative both nationally and for 46 of the larger subjects of the Russian Federation. It captures a range of aspects of household welfare and has a strong focus on household access to social services.

and suffering injuries increases sharply when various risk factors combine. As many as two-thirds of all cases of NCDs and injuries are attributable to smoking, unhealthy dietary habits, physical inactivity, psychosocial risk factors, alcohol abuse, and drug and toxic substance abuse. In Moscow a long-term prospective epidemiological study (1977-87) found that when two or three major risk factors (smoking, hypertension, and high cholesterol levels) combine, mortality from all causes and from CVD doubles compared to only one (MOH 1994). Risk factors more prevalent among the poor contribute to increases in the burden of illness and disease in low-income groups.

Young Russians add to these health risks by frequently engaging in other risky behaviors, such as unsafe sex, injecting drugs, needle sharing, and a general neglect of safety rules (UNICEF 2004; Abdullaev 2004). All of these behaviors point to a worrisome picture of a possible epidemic in HIV infection, other sexually transmitted infections, and tuberculosis that will compound the already-negative effect of NCDs and injuries on young Russian adults.

Since risk factors are so prevalent, synergistic, and often combined in individuals, addressing several rather than focusing on one at a time would have a multiplicative result in reducing morbidity and mortality. To effectively address these risk factors, as will be argued in the following chapters, will require societal commitment to a broad health promotion and disease prevention policy, not only to encourage people to make positive lifestyle changes, but also to create a physical and social environment supportive of such change.

Policy Implications

Different researchers have stressed that the understanding of the current poor state of health of the Russian population is contentious and provisional. Why is this?

First, compared to many other industrialized countries, in particular those in the G-8, Russia has very little systematic surveillance and monitoring of these factors at a population level. That is, sources of information on prevalence of smoking, hypertension, and obesity from representative samples of the Russian population are few and far between. In addition, most of the existing data

Table 4.5 Occupational Accidents and Work-Related Disease, Russian Federation, 2001

Economically active population	
Number	69,731,000
Percentage	48
Total employment	64,710,000
Work-related fatal accidents	
Accident causing 3 days' absence	4,789,749
Work-related mortality	130,533
Work-related diseases	117,981
Deaths caused by dangerous substances	26,015
International Labor Organization estimate of fatal accidents (correction rate 1.126)	6,276
Industry	3,021
Service	2,440
Agriculture	815

Source: World Bank 2005b.

are based on self-reports and thus underestimated, including, for example, the prevalence of hypertension, hypercholesterolemia, and obesity.

Second, the Russian people have been the subject of very few epidemiological studies on the etiology of the conditions that are driving the exceptionally high mortality among men (and women) of working age. Consequently, current understanding of disease etiology in Western countries cannot easily transfer to Russia, particularly with respect to cardiovascular disease. For example, recent studies note that the evidence that established risk factors explain most of the worldwide incidence of acute myocardial infarction is less convincing for Eastern Europe and the former Soviet Union. Specifically, the pattern of sporadic binge drinking of spirits that appears to distinguish Russian alcohol consumption from most other countries may well be associated with many sudden deaths—some of which may be erroneously classified as myocardial infarctions.

The paucity of adequate surveillance and monitoring data and of etiological evidence is itself a reflection of the serious lack of research and monitoring capacity. The level of research activity on the major causes of morbidity and mortality in Russia is lower that other

industrialized and G-8 countries. Epidemiology and public health in Russia retain much of the same focus as in the Soviet period. Epidemiology is principally about the surveillance and control of infectious diseases. Risk factors for disease are generally conceived of relative to the external environment—such as air pollution or even excessive noise levels. Knowledge and expertise in the use of epidemiological methods for studying non-communicable diseases common in industrialized countries (including cohort and case-control studies) is not widespread in Russia. Moreover, modern methods for assessment of efficacy of interventions or treatments, such as the randomized controlled trial, are not well known.

To be able to address effectively the threat from non-communicable diseases and injuries, Russia must broaden public health and epidemiological training and surveillance from its current relatively narrow emphasis on the monitoring and control of infectious diseases and environmental risk factors. In addition, knowledge of methods for evaluating the efficacy of interventions, both medical and community based, needs to be strengthened. Attention should be paid to building research capacity in public health and epidemiology to quickly increase the level of research activity conducted in Russia

While there clearly are many open questions on the current health crisis in Russia, and there is much to be studied, the policy implications are clear: without any reasonable doubt tobacco, alcohol abuse, and some aspects of national diet and physical inactivity are major causes of premature mortality, ill health, and disability in Russia. These are also factors where effective and measurable interventions are available that generate benefits in years rather than decades as demonstrated in several developed countries, such as Finland and the United States.

Chapter 5. The Impact of NCDs and Injuries on Health Care Costs

Non-communicable disease and injuries impose two types of costs on a society: direct and indirect. Direct costs are those that result from the consumption of hospital and other high-cost health care services. Russia's total health expenditures per capita were US$535, or 6.2 percent of GDP in 2002—an amount that represents less than 20 percent of the per capita health expenditures in France and Germany. Indirect costs are costs that result from ill health on individuals' productivity and income-generating potential. For example, the annual cost of cardiovascular disease (CVD) in the United States in 2003 was estimated at more than US$351 billion (AHA 2003). Of this, 60 percent (US$209.3 billion) was direct costs (hospital and nursing home care, physicians and other professionals, drugs, medical durable equipment, and home health care) and 40 percent (US$143 billion) was indirect (lost productivity from illness, disability, and death).

This chapter analyzes Russia's direct costs of NCDs and injuries and the impact of those costs on the budgets of the government, insurance organizations, and patients. The methodology, results, and policy implications of the analysis are detailed below.

Study Method

First, costs for NCDs and injuries in Russia were estimated for this study (Frid 2005) based on insurance and budgetary statistics for two regions—Chuvash Republic (an agricultural region) and Kemerovo Oblast (an industrial region). Each region's insurance company records covering the previous three years were examined. The entire population is covered by health insurance, so the sample is representative for these regions; the data may also be representative of other regions with similar characteristics but perhaps are not fully representative of large urban areas. The databases for Chuvash Republic and Kemerovo Oblast had 904,944 and 347,879 records, respectively. Treatment cases were summarized by diagnosis and by specialty unit in hospitals and outpatient clinics.

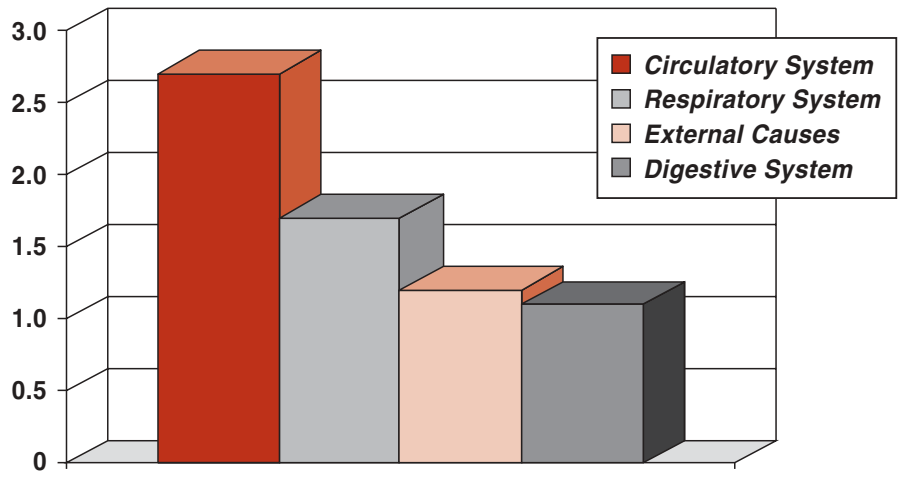
Cost per patient day was used in calculating the cost of inpatient care. The average cost per patient day was calculated using actual cost data and was adjusted for case mix. Budgeted and actual costs were available for individual health care units based on the following classification: salary and payroll taxes, meals, drugs, supplies, rent, and depreciation of equipment and buildings. This approach captured expenditures from the rayon and oblast levels, and facilitated the development of estimates of national level expenditures. The detailed cost data were linked with aggregate national level numbers on diagnoses, admissions, outpatient visits, and overall volumes of care. Interregional variations for input costs were used to adjust overall national estimates. The analysis then adjusted these figures across regions and used national estimates to derive national expenditure patterns. Outpatient costs were estimated using national level ratios of costs incurred for outpatient episodes.

Government and insurance expenditures constitute only a portion of total health expenditures in Russia, which has substantial formal and "informal" payments made by patients. Formal expenditures are mostly pharmaceuticals provided on an outpatient basis, while informal ones are demanded by health service providers. Together, these payments are significant, perhaps as much as 54 percent of total health expenditures (Shishkina et al. 2004). The analysis allocated estimates of informal payments to actual cost categories. These estimates were derived from the 2003 NOBUS survey and detailed studies by the Independent Social Science Research Institute in Moscow, which used household survey data collected over the previous five years. These studies provide information on each level of care and distinguish between formal and informal payments.

The analysis excluded costs related to emergency care, expenditures for drugs purchased by patients to take

Figure 5.1 Health Care Expenditures to Treat the Four Most Costly Disease Categories, 2003

US$ billions



Source: Frid 2005.

home, and expenditures for targeted programs, such as HIV/AIDS. These exclusions render the estimates low.

Results

The 2003 cost estimates from two regions in Russia were analyzed and extrapolated to the national level for this study using US$13 billion as the total health care expenditure figure, the widely accepted estimate of Russia's total health care expenditure, as a denominator, to determine the effect of NCDs and injuries on total health expenditures (Frid 2005). The results of those extrapolations indicated that the four broad groups of health conditions—circulatory system diseases, respiratory system diseases, digestive system diseases, and conditions due to external causes (as classified by the International Statistical Classification of Diseases and Related Health Problems, 10th revision [WHO: ICD])—account for an estimated 51.5 percent of total health expenditures in Russia in 2003. Figure 5.1 depicts these estimates by diagnostic group, with the highest at over US$2.5 billion and the lowest over a billion dollars, as follows:

- Expenditures for circulatory system diseases (i.e., hypertension, ischemic heart disease, and cerebrovascular disease) were US$2.7 billion (83 billion rubles) or 20.8 percent of total health expenditures.
- Expenditures for respiratory system diseases (i.e., acute upper respiratory infections, influenza and pneumonia, and chronic lower respiratory diseases) ranked second, accounting for US$1.7 billion (42 billion rubles) or 13.1 percent of the health expenditures.
- Expenditures for conditions due to external causes (i.e., injuries, accidents, poisonings, and burns) ranked third, accounting for US$1.2 billion (36 billion rubles) or 9.2 percent of the total.
- Expenditures for digestive system diseases (i.e., diseases of the esophagus, stomach, and liver) ranked fourth, accounting for US$1.1 billion (35 billion rubles) or 8.5 percent of the total.

Table 5.1 disaggregates by diagnostic group the total government and nongovernmental health care expenditures for 2003 as a percentage of GDP, showing the rank in terms of expenditures for each diagnostic group. The four groups listed above rank highest in terms of Russian health expenditures, followed closely by mental and behavior disorders, cancer, musculoskeletal system diseases, and genitourinary system diseases. The fact that infectious and parasitic diseases ranked 10th is evidence that Russia is still facing an unfinished agenda of infectious diseases along with a rising burden of NCDs and injuries.

Estimates of expenditures for circulatory system diseases, Russia's highest disease group by health care expenditure, are disaggregated in Table 5.1. Cerebrovascular disease is the most expensive condition in this group, accounting for US$565.6 million (21 percent) of the total. Also particularly high are expenditures attributed to hypertensive (high blood pressure) diseases. High-cost medical conditions not shown in Table 5.2 on page 52 include:

- Asthma: US$286 million (8.8 billion rubles);
- Fractures, injury, poisoning, and certain other consequences of external causes: US$268 million (8.2 billion rubles);

- Diabetes, malnutrition, and obesity: US$151 million (4.6 billion rubles);
- Gastric and duodenal ulcers: US$106 million (3.3 billion rubles); and
- Anemia: US$28 million (861 million rubles).

Policy Implications

This chapter shows the relative importance of NCDs and injuries on total health care costs in Russia. Many of the NCDs and injuries that cause death and disability in the Russian population are preventable with changes in lifestyle to eliminate the risk factors—namely, tobacco use, alcohol abuse, high blood pressure, high choles-

Table 5.1 Estimated Government and Nongovernment Health Care Expenditures (and Percentage of GDP) to Treat Diseases, by Diagnostic Group, 2003

US$ millions and Rub millions

Diagnostic group	*EXPENDITURES*		Percentage of Russia's GDP (estimated at 13.3 trillion rubles)	Rank
	Rubles	U.S. dollars		
Diseases of the circulatory system	83,094.6	2,708.4	0.62%	1
Diseases of the respiratory system	42,019.8	1,369.6	0.32%	2
Injury, poisoning and certain other consequences of external causes	36,478.4	1,189.0	0.27%	3
Diseases of the digestive system	34,713.3	1,131.5	0.26%	4
Mental and behavioral disorders	28,624.1	933.0	0.22%	5
Neoplasms (cancers)	26,521.8	864.5	0.20%	6
Diseases of the genitourinary system	25,636.4	835.6	0.19%	7
Diseases of the musculoskeletal system and connective tissue	25,429.7	828.9	0.19%	8
Pregnancy, childbirth, and the puerperium	21,600.3	704.1	0.16%	9
Infectious and parasitic diseases	20,983.7	684.0	0.16%	10
Diseases of the nervous system	14,000.5	456.3	0.11%	11
Diseases of the eye and adnexia	9,162.3	298.6	0.07%	12
Diseases of the skin and subcutaneous tissue	8,811.3	287.2	0.07%	13
Endocrine, nutritional, and metabolic diseases	7,623.9	248.5	0.06%	14
Certain conditions originating in the perinatal period	4,488.5	146.3	0.03%	15
Congenital malformations, deformations, and chromosomal abnormalities	3,577.1	116.6	0.03%	16
Diseases of the ear and mastoid	3,233.0	105.4	0.02%	17
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	1,684.8	54.9	0.01%	18
Symptoms, signs, and abnormal clinical and laboratory findings, not elsewhere classified	1,113.3	36.3	0.01%	19
Total	**398,797**	**12,999**	**3.0%**	

Source: Frid 2005.

terol, overweight, low fruit and vegetable intake, and physical inactivity—described in Chapter 4.

To compare Russia's highest-cost conditions against those of the United States, one can look at a study by Druss et al. (2002). Based on data from 1996, that study reports that the 15 highest-cost conditions in the United States (which include eight circulatory system and four respiratory system diseases) accounted for 44.2 percent of total U.S. health care spending. The two most costly conditions were ischemic heart disease and motor vehicle accidents; the most costly condition in Russia—cerebrovascular disease—ranked ninth in the United States in terms of expenditures.

Actuarial analysis would be needed to differentiate between the most expensive medical conditions at the national level and the most expensive condition to be treated at the individual level. In the Druss study, for example, respiratory malignancies are the most costly to be treated at the individual level, but they ranked 15th at the national level. Such differentiation between the national and individual levels would allow decision-makers to target morbidity more cost-effectively at the preventive and treatment levels, particularly to deal with future medical inflation that may result from aging and from rising expecations of the population, improved technology, increased care, and expanded scope of care.

Table 5.2 Estimated Government and Nongovernment Health Care Expenditures to Treat Diseases of the Circulatory System, 2003

US$ in millions and Rub millions

Diagnostic group			Diagnostic code	EXPENDITURES		Percentage
				Rubles	U.S. dollars	
Diseases of the circulatory system			I00-99	83,094.6	2,708.4	100.0%
Including:	*Acute rheumatic fever*		I00-02	1,419.3	46.3	1.7%
	Chronic rheumatic heart diseases		I05-09	6,829.9	222.6	8.2%
	Hypertensive diseases		I10-13	8,635.3	281.5	10.4%
	Stenocardia (angina pectoris)		I20	4,584.1	149.4	5.5%
	Acute cardiac infarction		I21-23	2,380.7	77.6	2.9%
	Other forms of acute ischemic heart disease		I24	128.3	4.2	0.2%
	Chronic ischemic heart disease		I25	3,065.1	99.9	3.7%
	Cerebrovascular diseases		I60-69	17,352.7	565.6	20.9%
	Including:	*Subarachnoid hemorrhage*	I60	336.6	11.0	0.4%
		Intracerebral and other nontraumatic intracranial hemorrhages	I61-62	6.429.2	209.6	7.7%
		Cerebral arterial occlusion, cerebral infarction	I63	2.372.1	77.3	2.9%
		Stroke unspecified as hemorrhage or infarction	I64	370.8	12.1	0,4%
		Occlusion and stenosis of precerebral and cerebral arteries; other cerebrovascular diseases	I65-67.1 I67.3-67.9	2.575.9	84.0	3.1%
		Cerebral atherosclerosis	I67.2	2.983.1	97.2	3.6%
		Other cerebrovascular diseases		2.462.1	80.3	3.0%
	Other circulatory system diseases			38,242.4	1.246.5	46.0%

Source: Frid 2005.

6

Chapter 6. How Do NCDs and Injuries Affect the Russian Economy?

Research increasingly indicates that a healthy population is not an automatic by-product of economic development, but can drive economic growth. Similarly, at the individual level, good health is an important determinant of economic productivity.[5] Little is known about the correlation of health and development for the transition countries in Central and Eastern Europe and the Commonwealth of Independent States that are facing a very particular health challenge, predominantly noncommunicable disease and injuries. This chapter takes a first step toward analyzing the issue in Russia.

Earlier chapters cite findings that the health status of the Russian population compares unfavorably to those of other G-8 countries. In light of those findings, this chapter describes the effect adult ill health, in particular that due to non-communicable disease (NCD) and injuries, has had on the Russian economy and the economic outcomes of its population.

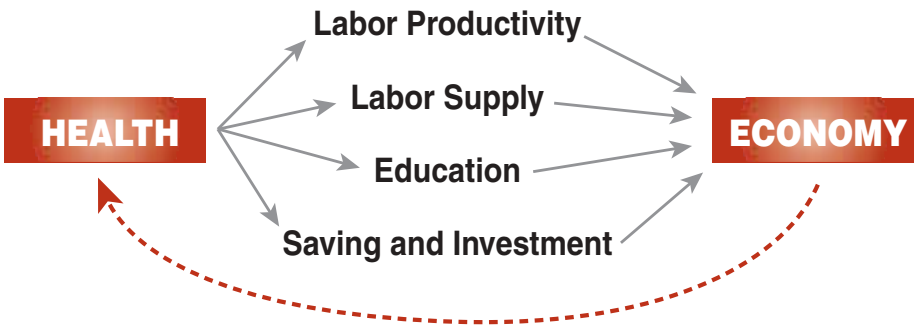
Conceptual Framework

Figure 6.1 shows the channels through which health could contribute to an economy and ultimately economic growth. Four channels are shown, though others may exist: enhanced labor productivity, greater labor supply, education and training fostering higher skills, and more savings available for investment in physical and intellectual capital. The figure also shows that as an economy grows, health improves. Each channel is described in turn below.

Labor productivity. Healthier individuals could reasonably be expected to produce more per hour worked. On the one hand, productivity could be increased directly by enhanced physical and mental activity. On the other hand, more physically and mentally active individuals could make a better and more efficient use of technology, machinery, and equipment. A healthier labor force could also be expected to be more flexible and adaptable to changes (e.g., changes in job tasks and the organization of labor), reducing job turnover with its associated costs (Currie and Madrian 1999).

Labor supply. Somewhat counter-intuitively, economic theory predicts a more ambiguous impact of health on labor supply. The ambiguity results from two effects working to offset each other. If the effect of poor health is to reduce wages through lower productivity, the substitution effect would lead to more leisure and therefore lower labor supply as the return for work diminishes. On the other hand, the income effect would predict that as lifetime earnings are reduced through lower productivity, the individual would seek to compensate by increasing the labor supply. The income effect is likely to gain importance if the social benefit system fails to cushion the effect of reduced productivity on lifetime earnings. The net impact of the substitution and income

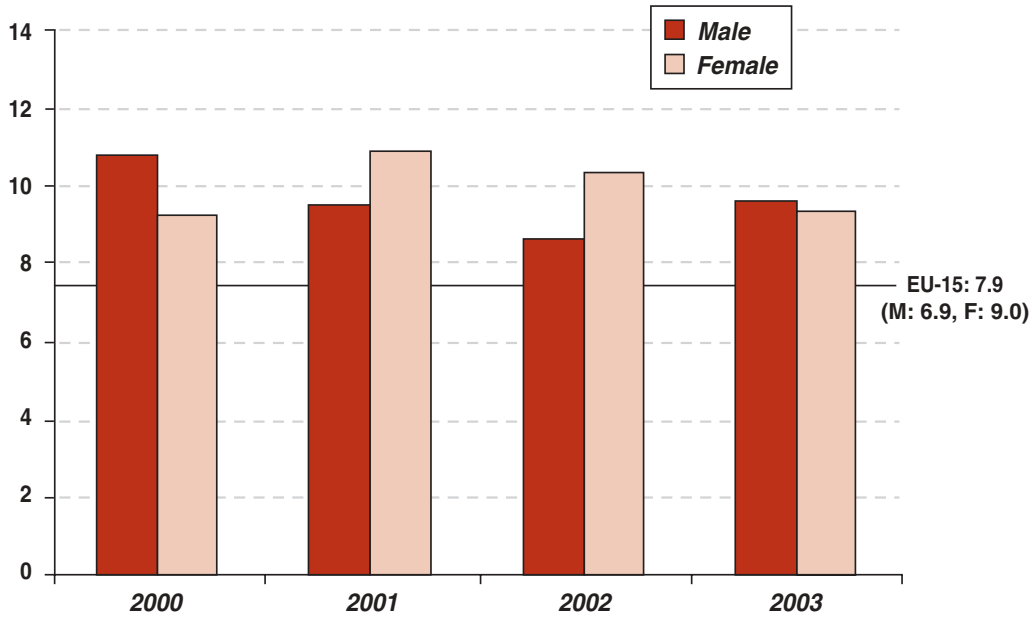
Figure 6.1 From Health to Wealth (and Back)



Source: Adapted from Bloom, Canning and Jamison (2004).

[5] The Commission on Macroeconomics and Health (CMH 2001) has developed a comprehensive body of work reviewing and contributing to the literature on the economic benefits of improving health in low-income countries. See Suhrcke et al. (2005a) for a literature review on the economic benefits of health in the high-income context.

Figure 6.2 Annual Average Days of Absence Due to Illness, per Employee, Russia and EU-15 Countries



Source: Suhrcke et al. 2005b. Russian data are from RLMS rounds 9-12; the Russian figures were obtained by multiplying the RLMS monthly figures by 12. EU-15 data refer to the year 2000 and are from the European Survey of Working and Living Conditions.

effects ultimately becomes an empirical question (Currie and Madrian 1999).

Education. Human capital theory suggests that more educated individuals are more productive (and obtain higher earnings). If children with better health and nutrition attain higher education and suffer less from school absenteeism and dropping out of school early, then improved health in youth would contribute to future productivity. Moreover, if good health is also linked to longer life, healthier individuals would have more incentive to invest in education and training, as the rate of depreciation of the gains in skills would be lower (Strauss and Thomas 1998).

Savings and investment. The health of an individual or a population is likely to impact not only the level of income but also the distribution of income among consumption, savings, and investment. Individuals in good health are likely to have a wider time horizon, so their savings ratio may be higher than that of individuals in poor health. Therefore, a population experiencing a rapid increase in life expectancy may be expected, other things being equal, to have higher savings. This should also contribute to any propensity to invest in physical or intellectual capital (Bloom, Canning, and Graham 2003).

What Effect has Adult Ill Health had on the Economic Outcome of the Population?

The overarching answer from an assessment prepared for this study is clear: poor adult health in Russia negatively affects economic well-being at the individual and household level (Suhrcke et al. 2005b). If effective action were taken in Russia, improved health would play an important role in sustaining high economic growth rates at the macro-level. The main findings of this assessment are:

Work absenteeism. Work absenteeism due to illness is a widely used, if imperfect, illustration of the effect of illness on labor supply. Figure 6.2 shows the annual average number of days of absence from work due to illness in Russia, calculated using data from the Russian Longitudinal Monitoring Survey (RLMS), compared

with the latest-available EU-15 data (2000). Although this indicator has a disadvantage in that it reflects both the burden of ill health and the incentives created by employment policies, it still reflects comparative lost productivity. On average 10 days are lost per employee per year due to illness in Russia, while in the EU-15 countries the average is 7.9 days (Paoli and Merllié 2003).

Table 6.1 Estimated Cost of Absenteeism Due to Illness in the Russian Federation

US$ billions

	Total wage loss	Total wage loss as share in GDP	Total production (GDP) loss	Total production loss as share in GDP
2000	40.33	0.55%	97.38	1.34%
2001	52.01	0.68%	105.17	1.37%
2002	56.62	0.71%	104.03	1.30%
2003	60.96	0.71%	112.87	1.31%

Source: Suhrcke et al. 2005b. Calculations based on RLMS absenteeism data.

Note: See appendix B table B1 for details of the calculation. The annual average missed days in Russia are obtained by multiplying the monthly RLMS figures by 12.

The cost of absenteeism due to ill health

The international experience. Sickness absence incurs a direct cost of the sickness benefits paid to absent employees (when applicable) as well as the indirect cost of lost productivity. A report (European Foundation for the Improvement of Living and Working Conditions 1997) provides information on the costs of work absenteeism: in the United Kingdom in 1994, lost productivity due to sickness absence was about US$19.7 billion. In Belgium, about US$3.5 billion was paid in 1995 in sickness benefits and benefits for work-related injuries and occupational diseases. In 1993, payments to cover absences from work were assessed to be up to US$37.8 billion in Germany and US$19.3 billion in the Netherlands (out of which one-fourth was for benefits for sickness absence and three-fourths were for disability benefits).

The cost in Russia. The overall cost associated with the reported workdays lost to illness in Russia varies between 0.55 percent and 1.31 percent of GDP (see Table 6.1), depending on the method of estimation. Annual absenteeism rates in Figure 6.2 can be converted into a monetary value either by using the average wage rate (resulting in the lower value) or the GDP per capita (resulting in the higher value). In 2003, the total wage loss in Russia is estimated at US$60.9 billion, while the total production loss is estimated at US$112.8 billion. This is a significant impact, given that the indicator fails to capture the many other ways ill health impacts the labor market. In particular, it does not capture the effects of reduced productivity and mortality. In a theoretical model, Pauly et al. (2002) examined the magnitude and incidence of costs associated with absenteeism under a range of assumptions regarding firm size, production function, nature of the firm's product, and competitiveness of the labor market. The conclusion is that the cost of lost work time can be substantially higher than the wage if perfect substitutes are not available to stand in for absent workers, production involves teamwork, or a penalty is associated with failing to meet an output target.

The impact on the labor supply. Significant research (for example, Currie and Madrian 1999; Suhrcke et al. 2005a) has explored the impact of ill health on the labor market in high-income countries. Such research shows a negative impact on both labor productivity and supply. Mitchell and Burkhauser (1990) used the U.S. Survey of Disability and Work in 1978 to find that arthritis reduced wages by 27.7 percent for men and 42.0 percent for women. Moreover, it reduced the number of hours worked by 42.1 percent and 36.7 percent, respectively, for men and women. Stern (1996), using the U.S. Panel Study on Income Dynamics of 1981, shows that limited ability to work due to illness reduced wages by 11.7 percent and by 23.8 percent for men and women, respectively, when a selection correction for participation in the labor force is introduced. In addition, the probability of staying outside the labor force increased by an estimated 13 percent. Using the same data, Haveman, Stone, and Wolfe (1994) estimate that ill health decreased worked hours by 7.4 percent. Berkovec and Stern (1991), using data from the National Longitudinal Survey of Older Men (1966-83), found that poor health status reduced wages by 16.7

percent. Baldwin, Zeager, and Flacco (1994), using data from the Survey on Income Program and Participation of 1984, found that health limits reduced wages by 6.1 percent for men and 5.4 percent for women. While the varying percentages from these studies lead to theoretical ambiguity, at least in high-income countries there is overall more evidence of a significant negative impact of ill health on labor supply than on productivity (i.e., wage rates).

Among jobholders in Russia in the recent years, ill health appears to have had a significant and sizable impact on labor productivity, but less so on supply. The impact also seems to be more pronounced among males than females. These findings, while slightly different from some in Organization for Economic Cooperation and Development (OECD) countries, are not necessarily surprising, since the social welfare system in Russia operates very differently than that those in OECD countries, affecting the relationship between health and the labor market. In fact, the finding of a significant impact on the wage rate rather than on hours worked is evidence of health's particularly strong economic impact. The following subsection presents evidence of the existence of one labor supply effect of, in particular, chronic illness via its impact on early retirement.

The impact of chronic illness on early retirement. Many studies in industrialized countries have shown that ill health, and in particular chronic illness, affects the decision to exit the labor force: healthier people, other things being equal, tend to retire later than less healthy ones. Based on a review of various U.S. studies, Sammartino (1987) concludes that those in poor health are likely to retire between 1 and 3 years earlier than those in good health with similar economic and demographic characteristics. Bound, Stinebrickner, and Waidmann (2003), based on the analysis of data from the American Health and Retirement Study, estimated that a representative individual in poor health is 10 times more likely than a similar person in average health to retire before becoming eligible for pension benefits. Coile (2003) found that health shocks have a large effect on labor supply decisions by both men and women, mainly when accompanied by major changes in functional status. For example, the onset of a heart attack or stroke accompanied by an important deterioration in the ability to perform "activities of daily living" (e.g., dressing) was estimated to reduce the number of work hours supplied by men per year by 1,030 or to raise the probability of leaving the labor force by 42 percent. A comparable effect of a 654-hour decrease or a 31 percent increase in the probability of leaving the labor force was found for women.

Turning to evidence from European countries, Jiménez-Martin, Labeaga, and Martínez (1999) found that health,[6] particularly among men, was a very relevant factor in the decision to retire and for their spouse to retire with them. The authors used information on labor market transitions between 1994 and 1995 from the European Community Household Panel, pooling data from across the EU, to analyze retirement patterns of individuals and couples in a sample of men older than 54 years and women older than 49. Strong evidence of the influence of health status in the retirement decision was also found by Siddiqui (1997), using data from the German Socio-Economic Panel looking at men in West Germany who have reached the minimum retirement age (which, given the related policies in the country is considered to be 58 years[7]). Indeed, the degree of disability seems to be the dominant factor explaining early retirement, with the probability of leaving the labor force at the earliest possible age for disabled men being four times that of men without disability. As the author notes, these results suggest that improving employees' health could be a highly effective measure to raise the actual age of retirement.

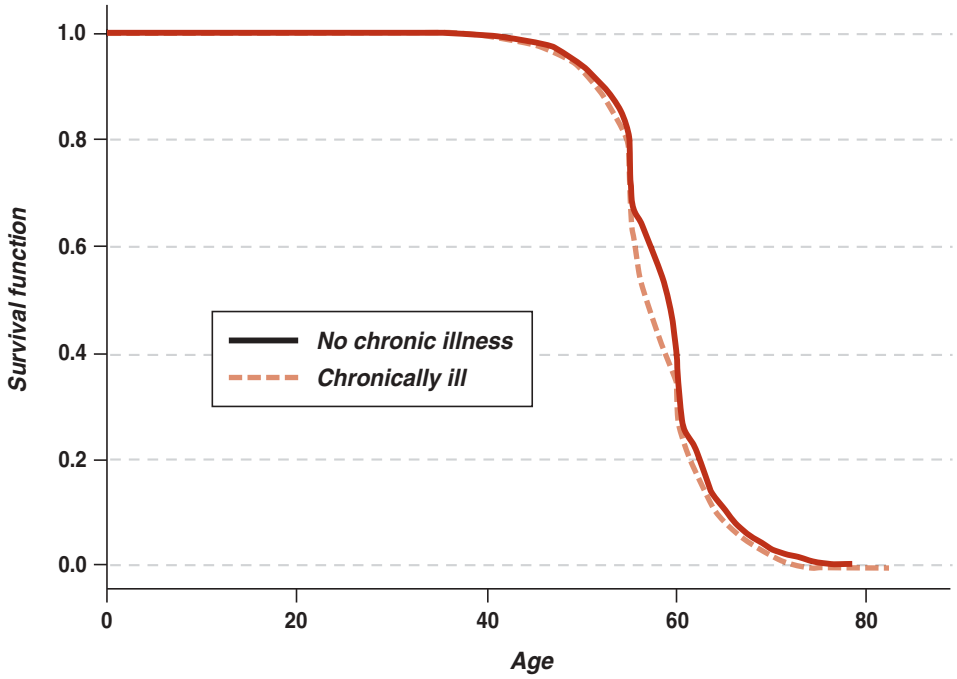
The impact in Russia. Applying the various approaches used in other countries to Russia's case reveals a statistically very robust and sizable impact of chronic illness on both age of retirement and on the probability to retire in the subsequent year. Two different, complementary approaches were followed: a Cox regression and a panel logit regression. Controlling for other relevant determinants of the decision to retire (e.g., age, gender,

[6] The health variables refer to year 1994 (to minimize the endogeneity bias) and include the following indicators: self-reporting good health, self-reporting a chronic physical or mental health problem (data available only for 1995), having been admitted as an in-patient during the previous year, having visited a doctor between one to five times in the year, and having visited a doctor more than five times in the year.

[7] The self-employed were withdrawn from the sample due to their different pension systems.

income), both approaches confirm the result that chronic illness increases the probability of retiring early. The former approach assesses the effect of chronic illness on the probability that an individual will retire in a given year after the first year of employment; this methodological limitation leaves the direction of the causality uncertain: does ill health predict retirement or vice versa? The second approach addresses this limitation by examining the effect of chronic illness on the probability of retiring in the subsequent year.

Figure 6.3 Probability to remain in the workforce with and without chronic illness in Russia, by age - based on Cox regression model



Source: Suhrcke et al. 2005. Calculations based on RLMS round 11; Cox regression results in the annex

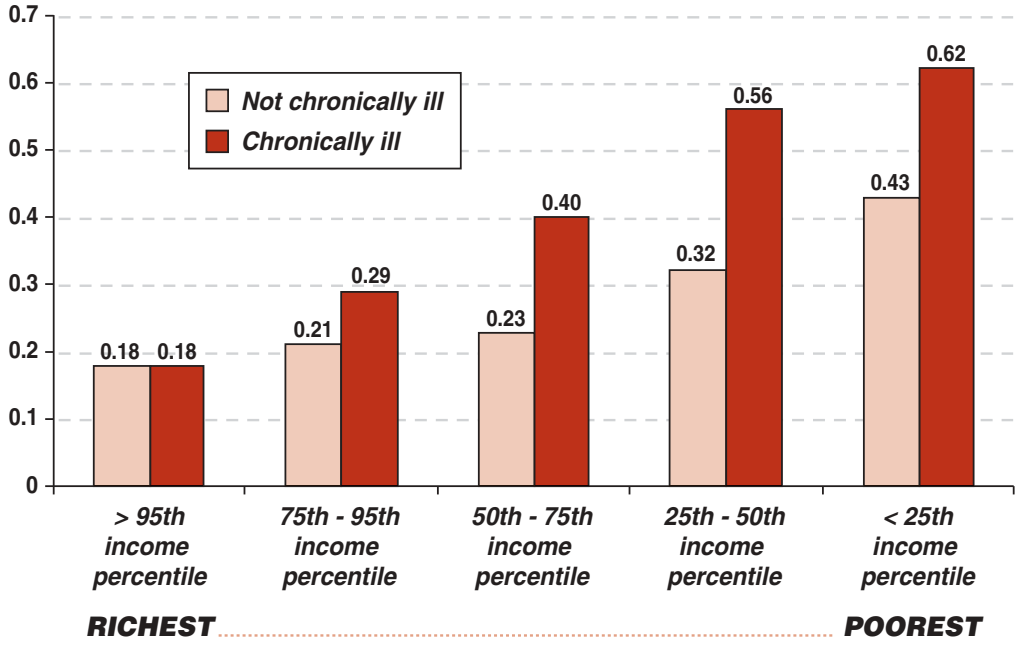
As shown in Figure 6.3, the Cox regression indicates that a hypothetical male individual aged 55 on median income and having certain other average characteristics [8] in Russia would be expected to retire at age 59, while a chronic illness would lower his expected retirement age by two years to 57 years. While the technical details of the regression results can be difficult to interpret, they are more intuitively understandable if applied to a hypothetical individual. Similar results are obtained for females. However, only evidence of an existing association between chronic illness and earlier retirement is shown, since it is not possible to determine the time of onset of an individual's chronic disease with the available data. In particular, whether the illness occurred before or after retirement is unknown. This analysis does not indicate whether the statistical association reflects the effect of chronic illness on retirement or vice versa. It is, however, possible to address this issue by using a panel logit regression (see appendix B table B13).

The panel logit regression results show that an individual who suffers from chronic illness has a significantly higher probability of retiring in the subsequent year than the same individual free of chronic illness. Some of the respondents in the RLMS have been followed over several survey years.[9] This allows the use of a panel logit regression to assess the impact of chronic illness in one year on the probability of retirement the next: the effects of chronic illness on the probability of entering retirement in the next year are assessed, not the effect on the probability to retire at a given year after first employment. Otherwise, the set of explanatory variables to be controlled for is identical to the Cox model. The results (presented in appendix table B13) show a pattern similar to those in appendix table B15 based on the Cox regressions, with only minor differences. Chronic illness emerges as a highly significant predictor of subsequent

[8] The other characteristics of this hypothetical individual are that he is married, has one child, has a high school diploma, was born in Russia, and is living in an urban area.

[9] This is the "panel" component of the RLMS, which in principle offers important opportunities for testing hypotheses that involve a causal perspective. One shortcoming of this panel dimension is that it does not feature a true panel design, as both entire households and individual members of households are not followed if they move from their dwelling. Nevertheless, the effect of attrition is relatively modest.

Figure 6.4 Average Predicted Probability to Retire in the Subsequent Period for Hypothetical Male at Varying Income Levels in Russia (Based on Panel Logit Model)



Source: Suhrcke et al. 2005b. Calculations based on RLMS rounds 9-11.

Note: Results refer to the hypothetical individual described in the text.

retirement. Given the different methodology, this result provides a more reliable basis for claiming causality between chronic illness and the probability of retirement. The magnitude of its effect is large compared to other variables in the model.

In either approach, the effect of chronic illness is found to vary with income: the lower the income the more chronic illness affects the decision to retire. This implies that less-affluent people carry a double burden of ill health: first, they are more likely to suffer from chronic illness, and second, once ill, they suffer worse economic consequences than rich people, a feature that tends to perpetuate socioeconomic disadvantage.[10] Technically speaking, this result is reflected in the statistically significant interaction term between income and chronic illness in the regression models. Figure 6.4 exemplifies the gradient of the impact on the basis of the panel logit model: among males with a very high income, the presence of a chronic illness has no effect on retirement age, while men just below the average of the income distribution (i.e., in the 25th to 50th income percentile) have a 24 percentage point higher probability of retiring early compared to their healthy counterparts. As for the Cox regression, the differential impact can be illustrated by comparing the effect of chronic illness in the hypothetical individual described above to another with the same characteristics but a lower income equal to 50 percent of the median: he will retire, on average, at 58.8 years without a chronic illness but at 56.3 if a chronic illness is present, a gap of 2.5 years and 6 months earlier than the richer individual (see appendix B for more detailed results).

The impact of alcohol consumption on the probability of being fired. Several studies in other developed countries have shown that heavy alcohol consumption has a negative impact on earnings, incomes, and wages, because it reduces individual productivity and may create problems with working arrangements (Mullahy 1991; Cercone 1994). In this section these results are applied to the available Russian data by exploring whether alcohol consumption in one year (2001, round 11 of RLMS) increased the risk of job loss in the subsequent year (2002, round 12). The rationale is that job loss would be a natural consequence of an appreciable reduction in individual productivity.

[10] Note that this approach does not allow exploration of a similar variation of the effect of ill health across the income scale in the wage and earnings regressions presented above. This would require a different approach, for instance a quantile regression (see, for example, Rivera and Currais [1999] for an application of quantile regressions to Brazil).

This assessment shows that one negative economic impact of severe alcohol consumption, arguably an important contributor to premature mortality in Russia, is that it significantly increases the probability of job loss. Using a panel probit model and controlling for gender, age, education, work experience, wage rate, and the ownership type of the employing organization, it was found that alcohol has a positive and statistically significant effect on the probability of being fired (see appendix B table B16 for details and results). This may reflect the simplified structure of the estimated model: further research would disentangle the complex but no doubt important effects of alcohol on the Russian labor market.

The impact on Russian families. The death of a household member was found to increase the probability of suffering depression by 53 percent when controlling for other relevant factors. The panel dimension of the RLMS (rounds 11 [2002] and 12 [2003]) were exploited, which enabled the assumption of a more causal interpretation of the results. The sample included only the individuals who were members of those households whose composition remained constant in 2002 and 2003 or was altered because one or more members died. Using probit analysis and controlling for relevant variables, the effect of a household member's death in 2002 on the probability that any surviving household member experienced a depression in the subsequent year was explored (detailed results are in appendix table B18). As expected, the probability of depression decreases with the age of the deceased. The possible differences in per capita income were also controlled for, in order to check whether depression was related to this factor rather than the death, and it appears that income differences do not affect the probability of depression.

Alcohol consumption was found to increase by about 10 grams per day as a consequence of the death of an unemployed household member and by about 35 grams if the deceased was employed. Using the same two years, a tobit model including essentially the same control variables as in the depression model were employed. Surprisingly, if the deceased was the household head, no independent impact was found, at least not in the short term examined (detailed results are in appendix table B18).

Effect of chronic illness on the household income in Russia. Chronic illness has negatively impacted household incomes in Russia, particularly in the period 1998-2002. In order to address some technical constraints on estimating the causal effect of health on economic outcomes, mainly the issue of endogeneity of the health proxy, a strategy was used here that differs from that of the other analyses undertaken for this study. A difference-in-differences estimator combined with a propensity score-matching technique was applied to the RLMS surveys from 1994 to 2002. Essentially, this technique allowed a comparison of pairs of households that are identical except for the presence of health problems (details of the methodology and the results are described in appendix B section 5).

Using a two-step procedure, chronic illness was found to contribute to an annual loss of 5.6 percent of per capita median income for a hypothetical individual with given characteristics (i.e., living in urban areas, with no smokers and no ex-smokers, no people aged over 60 or below 14, with at least two workers, and with at least one person who has a high school diploma). The first step confirmed a negative effect of poor health (in general) on household income. This effect is greater in the period 1998-2002 than before the financial crisis. A more detailed logit model then assessed the extent to which chronic illness increases the likelihood of experiencing adverse health events. Results show that chronic illness increases the risk of health problems. Combining the effect of chronic illness and poor health on income then gives the overall indirect impact of chronic illness on household income.

Policy Implications

The assessment in this chapter has demonstrated various channels through which health has affected various economic outcomes in Russia, aligning with findings from an increasing body of literature on health and the economy in other countries, both rich and poor. In each analysis, the results proved statistically highly significant and, where it could be assessed, of a notable size.

This shows how seriously ill health has negatively affected individual and household economic outcomes in Russia. The findings are consistent with studies on the

same topic in other countries but improves on them since they were largely confined to issues related to infectious disease or child and maternal health conditions, diseases that characterize developing countries and may have limited relevance to European countries. Some might have thought that diseases that allegedly strike the individual at a later stage in life would have only very minor economic importance, but the analyses here show that this hypothesis does not withstand empirical scrutiny. Adult health matters not only intrinsically, but also economically. The policy implications are:

- Investing in adult health is a sound investment strategy likely to yield tangible economic returns, on top of the human benefits.
- Policy makers interested in the economic future of Russia and its people would more likely succeed by incorporating health into their portfolio of investment strategies.
- Given the magnitude of economic benefits that can be expected from improving adult health in Russia, any reasonable and well-designed increase in the resources devoted to health, both in- and outside the health system, would produce a significant economic return. The challenge is of course not solely to increase resources, but also to put existing resources to better use.

7

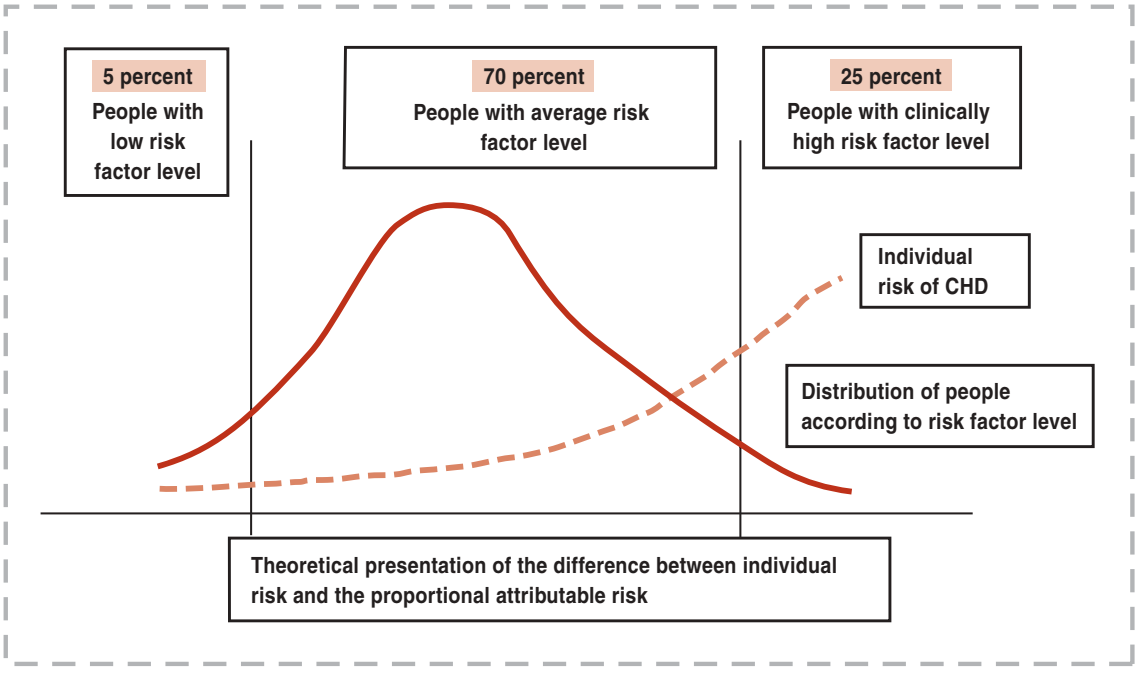
Chapter 7. What Strategies and Interventions Prevent NCDs and Injuries?

A number of developed countries have implemented a full range of effective strategies to prevent deaths and illnesses from NCDs and injuries. The research on effective policy measures and NCD risk factor interventions is growing steadily, enabling decision-makers to make informed policy choices. While the level of impact varies by strategy, local circumstances, and resource availability, the overwhelming evidence nevertheless suggests that an integrated strategy is most effective. That is, as demonstrated by the successful experience of the North Karelia Project in Finland, an integrated strategy incorporates all appropriate actions to reduce the burden of disease, including both population-based and high-risk prevention strategies (Box 7.1 on page 66).

The "population strategy" aims to change disease-related lifestyles, environmental factors, and their social and economic determinants in an entire population (e.g., information and communication programs addressing the risks of smoking and the value of smoking avoidance, excise and other taxes aimed at reducing smoking uptake and intensity, and restrictions on smoking in public places and on tobacco advertising). The main argument for this strategy is that it targets a high proportion of NCD morbidity and mortality: the majority with risk levels near the mode of the distribution, the 70 percent group in Figure 7.1. This large group would benefit from interventions that are far less expensive than what high-risk group needs, making the population strategy a cost-effective way to reduce NCD rates.

In the "high-risk strategy," individuals at high risk of developing selected diseases are identified, and actions are planned to reduce their disease burden through provider-based interventions (e.g., clinical interventions

Figure 7.1 Distribution of Risk Factors in a Population



Source: Rose 1992, as shown in North Karelia Project Presentation, National Public Health Institute, 2005.

Box 7.1 An International Good Practice: North Karelia

The results:

The North Karelia Project in Finland shows that major changes in mortality from NCDs can be achieved through dietary changes, increased physical activity, and reduced smoking, serum cholesterol, and blood pressure. Coronary heart disease (CHD) in adults aged 65 years and less fell by about 73 percent between 1970 and 1995. In a recent 10-year period, mortality from coronary heart disease declined by about 8 percent a year. Mortality from lung cancer declined more than 70 percent, mostly due to consistent declines in the proportion of men who smoked (from 52 percent in 1972 to 31 percent in 1997). Data on the risk factors from ischemic heart disease and mortality in Finland suggest that the changes in the main coronary risk factors (serum cholesterol concentration, blood pressure, and smoking) can explain most of the decline in mortality from that disease.

As a result of targeting important high-risk factors for NCDs, all causes of mortality in North Karelia declined by about 45 percent during 1970–95. In the 1980s, these favorable changes began to develop all over Finland, improving life expectancy by 7 years for men and 6 for women. The largest decline in age-specific mortality was reaped by the 35- to 44-year-olds: men in this age group saw an 87 percent decline in mortality from CHD between 1971 and 1995. Men 35–64 saw age-adjusted mortality rates decline from about 700 per 100,000 population in 1971 to about 110 per 100,000 in 2001. This rate for all of Finland among men in the same age group was about 470 per 100,000 and fell 75 percent. These improvements in life expectancy are correlated with significant declines in the amount of saturated fats consumed, coming mainly from milk products and fatty meat (saturated fat consumption dropped from about 50 gr/day in 1972 to about 15 gr/day in 1992) and significant reductions in blood cholesterol levels (from about 7mmol/L in 1972 to about 5.6 mmol/L in 1997).

Success factors:

- *Appropriate epidemiological and behavioral framework*
- *Restricted, well-defined targets*
- *Good monitoring of immediate targets (behaviors, process)*
- *Flexible intervention*
- *Emphasis on changing environment and social norms*
- *Working closely with the community*
- *Positive feedback, work with media*
- *International collaboration, support from WHO*
- *Close interaction with national health policy, integration with National Public Health Institute*
- *Long-term, dedicated leadership*

Source: Puska et al. 1995

to treat and counsel individuals about risk factors for CVD—smoking, excessive alcohol consumption, hypertension, hyperlipidemia, diabetes and obesity; management of patients at high risk according to established clinical practice guidelines; and therapy for individuals once overt CVD has occurred). High-risk strategies pose a major task for health services, and their per-person costs can be high.

Data from North Karelia reveal that results from prevention efforts may appear in years rather than decade—improvements occur some 2-7 years after the

elimination of the exposure to a risk factor, and that they are beneficial even for people in older age groups.

International Evidence on Effective Interventions to Control Individual Risk-Factors Associated with the Onset of NCDs and Injuries

Interventions to Reduce Alcohol Abuse

Epidemiological research has shown that patterns and levels of alcohol consumption, alcohol dependency, and alcohol abuse are determined by many factors: availability; income per capita; retail process, individual factors (genetic and environmental), such as age of first use, family history, education, and peer group pressure; psychosocial factors, cultural and historical context; and government policies, such as taxation and restrictions on advertisement and promotion. The most effective approach to reduce alcohol-related problems would be a comprehensive set of measures aimed at these factors.

On the demand side, interventions shown to be effective at reducing consumption include price increases, public education campaigns, and counseling or brief intervention. Price increase at a national level through taxation is the most cost-effective measure and has the largest and quickest impact on habits, especially for heavy drinkers and young people, while raising revenues with low transaction costs (Babor et al. 2003; Chaloupka, Grossman, and Saffer 2002). Many Nordic countries have very high taxation rates on alcohols and have successfully controlled per capita consumption. Education campaigns can be useful for raising the awareness of risks and effects of behavior change if supplemented by interpersonal counseling or targeted at specific risk groups (Raistrick, Hodgson, Ritson 1999; Holder 1994). For example, media advocacy has been effective in reducing illegal sales to minors, reducing alcohol availability on campuses. and building support for alcohol control policies in the United States. Individual counseling or brief intervention from health professionals was found effective at reducing consumption or improving alcohol-related problems in a WHO cross-national study, a meta-analysis of 14 data sets, and other studies (Babor and Grant 1992; Babor et al. 1996; Poikolainen 1999). Brief interventions are most effective for those seeking to quit, but for the general population, they are not cost-effective.

Measures to control alcohol supply include government monopolies or licensing over sales of alcohol, regulations restricting availability (i.e., limits on the times and conditions of sales or service, minimum-age limits), and restrictions on drinking alcohol in public. About 18 countries surveyed in the WHO Global Status Report on Alcohol have government monopolies that could raise prices and restrict availability on outlets and hours of sale. About 30 countries have high levels of restrictions, particularly in the Americas region. The United States, for instance, has regulations at state and local levels to license or restrict sales. However, evidence is unclear on the effects of restricted time and somewhat mixed on the effects of restricted outlets (Anderson and Lehto1994). More than 100 countries have a minimum age limit for alcohol purchases. Research shows that age limits can reduce harm to young people, as in the United States where traffic accidents declined when the age limit was raised (Wagenaar 1993). About 60 countries have a total ban on alcohol in official settings such as government offices, education and health institutions, workplaces, and public transport. Since alcohol-free environments are locally enforced, less is known about the impact of this approach. Regulations have also been enacted to ensure product quality and to restrict the sale of surrogate alcohols. These measures need to be enforcement to be effective.

Other alcohol harm reduction interventions proven effective are strong laws against drinking and driving. These laws include low Blood Alcohol Content (BAC) limits, visible and frequent enforcement, and license suspension in case of an offence (Babor et al. 2003). A combination of these approaches has been shown to reduce both the number of cases of drunk driving and alcohol-related traffic accidents (Chaloupka et al. 2002). Overall, almost all countries have a defined legal BAC limits for driving, and more than half perform random breath tests.

Among the mix of interventions, less effective are policies to restrict alcohol advertising and school-based education programs. There is no conclusive evidence on either method due to implementation and evaluation difficulties. More than half of the countries the WHO surveyed have no restrictions on advertising in print or billboards. Broadcast media and advertisements on spirits are somewhat more restricted. However, since exposures through

marketing are likely to shape positive perceptions of drinking, the WHO recommends that countermeasures to advertising be part of a comprehensive alcohol policy. Similarly, although a systematic review of studies aimed at educational and psychosocial prevention programs reveals a general ineffectiveness (Foxcroft et al. 2002), these programs nevertheless complement other efforts to prevent the initiation of drinking among youth.

Interventions to Reduce Smoking Prevalence

A comprehensive approach combining economic and regulatory measures with community-wide programs has been identified by the U.S. Surgeon General to have the greatest long-term population impact (U.S. HHS 2000). Countries with successful tobacco control policies have focused on measures to reduce both the demand for and supply of tobacco. On the demand side, many studies concluded that increasing the price of tobacco and taxes does significantly reduce consumption, especially among young people, and higher taxes have reduced cigarette consumption in Canada, South Africa, United Kingdom, United States, Thailand, and many other countries. It is expected that higher taxes are more effective in low- and middle-income countries where smokers are more responsive to price increases (World Bank 1999). Government revenues from tobacco taxes can be applied to anti-smoking activities, such as health education, health services, or counter-advertising campaigns, as being done in parts of the United States and China.

Non-price control measures and policies, such as consumer information, bans on advertising, and smoking restrictions in public places, have also proven to extensively reduce demand for tobacco. In the United States, smoking prevalence fell from above 40 percent to about 25 percent between 1950 and 1990. This period coincided with an increase in people's knowledge of the harmful effects of tobacco from below 45 percent to 95 percent. The "information shocks" from publicized research on the harmful effects of tobacco has found positive impact in countries such as Finland, Greece, Switzerland, Turkey, the United Kingdom, the United States, and South Africa. Warning labels on cigarette packs caused consumption to fall in Turkey, Australia, Canada, and Poland. Similarly, mass media campaigns aiming to counter advertising by the tobacco industry has been consistently found to reduce overall consumption in North America, Australia, Europe, and Israel. An analysis of 100 countries found that those countries with a comprehensive ban on tobacco advertising have a steeper decline in consumption trend over time than those without (Saffer 1995b). Since the 1970s, many countries have banned advertising and promotion, and in the mid-1990s, the restrictions on advertising became more comprehensive, such as in the European Union (EU). There is also a growing trend in a number of Western countries to restrict smoking in public settings, especially workplaces, restaurants, and transport facilities. In the United States, smoking bans in public areas have led to quit rates between 4 and 10 percent (U.S. HHS 2000).

There is less evidence showing success in reducing the supply of tobacco. Many countries relied on trade restrictions or agricultural policies, including restricting youth purchases of cigarette products; crop substitution and diversification; controlling imports; and restrictions on international trade. These measures are harder to enforce due to the black market supplies and the ease of smuggling. The WHO is leading an effort under a global treaty on tobacco control. It is expected that countries joining the treaty will be supported internationally on their tobacco control policies.

Finally, individual- and community-based programs such as cessation treatments and counseling are promoted in Western countries and are found to be both effective and cost-effective (West, McNeill, and Raw 2000). Nicotine replacement therapy products can double the success rates of other cessation efforts (Raw, McNeill, and West 1999). Telephone help lines or quit lines, along with mass media campaigns, have achieved quit rates of 15.6 percent in England and 28 percent in Australia (Australia Commonwealth Department of Health and Aged Care 2003; Owen 2000). On the other hand, community-based programs sometimes have difficulty with sustainability; when properly supported by local resources and networks and partnerships, their results are much more promising (U.S. HHS 2000).

Interventions to Prevent Road Traffic and Other Injuries

Interventions for road safety span a wide range. Proven

approaches fall into four broad categories: (1) vehicle design and safety equipment (i.e., helmets and seat belts), (2) road user measures (e.g., speed limits and restrictions on drinking and driving), (3) engineering measures that improve road design, and (4) traffic management and reducing exposure. To minimize traffic injuries for which prevention fails, effective post-crash measures are also important.

Vehicle safety design helps the driver avoid a crash or protects drivers and victims against injury. Safety design features include daytime running lights and impact protection (air bags or seat belts). Research indicates that crash protection design is the most effective strategy for reducing traffic deaths and serious injuries. A review in the United Kingdom found that crash protection improvements accounted for 15 percent of reduction to casualties, compared with 11 percent for drinking-driving measures and 6.5 percent for road safety engineering measures (Broughton et al. 2000). The European Transport Safety Council estimated that improved vehicle safety standards could reduce deaths and injuries by as much as 20 percent (European Transport Safety Council 1993).

Strong evidence also shows that laws requiring the use of seat belts and helmets to be effective. Mandatory seat belt use laws accompanied by strict enforcement are the most successful in preventing deaths, as demonstrated in a 30-year study in Finland and the United Kingdom (European Transport Safety Council 1996; Ashton, Mackay, and Camm 1983). The United States, Australia, New Zealand, the United Kingdom, and many other European countries have seat belt enforcement laws allowing the police to stop a motorist for not wearing a seat belt (primary enforcement), which increases the laws' effectiveness (Dinh-Zarr et al. 2001). Similarly, studies show that mandatory cycle helmet laws reduce the number of head injuries by around 25 percent (Elvik and Vaa in press). The helmet law was responsible for a 56 percent reduction in traffic fatalities in Thailand and 30 percent in Malaysia and the United States (WHO 2002b).

International experience and research have proven that other measures aimed at drivers and pedestrians are also effective, especially with good enforcement (Elvik and Vaa in press; Finch 1994). These measures include traffic rules such as speed limits, BAC limits, and, lately, cell phone use restrictions. Speed limit changes have been found to reduce the number of fatalities by a range of 6 to 24 percent in Switzerland, Denmark, and Sweden, depending on the size of the reduction (European Transport Safety Council 1995).

Engineering technologies and road designs that improve infrastructure, such as better geometric design, intersection control, safety or crash barriers, signs, markings, and maintenance are effective intervention strategies widely implemented in developed countries (World Bank 2003a). For example, collapsible lighting columns and other devices that break away on impact are widely used, and cable barriers have been used cost-effectively in Denmark, Sweden, Switzerland, and the United Kingdom (European Transit Safety Council 1998). Some of these crash-protective roadside objects, including guard fences, crash cushions, and slip base poles could result in a 30 percent reduction in injuries (Cirillo and Council 1986). Other low-cost traffic engineering measures that are highly cost-effective are skid-resistant surfacing, central refuges and islands, and signal control or operation of junctions.

Rules that require safety awareness in engineering and road planning as well as safety audits exist in many countries including the Netherlands, Australia, Denmark, New Zealand, and the United Kingdom. Safety audits and systematic safety impact assessments were shown to have a cost-benefit ratio of 1:20 in New Zealand (Macaulay and McInerney 2002).

The least-used and least-evaluated road safety intervention strategies are those that aim to reduce exposure to risk. It has been estimated in high-income countries that under certain conditions, for each 1 percent reduction in distance traveled, there is a corresponding 1.4-1.8 percent reduction in crash incidence (Litman 2000; Edlin 2002). It follows that policies that improve transport network and efficient land use to reduce distances and the necessity to travel make sense. Steps include providing shorter, safer routes; better management of commuter transport; better mass transit; and prioritizing or restricting access to different parts of a road network (preventing pedestrians and cyclists from motorways or preventing vehicles in pedestrian zones). Many countries are now focusing on transport and land use

policies for sustainable mobility; Colombia is a specific example (Rodríguez, Fernandez, and Velásquez 2003; Trans-Milenio 2001).

Finally, improvements in post-crash care can prevent deaths and limit the severity of injuries. Areas include faster access to pre-hospital, emergency room, and trauma care. In high-income countries, a standard emergency telephone number is available for public use to readily call ambulance, police, and firefighters. Additionally, many improvements have taken place in the West over trauma care with regard to clinical capability as well as equipment and supplies. However, investments into emergency or trauma care should be decided on the basis of the resources of individual countries (Peden et al. 2004).

The Government's Role in Disease Prevention

From an economic perspective, government intervention is justified as a means to achieve a net improvement in social welfare, in terms of increased efficiency and for reasons of equity through redistribution (Barr 1994). Alternative government interventions, such as regulations, taxation, and public provision, need to be assessed to determine their costs and benefits, as sometimes governments lack the capacity to correct market failures. In the health sector, there are strong reasons to support government intervention where information is incomplete or imperfect, and as a result individuals do not clearly perceive the costs of their actions to themselves or others (Cutler and Kadiyala 1999). Some argue that in the areas of behavior and lifestyle, a wider government role is justified when health benefits outweigh the curtailment or modification of individual choices (Musgrove 1996).

In the case of NCDs, a strong case could be make for government intervention as a result of a widespread policy failure that has often ignored these conditions relative to communicable diseases. That is, despite the obvious epidemiological trends, the policy response, in terms of NCDs prevention and control, has been inadequate and only a very few countries have implemented comprehensive policies. In addition, official development assistance earmarked for NCDs is extremely low in comparison with communicable diseases, and much less than would be justified in terms of their overall contribution to the global burden of disease. This mismatch is especially great in eastern Europe, where NCDs predominate.

As the etiology of most NCDs is complex, so risk factors should be managed from multiple directions. The government's role in disease prevention should be multifaceted, including setting priorities, formulating policies and enacting and enforcing regulations,, rallying constituencies for health promotion and disease prevention, establishing infrastructure and institutions, and educating the public. Many disease-prevention efforts also require larger health system reform, for example, creating financial incentives to strengthen public health prevention and develop community-based intersectoral interventions to benefit the majority of the population.

Role of Private Employers

Private sector involvement is particularly important. The poor health of employees quickly affects a company's bottom-line and has a longer-term impact on profits. Businesses have a vested interest in supporting activities to improve employee health and can have a strong influence on their employees' behavior and make them aware of health risks in ways unavailable to the government. The involvement of major Russian companies, multinational corporations, and other stakeholders with experience in employee- and community-directed health programs will be critical in reducing NCDs and injuries.

The concept of employers playing a larger role in improving employee fitness and health is not new. The U.S. Government is encouraging employers to invest in workplace health promotion, and about 95 percent of its large employers and one third of its smaller ones offer wellness programs.

A growing awareness of the costs linked to risk factors provides the grounds government promotion of workplace-based initiatives. Johnson & Johnson launched a frequently cited model of employer-based health promotion in the 1970s and reports having saved US$38 million in health care costs between 1995 and 1999 by promoting healthy lifestyles (Zeidner 2004). During the

1990s, the firm attributed annual savings of US$225 per employee to intervention programs aimed at exercise, smoking, fiber, cholesterol, and blood pressure.

Citibank offered employees modest financial compensation for completing a health risk appraisal. Participants with risk factors were selected to receive educational materials and were monitored by a health counselor. The program saved five dollars $5 for each one spent.

PacifiCare recently offered US$390 a year to employees to encourage them to eat better, exercise, and reduce smoking or drinking. Participants record their daily food intake and exercise routine. The company expects the program, not yet evaluated, to return more than it costs within two years.

8

Chapter 8. How Is Russia Responding to NCDs and Injuries?

It is assumed that over the last three decades the Soviet health care system lagged behind that of western countries in terms of health care outcomes as the country was not able to take full advantage of new medical knowledge and technological advances, including new treatment regimes and drugs (Andreev et al. 2003). A series of health reforms were initiated in Russia during in the 1990s to address this situation, mainly focusing on financing and delivery of services. Although these reforms changed the health sector's organizational and financial structures and contributed to some important legislation for addressing NCDs, the public health system has largely retained its infectious disease focus. Recently, the Russian government set up institutional arrangements to respond to NCDs and injuries. However, improved institutional capacity is still needed to make health promotion and disease prevention programs more effective. Indeed many health experts, including Russian government representatives, agree that the Russian health system and the Ministry of Health and Social Development (MOHSD) are not yet equipped to tackle NCDs and injuries effectively.[11]

Recent Organizational Reforms

Government reforms changed the organizational structure of the federal health sector in March 2004, especially at the federal level, as follows:

- The Ministries of Health, Social Affairs, and Labor were merged in 2004 to create the Ministry of Health and Social Development (MOHSD). The new Ministry gained an enhanced policy-making role while losing many traditional functions, such as epidemiological surveillance and control and management of federal bodies (e.g., research institutes and tertiary referral facilities). MOHSD was designated as responsible for developing state policy and normative and legal regulations in such areas as health protection, social development, labor, occupational health and safety, sports, tourism, and consumer rights.
- The Agency on Health Care and Social Development became responsible for providing state services and managing state assets in the health and social development sector, including provision of medical and resort services, rehabilitation of handicapped persons, and social protection of the population.
- Two federal services were created to address issues related to public health:
  - The Federal Service of Surveillance in the Area of Consumer Rights' Protection and Human Welfare is to perform control and monitoring functions to safeguard sanitary conditions and public health and to protect consumer rights. For example, this service registers imported food and is responsible for identifying causes and conditions for infectious disease and for some non-infectious conditions (e.g., poisoning).
  - The Federal Service for Surveillance in the Area of Health Care and Social Development is responsible for surveillance, monitoring, and control in such areas as pharmaceuticals, some aspects of occupational health and disability due to accidents at productive enterprises, and setting standards for and assuring quality of medical care.

These organizational reforms have opened a window of opportunity for programs aimed at public health as the new MOHSD is expected to assume greater responsibility beyond managing medical care. However, the new organizational structures for health and other sectors are not yet consolidated, hindering multisectoral arrangements for implementing health promotion, health pro-

[11] Opinions expressed during a World Bank–sponsored senior policy seminars on public health and disease control for Russian Government and other international and bilateral agencies in 2002–03.

tection, disease prevention, and control of NCDs and injuries. President Putin has repeatedly criticized health care reform's failure to produce significant improvements in public health, evidenced by Russia's trailing many countries in key health indicators, particularly among adults.

The Legal Framework for Action Against NCDs and Injuries

The health sector is regulated by more than a hundred federal laws.[12] Targeted programs (Table 8.1) are anchored in federal laws that mandate program implementation. Other legal documents supporting these programs are (a) "Concept of Health Care and Medical Science Development in the Russian Federation," approved by the Russian Government in November 1997 and the first legal document specifically targeting health that was approved by the Government; (b) "Concept of the Russian Population Health Protection," approved in August 2000; and (c) "Concept of Demographic Policy of the Russian Federation to the year 2015," which is also directly linked to adult health, health prevention, and promotion and which was discussed at a government meeting in 2001.

Although the legal framework covers most major areas of public health, it has several weaknesses: it is vague and declarative, its legislative bases were often driven by political influence rather than scientific evidence; and it lacks enforcement mechanisms. Implementation of targeted programs is problematic and hampered by budgetary legislation, limiting legitimate investment in capacity development for population-level interventions to prevent NCDs. As staff costs for these programs often cannot be justified under laws and regulations, funding is usually tied to purchasing goods. The situation is aggravated by the limited knowledge of health promotion among curative care-oriented medical and other health professionals. Even ongoing prevention efforts are very medicalized: an example is the expensive but ineffective "despansarization" of all children. These routine, organized programs have all children undergo a day-long examination by 5 to 12 specialists. Children are screened for all diseases in a process lacking standards and reference to disease prevalence, and medication is often prescribed without appropriate diagnosis.

Issues related to occupational health are addressed in a wide range of ordinances, including the Labor Code, a federal law "On Mandatory Social Insurance from Accidents at Industrial Enterprises and Occupational Diseases," and health ministry orders issued in the 1980s and 1990s. Some of these ordinances are now outdated. A number of new ordinances are under discussion, including the draft of a proposed program, "Health of Working Population in the Russian Federation for 2005."

Russia's 2001 Federal Law on Tobacco is weak by international standards, and compliance and enforcement are known to be low generally. Some MOHSD and nongovernmental organization programs endeavor to educate and inform the public, discourage tobacco use, and encourage cessation, but they are small relative to the public health importance of this risk factor (Ross 2004; Gerasimenko and Demine 2001; McKee et al. 1998). Low prices and taxes make cigarettes more affordable in Russia than in most other countries (Guindon, Tobin, and Yach 2002). In December 2004, President Putin signed a law strengthening the Law on Tobacco Consumption to make it illegal to sell tobacco products in health, cultural, and educational facilities and to smoke in workplaces, public transport, closed sport facilities, health and educational facilities, and government buildings except in designated smoking areas. However, Russia has not signed yet the World Health Organization (WHO)-sponsored Framework

[12] Legislative bases on citizens' health protection include laws "Sanitary and Epidemiological Welfare of the Population"; "On Health Insurance of the Population in the Russian Federation"; "On Prevention of Spread of Disease Caused by HIV in the Russian Federation"; "On Narcotic and Psychotropic Substances"; "On Pharmaceuticals"; "On State Regulation in the Area of Genetic Engineering Activities"; "On Radiation Safety of the Population"; "On Protection of Population and Territories from Emergency Situations of Natural and Technological Causes"; "On Mental Health Care and Guarantees for Citizens' Rights When Delivering It"; "On Blood and Its Components' Donation"; "On Transplantation of Organs and/or Human Tissues"; "On Natural Treatment Resources, Treatment and Rehabilitation Territories and Resorts"; "On Safe Circulation of Pesticides and Agricultural Chemical Substances"; "On Atmospheric Air Protection"; "On Main Guarantees of Children's Rights in the Russian Federation"; "On Immunological Prevention of Infectious Diseases"; "On Quality and Safety of Food Products"; "On Prevention of TB Spread in the Russian Federation"; "On Limitations of Tobacco Smoking"; and "On Temporary Ban of Human Being Cloning."

Table 8.1 Active Federal Targeted Programs in Public Health in the Russian Federation

Program and budget	Objectives	Activities	Main program developers
"Prevention and Control of Socially Significant Diseases" (2002-06) Budget: US$122.2 million	To decrease morbidity, disability, and mortality due to socially significant diseases (diabetes, tuberculosis, HIV/AIDS, sexually transmitted diseases, etc.)	Prevent, diagnose, and treat socially significant diseases	Ministries of Health; of Justice; of Agriculture; of Industry, Science and Technology; of Education; and of Nuclear Energy; Russian Academy of Medical Science
"Prevention and Treatment of Arterial Hypertension in the Russian Federation" (2002-08) Budget: US$1.6 million	To improve the prevention, diagnosis, and treatment of hypertension and rehabilitation of patients with complications	Establish hypertension prevention, monitoring, and reporting systems; strengthen cardiology facilities; train medical personnel	Ministries of Health; of Education; and of Industry, Science and Technology; Russian Academy of Medical Science
"Ecology and Natural Resources" (2002-10) Budget: US$42.8 million	To protect natural resources, stabilize and improve the ecological situation in the country, and prevent environmental degradation	Establish a national environmental monitoring system, introduce measures to reduce pollution, and develop national parks	Ministries of Natural Resources and Agriculture, State Committee on Fishing, Federal Hydrometeorology and Environmental Monitoring Service, Federal Service for Geodesy and Maps
"Nuclear and Radiation Safety of the Russian Federation" (2000-06) Budget: US$7.1 million	To reduce the risk of radiation to people and their homes to a socially acceptable level, resolve nuclear waste disposal issues, and introduce safety measures at nuclear enterprises	Establish a national nuclear monitoring and reporting system, train personnel, and establish occupational health programs at nuclear enterprises	Ministry of Nuclear Energy
"Risk Reduction and Mitigation of Impacts from Emergency (Natural and Technological) Situations in the Russian Federation until the Year 2005" Budget: US$3.3 million	To increase protection from emergency situations for populations and territories, develop a methodological and scientific basis to manage risks of emergency situations, and strengthen training programs	Implement measures to forecast and monitor emergency situations and train the general population and specialists to manage emergency situations	Ministry of Emergency Situations and the Russian Academy of Science
"Russia's Youth" (2001-05) Budget: US$29.1 million	To develop legal, economical, and organizational conditions to bring up youth as part of democratic society and as active participants in transformation processes in the country	Create job opportunities for youth and support youth sports, civil organizations, educational programs, and health programs; promote and strengthen the family support system	
"Children of Russia" (2003-06) Budget: US$74.5 million	To improve children's quality of life and health status	Oversee maternal and child health programs, provide social services to disabled children, train and retrain specialists, and develop and implement an information system	Ministries of Labor and Social Development, of Health, and of Education
"Comprehensive Measures to Counteract Drug Abuse and Their Illegal Turnover" (2005-09) Budget: US$17.9 million			

Source: Russian MOHSD documents.

Convention on Tobacco Control, an international treaty to limit tobacco use. In addition, President Putin has not signed the law "On Limitation of Sales and Drinking of Beer and Drinks Produced on its Basis"; comments have been submitted to Parliament to strengthen it, which may cause delay.

Institutional Weaknesses in Preventing and Controlling NCDs

Several factors hinder Russia's progress in developing institutions and in applying effective approaches to health promotion, health protection, and disease prevention for NCDs. These factors are largely associated with insufficient action to include public health as part of ongoing health system reforms. This failure implies that the country has not shifted from the system of infectious disease control to a system of NCD prevention and control that requires new approaches and methods (MOPH 1997).

The federal level is responsible for "the organization of the State Sanitary Epidemiological Surveillance (SanEpid) System, development and approval of federal sanitary regulations, norms and hygienic standards, sanitary-epidemiological surveillance, and organization of the system for sanitary protection." Traditionally, the SanEpid System has concentrated on infectious disease prevention through an environmental approach (e.g., enactment of regulations, inspection system, and penalties to prevent mainly food- and water-borne diseases and limit environmental pollution and workplace hazards). This approach was justified in the past, but changing disease patterns call for new forms of involvement with populations and communities served.

Both health care and academic institutions are also poorly equipped to address NCDs. Overspecialization of both doctors (there are over 120 narrow specialties in Russia) and facilities hinders disease prevention and control efforts following population-based, multisectoral approaches. Several federal research institutions have been tasked with various aspects of NCD prevention, including the National Center for Preventive Medicine under the MOHSD, the Institute of Information and Organization of Health Care, and the Institute of Public Health. However, the role and influence of these institutions in policy formulation and program development are limited.

The Centers for Medical Prevention are charged with NCD prevention and control in the regions. Despite being a wide network and often nearly the only agency active in NCD prevention, they are not active in many regions. Separated from the rest of the health care community, they suffer from having a low priority status and from an inability to influence regional policy, with some notable exceptions (e.g., in Vologda and Primorsk). Their ability to influence populations and communities is limited by funding constraints and spending regulations. Restrictions on the degree to which local policies can diverge from national ones also hinder progress. Regional health authorities often see their responsibility as running public health schools, which are predominantly treatment oriented. The local level largely lacks structures systematically designated to prevent NCDs. Furthermore, medical institutions are not reimbursed for providing preventive services.

What Are the Main Problems?

Although established structures and ongoing efforts could contribute to a solid foundation for NCD prevention and control in Russia, progress is hindered by several factors:

Insufficient coordination of NCD prevention and control activities. The roles and responsibilities in NCD prevention and control at the federal, regional, and local levels, as well as among the national institutes, are not well defined or communicated. Coordination is especially important, since anti-NCD programs require multi-sector collaboration.

Limited workforce for NCD prevention and control. Human resources well trained in NCD prevention and control are lacking. Knowledge and skills relevant to NCD prevention and control need to be taught in medical academies, schools of public health, preventive medicine and nursing, post-graduate courses, and degree programs such as MPH and DrPH. Urgently needed are public health courses of various formats and foci targeted to a range of trainees, including (but not limited to) MOHSD staff, national institutes' staff, primary health care providers, specialist physicians, nurses, sociologists, psychologists, administrators and managers, journalists, health statisticians, and public relations professionals at all levels.

Inadequate access to information on NCD prevention and control. Regional and local staff have had limited training in modern approaches to NCD prevention and control and lack ready access to information. Lack of English proficiency is a common barrier to international sources of information. Numerous examples of scientific methodologies, programs, and evaluation results at regional and local levels exist, but information about experiences and good practices in health promotion is not well shared. Many regional and local staff start from scratch and rely on self-learning, and some regional staff have developed materials and interventions on their own. Feedback or mentoring from the federal level, now limited, would propel such efforts: the lack of federal leadership leads to high variability in content and approaches, whereas tested, effective, well-focused, and consistent messaging for the target populations is required. Federal institutes could be natural nodes for collaboration and information sharing.

Treatment bias. Health care providers tend to treat patients only for the condition that stimulates the patient's visit. Providers need to be trained to watch for and ask about other symptoms that would signal another condition(s) and to talk to patients about risky behaviors and exposure.

Limited funding for NCDs prevention activities. As the resources allocated to NCDs prevention activities are low, the development of a financial policy is required for supporting integrated prevention programs and activities at the federal and regional levels. Given the magnitude of economic benefits that can be expected from improving adult health in Russia, any reasonable and well-designed increase in the resources devoted to health, both inside and outside the health system, would produce a significant economic return. The challenge is of course not solely to increase resources, but also to put existing resources to better use.

Inadequate NCD surveillance capacity and research efforts. A surveillance system that tracks trends and reports cases is a key public health tool for preventing and controlling NCDs, but Russia's capacity for implementing, monitoring, and evaluating NCD prevention and control is weak. Several regions have tried to collect data on behavior and risk factors, but epidemiological surveys are intermittent, underfunded, and limited in scope and coverage. Monitoring and reporting surveillance data, coupled with research and evaluation activities, are necessary in developing relevant health policies and effective programs at the federal and regional levels.

Some Good Practices in Russia

The CINDI Experience

The Countrywide Integrated Noncommunicable Disease Intervention (CINDI) Program is a multi-country initiative of the WHO and has been actively implemented in Russia since the mid-1980s. The National Center for Preventive Medicine under the MOHSD manages CINDI, which covers 18 regions[13] in Russia with four new regions having applied to join. The center works actively in the areas of disease prevention and health promotion. Its most recent publications and studies include (a) guidelines for monitoring behavioral population risk factors of NCDs, (b) a reference book for physicians on adult nutrition, (c) methodological recommendations on health care development for strengthening health and preventing NCDs, and (d) research on smoking in Russia. Other organizations contributing to this work are the Science and Research Institutes on Occupational Health; on Human Ecology and Environmental Hygiene; on Nutrition; on Social Hygiene; on the Economics and Management of Health Care; and on Epidemiology and Microbiology; the Scientific Center for Mental Health; and the Scientific Center for Rehabilitation and Resorts.

CINDI aims to support the reduction of smoking, unhealthy nutrition, alcohol abuse, physical inactivity, and psycho-social stress; enhance preventive practices of health professionals; and ensure success by exchanging information, sharing experiences, and building international networks. One of CINDI's major contributions is data collection and analysis on cardiovascular diseases (CVDs), which are not otherwise routinely performed in Russia. In addition, the program recently introduced new methods for the collection and analysis of data, enabling evaluation of the process of development and

[13] The CINDI regions are Chelyabinsk, Electrostal, Krasnodar, Kostomuksha, Mirnyi, Novosibirsk, Orenburg, Pitkyaranta, Rostov on Don, Pontonnaya,Tomsk, Tver, Perm, Bijsk, Ufa, Murmansk, Verkynyaya Salda, and Vologda.

implementation of preventive measures (MOPH 1999; CINDI 2004). A good example of the application of these research tools is in Pitkaranta, Karelia Republic, where a health surveillance program was developed and implemented over the last 10 years through collaboration among the Health Ministry of Karelia, the Central Hospital of Pitkaranta, the National Public Health Institute in Finland, and the North Karelia Project. Surveys of risk factors (a self-administered questionnaire, physical measurements, and laboratory tests) are undertaken by trained teams of physicians and nurses every five years. In addition, health behavior surveys are conducted by a mailed, self-administered questionnaire every two years (Laatikainen et al. 2005). These efforts have developed a comprehensive, reliable database on chronic disease risk factors and related health behavior among Pitkaranta adults. Changes in CVD risk factors and health behaviors were observed in this region over the 1992-97 period (Laatikainen et al. 2002b).

Other activities developed in the CINDI regions include:

Healthy nutrition policy. Capacity development for nutrition assessment among adults and children.

Smoking. The population-based Quit&Win smoking cessation campaign was launched in 2002, covering 28 centers at regional and local levels and more than 28 million people, including 7 million smokers. More than 40,000 smokers and more than 3,000 health professionals participated.

Behavioral risk factors. Guidelines to monitor behavioral risk factors have been developed and adopted by the MOHSD for implementation countrywide.

Hypertension management. The 11-year collaboration between CINDI Pitkaranta (Karelia) and CINDI Finland on blood pressure control first showed signs of success in 2002, with lower systolic blood pressure in these populations.

The CINDI network has also facilitated international collaboration, clearly beneficial in many ways: in building research capacity, in health promotion planning, and in stimulating participation in international activities and funding.

Regional Efforts

Beside the CINDI projects, some innovative cross-sectoral approaches are starting to be developed in different regions of the country. Among the leading regions in terms of promoting healthy living is the Chuvash Republic, where the regional government has taken a leading role in establishing an enabling environment for health promotion and disease prevention involving public and private institutions, community organizations and individual citizens (Box 8.1). The Tula Oblast provides another good example (WHO 2005). As a result of efforts initiated in 1998 and supported by the Central Public Health Research Institute of the Russian MOHSD and the Tula Oblast Health Authority, together with international partners, a 70 percent success rate in controlling high blood pressure, a 85 percent reduction in admissions for high blood pressure, and net savings for overall high blood pressure care costs of 23 percent, were achieved.

NGOs Efforts

In Russia, a number of NGOs, such as the Open Society Institute and its spin-off, the Open Health Institute, have since 1998 implemented activities aimed at developing public health training. Nearly 30 specialists have been trained as Masters of Public Health. Graduates of international programs and other internationally recognized researchers have formed a number of associations, e.g., "For Public Health Support" and "Society of Evidence-Based Medicine Specialists." The Moscow Medical Academy is running a full-time, two-year program in Public Health and Health Management. The St. Petersburg Medical Academy of Postgraduate Training, Tver Medical Academy (TMA), and Urals Medical Academy of Additional Education (UGMADO in Chelyabinsk) are implementing postgraduate training programs and courses similar to European schools of public health. All four academies provide training for specialists with different backgrounds. The Moscow Medical Academy has set up departments of Law, Economics, and Sociology with the involvement of non-medical professionals. TMA and UGMADO are providing problem-oriented courses for representatives of their regional legislative authorities and other non-medical professionals.

Box 8.1. Chuvash Republic: Innovative Approaches to Healthy Living

Chuvash Republic is a leading region in Russia in terms of promoting healthy living. In February 2004, its president signed a decree entitled "On Organizing a Movement 'Chuvash—Healthy Region.'" This decree was intended to create optimal social and economic conditions to improve the population's quality of life, labor growth, and healthy living. It declared several objectives as the priorities for state policy: (1) strengthening population health, (2) environmental improvements, (3) forming high moral values and culture, and (4) personal responsibility for health.

The decree tasked the Cabinet of Ministers of Chuvash with developing the Concept of Health Protection for Healthy People in the republic for 2004–10 and a health promotion strategy for youth. The documents promote a multisectorial approach to lifestyle, environment, and health protection and call upon local and municipal self-governance bodies to develop long-term programs for health protection and improvement of living conditions.

A management council for "Chuvash—Healthy Region" was established to coordinate activities at the Government level and self-governance bodies for implementing activities in the area of health protection and health promotion. The president declared 2004 the "Year of Youth and Healthy Living." Various activities were conducted throughout the Republic at different levels, all aimed at health promotion, development of socially significant youth initiatives, and broad participation in physical activities and sports.

The republic also spends significantly on prevention and health promotion programs. According to its Ministry of Health, 93 million rubles (about US$3.3 million) were spent on these activities in 2002 and 102 million rubles (about US$4 million) in 2003. The Healthy Living Concept focuses on:

Prevention of infectious diseases. This work seeks to reach full coverage (95 percent or more) with vaccination programs and increase personal responsibility for health.

Significant improvement of environmental conditions. Chuvash is currently implementing such programs as "Provision of Chuvash Population with Drinking Water: 1999–2010" and "Environmental Safety of Chuvash Republic for 2001–2003 and for the period till 2005," and "Healthy Nutrition."

Health promotion. The program "Development of Physical Exercises, Sports and Health Promotion for Chuvash Republic Population for 2003–2006" is being actively implemented throughout the republic. Different regional entities are also involved in the project "Healthy Cities, Rayons, Settlements" under which they perform health promotion activities at the local level reaching people regionwide.

Improvement of social and economic conditions. Chuvash has adopted a comprehensive Program of Economic and Social Development for 2003–2010 under which the authorities are strengthening education, increasing employment, and improving housing and health.

Occupational health. Chuvash adopted a law on "Labor Protection in Chuvash Republic" as well as programs on improving working conditions and "Health of Working Population: 2004–2010." Medical check-ups are being conducted regularly at regional enterprises.

Shifting primary care focus to prevention. Chuvash is a leader in promoting general practice. In 2003 the number of general practitioner offices reached 200 with more than 100 being opened in rural areas. Health schools, such as an "Asthma School," "Hypertension School," and "Diabetes School" are being organized.

This program is successful not only through a very strong commitment at the highest level of Government but also through its years-long multisectorial approach. Establishment of intersectorial teams to deal with various tasks enables them to work with different agencies and entities involved at all levels, from municipalities and settlements and to the regional level.

Sources: Various documents from the Chuvash Ministry of Health.

Steps to Advance NCD Prevention and Control Efforts

As part of its ongoing dialogue with the Russian Government, the World Bank collaborated with the MOHSD in 2002-03 by supporting a series of senior policy seminars on public health and disease control. These seminars provided opportunities to share scientific information and health system reform experiences from countries in Eastern Europe and the Organization for Economic Co-operation and Development and to put forward options for official consideration by the MOHSD and other agencies. Seminar participants included representatives of the Russian Government, relevant public institutions, and Russian scientists, as well as external resource persons and partner agencies, such as the WHO, the U.K. Department for International Development, the U.S. Agency for International Development, the Canadian International Development Agency, and the Soros Foundation. Participants generally agreed that the Russian health care system and MOHSD are not well equipped to tackle NCDs effectively. They also agreed on a number of activities that must be implemented to move Russia forward in the prevention and control of NCDs and injuries. They identified a wide range of potential stakeholders and partners in NCD prevention and control:

Potential stakeholders in the health sector include MOHSD, Health Committee of the Duma, regional and local health authorities, SanEpid, centers for disease prevention, primary health care facilities and providers, the federal Health Insurance Fund, professional health organizations (i.e., the All Russia Scientific Society of Cardiologists, the Russian Academy of Medical Sciences, and the Hypertension Society); and research institutes.

Potential stakeholders outside the health sector include government and legislative structures, such as the President's Office, the Duma, oblast legislatures, and political parties; the Ministry of Education, educational organizations, school teachers, and various faculty; the Ministry of Culture and Sport and physical training and sports organizations; the mass media; public organizations and associations; the Ministries of Economy, Finance, Trade; state and private industry; religious organizations; employers and worker associations; ministries and organizations for agriculture and environment; Ministry of Transport, police, and international agencies; well-known public figures; and the public. Alcohol, tobacco, pharmaceutical, and food industries are stakeholders, but partnerships are often impossible due to conflicts of interest.

Seminar participants generally agreed that the following steps must be taken to move Russia forward in the prevention and control of NCDs and injuries:

- Upgrade the training of human resources;
- Increase financial and technical resources;
- Develop comprehensive legislative and policy frameworks;
- Upgrade the SanEpid's technical capability to carry out epidemiological surveillance, and improve the quality of the data for use in monitoring, reporting, and communicating trends in risk factors;
- Establish adequate organizational and institutional structures in health protection, NCD prevention, health education, and health promotion, with clearly defined and coordinated roles, responsibilities, and functions.

Finally, seminar participants noted that many actions that could improve Russians' quality of life and extend life expectancy require intersectoral policies and interventions beyond the scope of the health services system. They also recognized that Russia's current health system is neither designed for promoting health at the population level nor well positioned for delivering cost-effective interventions to control NCD risk factors.

Policy Implications

Strengthening Russia's existing public health infrastructure and redefining its agencies' roles is needed to advance NCD control. It is important to involve national research institutes, including those responsible for various medical specialties, e.g., cardiology and traumatology. General practitioners and other medical professional groups of primary contact (district *[uchastkovii]* physicians and nurses) also need to be involved, as they see patients before onset of a disease or in its early stages. Research institutes and centers of preventive medicine need to lead in formulating health policy and implementing preventive programs, but first

they must improve their ability to independently and effectively carry out the task of NCD control. Involvement of civil society, including citizen-based organizations—such as patient associations and diabetes associations—and research groups outside the traditional health field would boost opportunities for advocacy and promotion of intersectional approaches.

Although the projects carried out under the CINDI Program in Russia, such as in Pitkaranta, have been small, the results show success and suggest that they could serve as powerful stimulants for the development of national policies and programs. They should be scaled up and replicated in other regions to achieve long-term health improvements. In particular, the development of health surveillance through population surveys, the planning and implementation of pilot interventions, and several education activities for health personnel and the public are critical building blocks for successful NCD prevention and control programs. CINDI's educational activities have played a key role in increasing the knowledge of health personnel. Its emphasis on prevention—and its promotion by political authorities—stimulated resource allocation and the shifting of health services away from a purely medical care approach.

Chapter 9. What Additional Actions Can Russia Take?

As noted in the previous chapter, several efforts to reform the Russian health care system are underway. Health care organization is being restructured to achieve a better balance between hospital and ambulatory care and between prevention and treatment. Revised standards and norms are being used to assure the quality of care. Meanwhile, demographic and health trends signal the absolute and relative importance of adult health problems caused by noncommunicable diseases (NCDs) and injuries. New paradigms and intensive efforts are recognized as needed to meet new, complex, and multisectoral challenges. Experience in G-8 countries shows that in the medium and long term, reducing the social costs associated with NCDs and injuries and improving the population's overall health will require comprehensive and multisectoral health promotion and disease prevention efforts.

The Russian Government is cognizant of the experience in other countries and is willing to invest in a federally mandated program under the MOHSD to reduce premature mortality and avoidable disability, especially in working-age adults. It has indicated its commitment to launching a coherent and comprehensive program to combat NCDs and injuries.

The Rationale for a Comprehensive Program

A well-defined and structured national program of population-based and clinical interventions to confront NCDs and injuries in Russia would help improve social welfare and contribute to sustainable economic growth by (a) bettering the health of the economically active population; (b) reducing labor supply and productivity losses from preventable deaths, illnesses, and disabilities due to NCDs and injuries; and (c) minimizing regional disparities by reducing social risks for NCDs and injuries in the most vulnerable regions.

A nationwide mortality reduction program should include three focus areas: (a) federal-level policies and strategies, (b) priority sub-programs in regions, and (c) measures to improve road safety and emergency services:

A. Federal Level Policies and Strategies

National subprograms must be defined in light of the magnitude of each health threat, the political commitment required to solve or manage it, and feasibility and cost-effectiveness. The support mechanisms required for success-legislative frameworks, institutional capacity, and federal oversight also need to be considered.

Select priority subprograms

Subprograms can target the population at large ("primary" or "population-based" efforts) or individuals who need clinical intervention ("secondary" or "individual" efforts). These latter individuals need medical attention, treatment, and follow up to prevent their existing condition(s) from worsening. *Population-based subprograms* should be developed to address alcohol, tobacco, road safety, and diet/physical activity, while *Individual subprograms* would help people with hypertension, elevated levels of cholesterol, and/or diabetes.

Develop legal, policy, and strategy support for priority subprograms

Success in the alcohol, tobacco, road accident subprograms requires a strong framework of laws, regulations, and enforcement mechanisms. The legal framework would set out the national strategy and selected subprograms. Passing laws, issuing regulations, and developing strategies require strong political and technical leadership and broad support for the national program from myriad stakeholders. Good communication is essential, including stakeholder consultations, public relations, working with the mass media, educating the public, and developing strategies to convey behavior change messages.

Build institutional capacity to implement priority subprograms

Building institutional capacity entails (a) strengthening national technical leadership in developing a national strategy, action plan, and health goals; creating a popular and political consensus on strategy and goals; and establishing partnerships with international stakeholders; (b) developing mechanisms for creating multisectoral links with other ministries, NGOs, and the private sector; (c) implementing professional training to remedy the shortage of trained public health professionals and researchers; (d) creating a surveillance system integrated with a federal databank to generate valid, reliable, and timely data; (e) overseeing empirical research; and (f) partnering with the private sector and civil society to leverage resources and increase program effectiveness.

Assure federal oversight of and accountability for priority subprograms

The MOHSD should be the coordinating ministry, and a high-level working group in the Presidential Administration should ensure that the actions of participating ministries and the private sector are executed timely. This group's members could include MOHSD, Ministries of Transport, Justice, Agriculture, Education, Industry, Science and Technology, Economic Development and Trade, and Finance. To ensure the program's technical quality and relevance to the Russian context, the group should be supported by technical working groups responsible for coordinating and/or executing specific subprograms.

B. Priority Subprograms in Regions

This area should support implementation of national priority programs in the regions, executing the nationally defined priority subprograms, but allowing for regional differences in health status and choosing region-specific, appropriate, effective interventions. Activities should include primary prevention (before problems arise) through population-based interventions targeting alcohol, tobacco, and diet/physical activity and secondary prevention (to control disease in its early stages and prevent progression) through clinical interventions targeting individuals with high blood pressure, elevated cholesterol, and diabetes.

Activities would seek to control multiple risk factors and include prevention, diagnosis, treatment, and follow-up at the inpatient level, in ambulatory settings, in work places, and at homes. The subprograms should support the development and national implementation of NCD prevention and control, incorporating Russian expertise and WHO guidelines. Both population and clinical interventions should be covered at the federal, regional, and municipal levels.

The subprograms should build on the CINDI Program experience and promote healthy behaviors by awarding "health promotion initiative grants" to stimulate innovative health promotion and disease prevention initiatives at the regional and municipal levels and to build capacity at these levels for implementing integrated approaches. Technical assistance should be provided to assess the capacity and readiness of various partners and organizations to undertake health promotion and prevention activities, to establish efficient organizational and managerial structures for health promotion, and to conduct process and outcome evaluation studies to measure federal program success.

Population-based interventions

Control of Alcohol Consumption

Priority actions for controlling excessive alcohol consumption should target both supply and demand.

- **Supply:** Alcoholism can be prevented by limiting the availability of alcohol through the regulation of production, quality assurance, distribution, prices, access (particularly for minors), and advertising. Supply can be regulated through higher taxes and prices and by reducing the number of sales outlets, limiting their operating hours, and prohibiting sales to minors. These policies must be coupled with restricting advertising and broadcasting messages compatible with healthy lifestyles. Particular attention must be paid to prevention of (a) the sale of surrogate alcohol, which is highly toxic, and (b) home-produced alcohol. Stronger laws against drunk driving are also needed.

- **Demand:** It could be modified through education and information to reduce the onset of excessive drinking, particularly among youth, and excessive drinking among heavy drinkers; promoting moderate alcohol consumption; and increasing awareness of the adverse consequences of alcohol abuse. Efforts

should be tailored to the diverse circumstances of the general population, adolescents (especially students), pregnant women, drivers, family members of alcoholics, and worksite supervisors. Health professionals and volunteers can provide key support in achieving these educational goals through training and advisory assistance to teachers and community leaders. The effectiveness of Russian narcology services and innovative methods, such as motivational interviewing, should be reviewed.

Tobacco Control

- The highest priorities should be for the Government to sign the WHO-sponsored Framework Convention on Tobacco Control and to enforce existing policies for smoke-free worksites and public places, and, if allowed by the existing regulatory environment, to extend their scope to all workplaces and enclosed public places. This may require aggressive education and information efforts so that people understand the risks of second-hand smoke. Considerable international experience shows how to implement and enforce such policies.

- Second-tier priorities should be to identify successful tobacco control and smoking cessation efforts and expand and build on them. It is important to evaluate program impact to learn which programs are most cost-effective and worthy of expansion.

- Substantial tax increases are needed and should be designed to steadily raise cigarette prices and reduce their affordability. Simultaneous efforts must reduce smuggling and informal market cigarette sales. Fines that are consistent with the very large profits being made should be used when people are convicted of selling cigarettes on which taxes have not been paid. This measure may deter some violators, would generate revenue for enforcement, and would cut into informal market profits, perhaps causing increases in the prices of these cigarettes.

- Russian physicians who still smoke set a bad example and should be encouraged to stop. All physicians should be trained to ask patients whether they smoke, provide advice and written materials on quitting, and increase availability of cessation support services.

- Large, strongly worded health warnings should be required on all cigarette packs sold in Russia. Advertisers should be required (with strong enforcement and large fines for noncompliance) to display large warning labels covering about 20 percent of all print advertisements and to pay for counter-advertising in a required proportion to all radio and TV advertising. These recommendations are low cost for the MOHSD, but they are made with awareness of previous attempts to implement tobacco advertising bans and restrictions that were successfully resisted by the media and cigarette companies.

- Legislation banning all tobacco advertising, promotion, and sponsorship and banning tobacco product sales to minors should be considered.

It should be clear, however, that alcohol abuse and tobacco control measures will depend on the capacity of law enforcement agencies to implement and enforce related laws and regulations.

Changes in Diet and Promotion of Physical Activity

Five of the ten leading risk factors contributing to high levels of mortality are influenced by diet and sedentary lifestyle: high blood pressure, elevated cholesterol levels, and high body mass index. Priority actions for this population-based intervention should include:

- Public health policies promoting dietary guidelines for healthier eating;
- Celebrities and well-known athletes serving as champions for an active lifestyle, low body mass index, and healthy diets;
- Corporate and social responsibility of the food manufacturing industry in manufacturing and marketing healthier food;
- School programs on the importance of diet and physical activity and their contributory causal relationships to cardiovascular disease, cancer, and diabetes;
- Public health policies promoting regular physical activities; and
- An outdoor environment that invites physical activity: bicycle paths, sidewalks, and crime-free parks.

Secondary prevention interventions

Clinical interventions occur at the patient level in a health care setting. The physician is responsible for (a) early detection and diagnosis through laboratory testing of hypertension, high total and/or LDL cholesterol, and early signs of diabetes; (b) prescribing correct treatment; (c) following up by checking patient compliance with treatment, periodic retesting, and adjusting treatment regimen; and (d) informing patients of health risks and where to find more information and help. These efforts should build upon ongoing reforms of the primary care system at the regional level, such as in the Voronezh Oblast and the Chuvash Republic supported under the Health Reform Implementation Program.

Hypertension: Individuals with uncontrolled hypertension have a three to four times greater risk of developing coronary disease and a seven-fold greater risk of having a coronary event than those with normal blood pressure. Early detection, timely treatment, and monitoring of treatment compliance would reduce cardiovascular mortality but must be balanced against the financial burden on people needing long-term care (e.g., in many parts of Russia drugs must be paid for out-of-pocket).

Cholesterol: High cholesterol levels are related to diet and have a significant impact on cardiovascular mortality. Strategies for reducing mortality from CVDs include (a) screening people with multiple risk factors at the local level and at worksites; (b) expanding accessibility, coverage, quality, and timeliness of care, including follow-up programs; and (c) health education and community activities to control risk factors and increase treatment compliance.

Diabetes: Primary prevention of diabetes is feasible in part through physical activity, appropriate diet, and control of obesity. The importance of this pathology rests on its complications (e.g., blindness, renal insufficiency, and cardiovascular and neurological complications), and its control is critical in the prevention of such complications. A secondary prevention program is therefore necessary at the primary care level. Primary care strategies must include early detection and diagnosis in high-risk groups (e.g., obese and pregnant women) and effective follow-up and monitoring of all cases diagnosed. Orientation for nurses, teachers, and community health workers on proper management of diabetes can have a multiplier effect on basic actions carried out among patients and their family members.

Regional support subprograms for implementing the national mortality reduction program:

Analogous to the institutional capacity-building subprograms defined at the federal level in the first focus area for implementing priority subprograms, the regions and municipalities should (a) conduct professional training programs and empirical research studies; (b) develop mechanisms to link the various stakeholders and form partnerships; (c) implement a surveillance system to monitor the epidemiological evolution of the incidence and prevalence of NCDs and injuries targeted in the priority programs; and (d) develop regional databases compatible with the structure and content of the federal one and capable of data sharing and reporting progress towards achieving the national objectives.

The federal level should provide regions and municipalities with technical assistance to establish, implement, and/or strengthen these support systems. Regions and municipalities with strong support infrastructures should provide technical assistance to regions with weaker ones. Also, regions and municipalities could work in clusters to share experiences and collaborate.

C. Improved Road Safety and Emergency Services

As these efforts involve many more stakeholders than does the control of other risk factors, they warrant a separate area of focus.

Federal Level Responsibilities

Experience from other countries shows that improving road safety requires a consistent, 20- to 30-year effort to develop and implement comprehensive, integrated safety programs, including enhancement of road safety, auditing processes, and funding of interventions in priority high-risk road corridors. Business planning processes and performance monitoring systems must be created to support such a long-term strategy, and the first phase of such strategy should lead to consensus among stakeholders and public sector agencies on a long-term action plan based on demonstrably successful interventions. A financing plan for implementing the strategy should also be specified. Support should be provided to develop a program of road-user education, traf-

fic safety enforcement, and emergency preparedness along a first set of demonstration corridors.

Motorization in Russia has increased rapidly, and the public sector response has emphasized basic traffic management functions, such as driver licensing and vehicle inspection. International experience suggests that such programs, although important, have only a marginal impact on accident and fatality rates. To curb rapidly rising accident and fatality rates, targeted, cost-effective measures that have an immediate impact, such as speed-limit and drunk-driving enforcement, separation of traffic, and motorcycle helmet law enforcement, must be identified, implemented, and monitored under a comprehensive program.

Public awareness of road safety must change. For example, alcohol is a big traffic safety problem, but there is virtually no public or political support for countermeasures or a sufficient legal basis to deter drunk drivers. Furthermore, laws requiring seat belts and motorcycle helmets and imposing speed limits are ineffective or seen as conflicting with personal freedom. Finally, in the face of poor traffic behavior, traffic police lack knowledge of—and incentives for developing—more effective policing strategies, have limited resources, and see their responsibility as apprehending offenders rather than deterring unsafe behavior.

Specific federal responsibilities would be to (a) ensure that an enforceable legislative framework is in place by reviewing and revising existing laws and reviewing and adjusting regulations that implement them; (b) formulate a national road safety strategy and subprogram, identifying risk factors as a basis for planning and improving effective prevention of injuries through a combination of education, regulation, enforcement, engineering, and technology; (c) establish mechanisms to forge links with public sector entities, industry, and NGOs; (d) identify dangerous road corridors for early action; (e) set standards and disseminate clinical protocols specifying procedures on clinical management of patients during emergency medical services on the road, while in transport, and in trauma centers and hospitals to reduce pre-admission death rates and disability from accidents; (f) create a national road accident database and establish/upgrade a management information system on road traffic accidents; (g) establish, implement, and maintain a robust monitoring and evaluation framework with indicators and national and regional targets; and (h) provide technical assistance to regions.

Regional Responsibilities

Each region should develop its own road safety strategy and action program following the federal program. Regions should be responsible for implementing national laws, standards, and guidelines; implementing emergency medical services; and developing an inter-institutional emergency medical network, including the ambulance network and emergency communication system.

Regional responsibilities for training, capacity building, developing partnerships and collaborative arrangements among all sectors, monitoring implementation of action plans, evaluating the outcomes of the road safety strategy, and developing a regional database compatible with the federal one are similar to those described in the previous focus area on alcohol, tobacco, and diet/physical activity. Also analogous is that regions implementing road safety strategies and programs should receive technical assistance from the federal level to establish or strengthen the support systems. Regions that already have a strong support infrastructure should provide technical assistance to weaker ones, and, again, regions could work in clusters to share experiences and collaborate.

Cost-effective interventions for preventing road traffic injuries should include (World Bank 2004e):

- **Road environment:** safe design of new infrastructure; retro-fitting current infrastructure with of low-cost safety design features (medians; roundabouts; separation for motorcyclists, cyclists, and pedestrians); systematic maintenance of all safety features, systematic reviews to identify and remediate road hazards, systematic safety audits of road designs to ensure compliance with safety standards and regulations;
- **Speed management:** general deterrence-based police enforcement and education to ensure compliance with speed limits;
- **Safety belts and helmets:** general deterrence-based police enforcement and education to ensure compliance with child restraints, child auto safety, and helmet standards and rules;

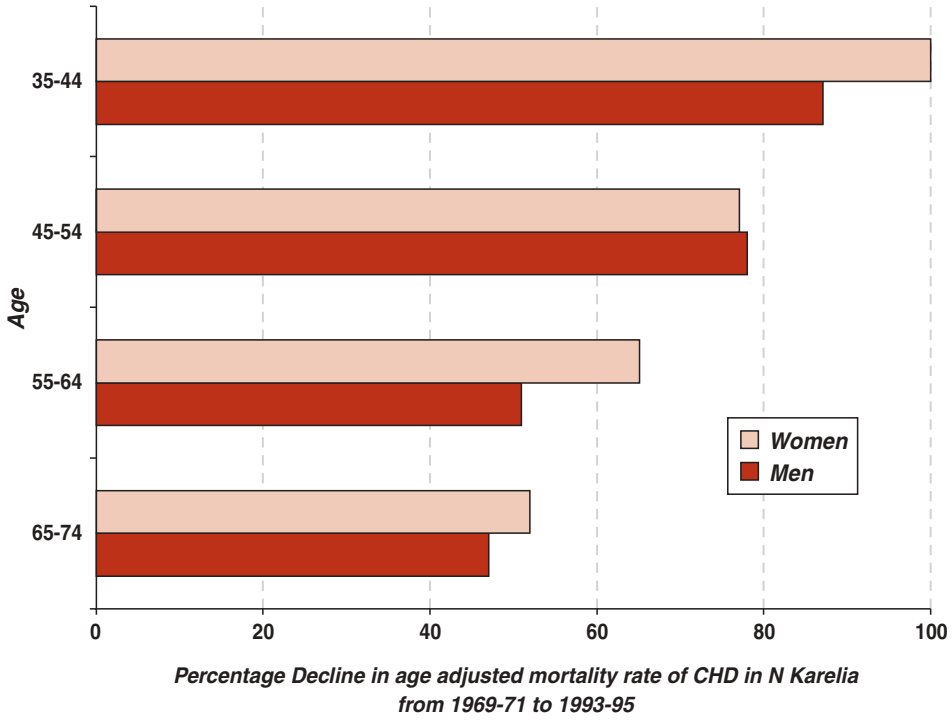
- **Drunk driving:** general deterrence-based police enforcement and education to ensure compliance with legal alcohol limits;
- **Novice drivers:** graduated driver-licensing system to control and reduce the risk exposure of young drivers;
- **Vehicle safety:** harmonization with international best practices and systematic inspection and certification to ensure industry compliance with standards and rules;
- **Commercial vehicles:** general deterrence-based police enforcement and education to ensure compliance with safe loads, driving hours, and vehicle standards;
- **Child safety:** traffic safety education in the core school curriculum; and
- **Emergency medical services:** pre- and post-hospital care and victim recovery targeting high-risk corridors, including communication and ambulance networks, well-trained teams, and improved emergency care wards in hospitals.

10

Chapter 10. What Health Improvements Could Result from an Intensified Program of Action?

As discussed in Chapter 7, Finland's North Karelia Project provides strong evidence of what Russia could expect from a carefully designed, rigorously implemented program to reduce NCDs and injuries. This project achieved major changes in mortality from NCDs through dietary changes; increased physical activity; and reduced smoking, serum cholesterol, and blood pressure. By targeting important high-risk factors for NCDs, mortality by all causes in North Karelia declined by about 45 percent during 1970-95. In the 1980s, these favorable changes began to develop all over Finland, improving life expectancy by 7 years for men and 6 for women. As shown in Figure 10.1, the 35-44-year-olds reaped the largest decline in age-specific mortality: men in this age group had an 87 percent decline in mortality from CHD between 1971 and 1995. Men 35-64 had their age-adjusted mortality rate decline from about 700 per 100,000 population in 1971 to about 110 per 100,000 in 2001.

Figure 10.1 Decline in Age-Adjusted Mortality from CHD in N. Karelia: 1969-71 to 1993-95



Source: Adapted from Puska et al. (1995).

More importantly for Russia, data from North Karelia reveal that results from prevention efforts may appear in years rather than decades—improvements occur some 2-7 years after the elimination of the exposure to a risk factor, and that they are beneficial even for people in older age groups.

Mortality Reduction

The Multiple Decrement Life Table[14] approach was used to estimate the effect reductions in cardiovascular, digestive, and external causes of diseases could have on life expectancy in Russia. While the North Karelia experience cannot automatically be extrapolated to the Russia experience, it does signal the possibilities. The data in Tables 10.1 (males) and 10.2 (females) on page 92 must be interpreted with caution and be mindful of the assumptions underlying this exercise. Further analysis could add context to this assessment by availing of

14 Age-specific and age-and-cause-specific death rates and cause of death ratios were computed, and an ordinary life table using age-specific death rates for all causes combined was developed. Next, death rates were distributed by cause, indicating the total number of deaths in each age group. Probabilities of death by cause were then computed by cause elimination, after which the associated decrement tables were calculated.

Table 10.1 Estimated Improvements in Life Expectancy if Mortality Rates Are Reduced by 20 and 40 Percent, Russian Males, 2000

	Current Life expectancy	Circulatory		Digestive		External causes	
		20	40	20	40	20	40
Birth	57.77	62.5	63.9	58.3	59.8	61.3	62.5
20-24	40.08	44.0	46.2	40.6	41.9	45.4	46.2
25-29	35.74	41.7	44.2	36.3	37.5	40.4	42.0
30-34	31.82	37.8	40.6	32.3	33.4	35.7	36.1
35-39	27.78	33.8	34.6	28.3	29.6	30.9	32.9
40-44	24.19	30.0	30.8	24.6	25.1	26.6	27.9
45-49	20.40	26.1	28.3	20.8	20.9	22.2	25.3
50-54	17.33	22.5	24.8	17.6	17.7	18.6	19.2
55-59	13.92	18.7	21.5	14.2	14.2	14.7	15.4
60-64	11.48	15.1	17.0	11.6	11.6	11.9	14.1

Source: Bakilana 2005.

Table 10.2 Estimated Improvements in Life Expectancy if Mortality Rates Are Reduced by 20 and 40 Percent, Russian Females, 2000

	Current Life expectancy	Circulatory		Digestive		External causes	
		20	40	20	40	20	40
Birth	72.3	73.9	75.2	73.2	74.1	72.8	73.1
20-24	54.0	55.6	56.9	54.9	55.8	54.5	54.8
25-29	49.3	50.9	52.2	50.2	51.1	49.8	50.1
30-34	46.6	46.2	47.5	45.5	46.4	45.1	45.4
35-39	40.0	43.6	42.9	40.9	41.8	40.5	40.8
40-44	35.4	37.0	38.3	36.3	37.2	35.9	36.2
45-49	30.9	32.5	33.8	31.8	32.7	31.4	31.7
50-54	26.7	28.3	29.6	27.6	28.5	27.2	27.5
55-59	22.6	24.2	25.5	23.5	24.4	23.1	23.4
60-64	18.8	20.4	21.7	19.7	20.6	19.3	19.6

Source: Bakilana 2005.

Russian morbidity and mortality data and data from epidemiologic transitions models.

If mortality from preventable or treatable components of circulatory and digestive diseases and external causes can be reduced in working-age adults in Russia, important improvements would result in life expectancy for both men and women. For example, life expectancy at birth for men could increase as much as 5 years by reducing CVD by 20 percent. The impact of reducing the burden of these diseases among men is more evident in adulthood. The estimates of reducing external causes of mortality (road accidents, intentional self-harm, and assaults) signal that this as another high impact avenue for raising life expectancy in Russia (Table 10.1).

Although women in Russia already live longer than men, significant gains are possible for women, too, although the magnitude of the improvement is not as large (Table 10.2).

As shown in Figure 10.2, WHO estimates show that controlling the major risk factors could result in major improvements in healthy life expectancy (HALE), an indicator that captures both mortality and morbidity. The region that includes Russia, EUR-C,[15] could gain more than 10 years of HALE by controlling the 20 leading risk factors. This is a very important finding because increasing life expectancy but not HALE would spike the health system's burden.

The Impact on Achieving the Millennium Development Goals (MDGs)

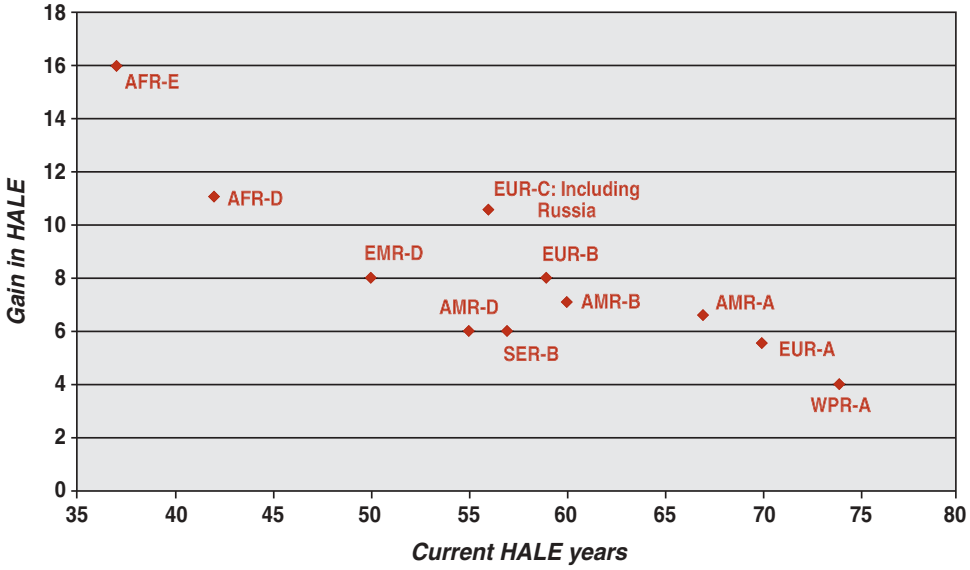
NCDs and injuries have not been considered sufficiently important to be included among the health-related targets of the MDGs, leading the relevance of these goals for countries in eastern Europe and Russia, where NCDs predominate, to be called into question (Marquez and Suhrcke 2005).

[15] EUR-A (countries with very low child and adult mortality): Andorra, Austria, Belgium, Croatia, Cyprus, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Monaco, the Netherlands, Norway, Portugal, San Marino, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom; EUR-B (countries with low child and adult mortality): Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Georgia, Kyrgyzstan, Poland, Romania, Serbia and Montenegro, Slovakia, Tajikistan, the former Yugoslav Republic of Macedonia, Turkey, Turkmenistan and Uzbekistan; and EUR-C (countries with low child and high adult mortality): Belarus, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, the Republic of Moldova, the Russian Federation, and Ukraine.

A recent World Bank study (Rechel, Shapo, and McKee 2004) examined the potential impact of achieving the MDGs in Russia and concluded that achieving the goals for child mortality and maternal mortality (67 percent and 75 percent reductions, respectively, from the 1990 values) would contribute very little to improving life expectancy at birth (0.96 years). By contrast, reduction of adult mortality due to CVDs and external causes of death (injuries, violence and poisoning) to the level found in the European Union, would yield an increase in life expectancy at birth of more than 10 years in the Russian Federation.

It is clear, therefore, that health improvements in Russia will require a substantial effort in NCDs prevention and control in the upcoming years. However, progress towards restoring a balance in the global health agenda is likely to be furthered by capturing and translating the impacts of NCDs into economic valuations as it is done in Chapter 11 of this study.

Figure 10.2 Estimated Gains in Healthy Life Expectancy with Elimination of the 20 Leading Risk Factors by Subregion



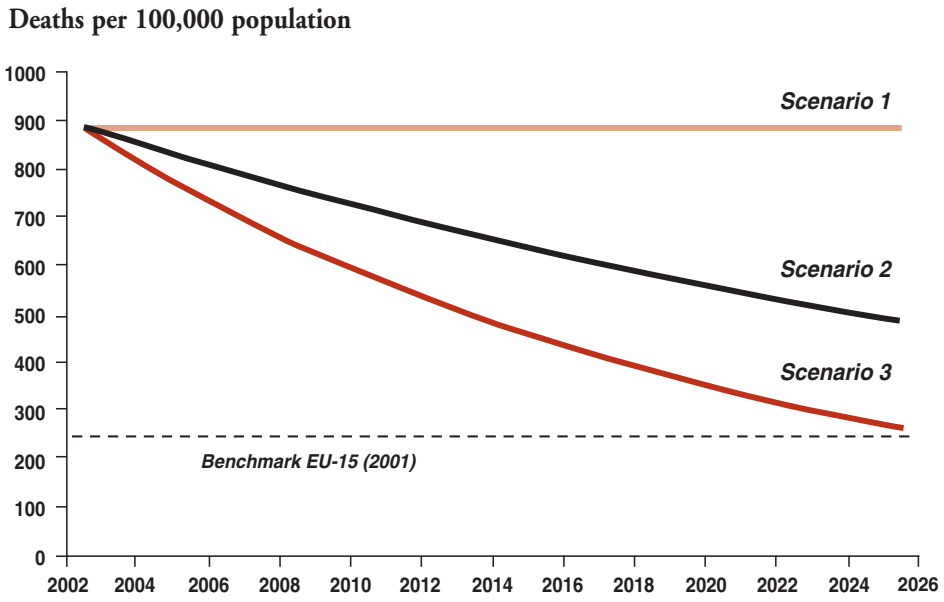
Source: Adapted from WHO 2002b.

11

Chapter 11. What Are the Potential Benefits of Mortality Reduction in Russia?

If the excessive burden of adult ill health and premature death in Russia due to NCDs and injuries were reduced, what economic benefits could result? The overarching message in this chapter is unambiguous: if effective action were taken in Russia, improved health would play an important role in sustaining high economic growth rates at the macro-level. This is despite the fact that the assessment concentrates only on the effect of mortality reductions, setting aside the impact of the likely associated morbidity reduction.

Figure 11.1 Three Scenarios for Russian Adult Mortality Rates due to Noncommunicable Diseases and Injuries, Age 15-64, 2002-25



Source: Suhrcke at al. 2005.

Note: Scenarios are based on the assumptions outlined in the text.

Benefits of Reducing NCDs and Injury Mortality: A Simple Static Calculation

The potential impact of policies that promote reduction in preventable adult mortality on the Russian economy was assessed for this study by comparing three scenarios (Suhrcke at al. 2005). Adult mortality itself was defined as mortality in the age group 15-64, between 2002 (the year for which the latest Russian data from the WHO Mortality Database are available) and 2025. Since this report focus on the impact of NCDs and injuries, only changes in adult mortality driven by the evolution of adult NCD- and injury-mortality rates were assessed, understating the greater health impact that eventual broad-based health interventions would likely have.

These scenarios, as illustrated in Figure 11.1, are:

Scenario 1: Status quo. In this scenario, the current (2002) level of adult mortality from NCDs and injuries is assumed to remain constant until 2025. This might seem to be an unnecessarily pessimistic scenario as NCD- and injury-mortality could be expected to decline simply as a response to the rapid economic growth observed in the last five years (a trend that may well continue into the future), even without specific additional efforts undertaken to improve adult health. The future trends cannot be predicted, but what is known, as shown in the previous chapters, is that (a) the long-term, increasing trend of non-communicable (in particular CVDs) disease and injury-related mortality over the past decades leaves very limited hope for a sudden or even gradual reversal of these trends, and (b) these cause-specific mortality rates have increased significantly even in recent years when economic growth was particularly strong (see Figure 1.11 in chapter 1). For these reasons, a benchmark scenario in which the relevant cause-specific mortality rates would remain at their 2002 levels is considered modestly optimistic.

Table 11.1 Economic Benefit Estimation for Scenario 2

	NCD	Injuries	NCD + Injuries	CVD
A) Zero growth in GDP p.c.				
Present value of benefits 2002-2025 (in billion US$ PPP)	15.217	9.637	24.854	15.474
Share of benefits in 2002 GDP	1.3%	0.8%	2.1%	1.3%
B) 3% p.a. growth in GDP p.c.				
Present value of benefits 2002-2025 (in billion US$ PPP)	22.974	14.490	37.464	23.146
Share of benefits in 2002 GDP	1.9%	1.2%	3.2%	2.0%
C) 5% p.a. growth in GDP p.c.				
Present value of benefits 2002-2025 (in billion US$ PPP)	30.454	19.158	49.612	30.506
Share of benefits in GDP	2.6%	1.6%	4.2%	2.6%

Source: Suhrcke at al. 2005b.

Note: Future benefits are discounted to the present at a 3% rate p.a.

Scenario 2: Intermediate scenario. This scenario assumes that policies are adopted that achieve half the improvement seen in the most optimistic scenario, number 3. This second scenario corresponds to an annual reduction of 2.3 percent for NCDs and 3.3 percent for injuries.

Scenario 3: Optimistic scenario. This scenario assumes that policies are adopted that cause a decline in Russian mortality rates from NCDs and injuries to the most recent available EU-15 level. This corresponds to an annual rate of reduction of 4.6 percent for NCDs and 6.6 percent for injuries.

None of these scenarios is based on the detailed modeling of the impact of specific policy interventions, a subject of further research. What is important here is that the chosen scenarios can be considered as plausible, based for instance on the mortality reductions that other Western and Northern European countries have achieved in the past decades. While the optimistic scenario is no doubt very ambitious, it is within reach of what those other countries (e.g., Finland) have achieved.

The main findings of the assessment prepared for this study (Suhrcke et al. 2005b) are:

The static economic benefit of gradually bringing the adult NCD- and injury-mortality rates down to current EU-15 rates by the year 2025 (scenario 3) is estimated to be between 3.6 percent and 4.8 percent of the 2002 Russian GDP. The analysis of scenarios 2 and 3 distinguishes between three sub-scenarios A, B, and C, each varying with its own assumed future growth path. The higher the future GDP, the more production would be foregone due to a life year lost, and by implication the benefits of reducing mortality would be greater. Under this approach, each year saved (compared to the first scenario) was valued by the projected per capita GDP for the year in which the "saving" occurs. To be able to compare the different future income streams, the 2002 present value of future values was calculated by applying the commonly used discount rate of 3 percent. Table 11.1 and Table 11.2 report the benefits in both absolute dollars and as a share in GDP for scenario 2 and 3, respectively. A column that examines the reduction in adult CVD mortality is also included in the tables.[16]

It is highly probable that the actual economic gain from reducing future mortality is larger than the static gains

[16] As in the case of non-communicable diseases and injuries it is assumed that Russian CVD rates would reach the latest EU-15 rates by 2025.

Table 11.2 Economic Benefit Estimation for Scenario 3

	NCD	Injuries	NCD + Injuries	CVD
A) Zero growth in GDP p.c.				
Present value of benefits 2002-2025 (in billion US$ PPP)	28.654	13.975	42.629	17.631
Share of benefits in 2002 GDP	2.42%	1.18%	3.60%	1.49%
B) 3% p.a. growth in GDP p.c.				
Present value of benefits 2002-2025 (in billion US$ PPP)	34.126	16.544	50.671	20.753
Share of benefits in 2002 GDP	2.88%	1.40%	4.27%	1.75%
C) 5% p.a. growth in GDP p.c.				
Present value of benefits 2002-2025 (in billion US$ PPP)	38.707	18.685	57.391	23.341
Share of benefits in GDP	3.3%	1.6%	4.8%	2.00%

Source: Suhrcke at al. 2005b.

Note: Future benefits are discounted to the present at a 3% rate p.a.

calculated above. If dynamic effects exist, they are bound to be larger than any static effect, as even a marginal dynamic impact will outgrow any static gain over time. There is substantial empirical evidence that health does impact positively on economic growth and, hence, does entail positive dynamic effects on the macroeconomy.

Static Welfare Effects

The Theoretical Framework. Several prominent economists, as well as multilateral financial organisations (World Bank, IMF) have measured the economic cost of mortality using a broader concept than GDP per capita. The new approach starts from the recognition that GDP is an imperfect measure of social welfare: it fails to incorporate the value of health. The true purpose of economic activity is the maximisation of social welfare, not necessarily of the production of goods by itself. Since health is an important component of properly defined social welfare, measuring the economic cost of mortality only in terms of foregone GDP leaves out a potentially major part of its 'true economic' impact, defined as its impact on social welfare.

Health is not incorporated in the measurement of GDP because it is a non-market good and consequently has no quoted market price.[17] Yet having no market price does not mean health has no value. When asked, people are ready to pay substantially for better and longer health, so there must be an implicit value that people attribute to health. While this value is high, it is not infinite, since people are not willing to give up everything in exchange for better health.[18]

One way to make the high value attributed to health more explicit is by measuring the extent to which a person is willing to trade off health with specific market goods for which a price exists. Willingness-to-pay (WTP) studies undertake this measurement. WTP can be inferred from risk premiums in the job market: jobs that entail health risks, such as mining, pay more in the form of a risk premium. A large number of WTP studies now make it possible to calculate a "value of a statistical life" (VSL), which can be used to value changes in mortality. Usher (1973) first introduced the value of mortality reductions into national income accounting.

[17] The health care inputs included in the measurement of GDP represent only a small share of the true value of health, as argued here.

[18] Referred to here are situations where people face marginal trade-offs between health and other goods, not the far less representative situation where people face immediate death, the prospect of which would increase the readiness to pay.

Table 11.3 Welfare benefits of Scenario 3 and 2

	NCD	Injuries	NCD + Injuries	CVD
SCENARIO 3				
Present value of benefits per capita (in US$ PPP)	1,512	866	2,377	1,242
Share of benefits in 2002 GDP	18.4%	10.5%	28.9%	15.1%
SCENARIO 2				
Present value of benefits per capita (in US$ PPP)	919	565	1,484	876
Share of benefits in 2002 GDP	11.2%	6.9%	18.0%	10.6%

Source: Suhrcke at al. 2005b.

This was done by generating estimates of the growth in "full income" (or "wealth"), a concept that captures changes in life expectancy by including them in an assessment of economic welfare, for six countries (Canada, Chile, France, Japan, Sri Lanka, and Taiwan) during the middle decades of the 20th century. For the higher-income countries, about 30 percent of the growth of full income resulted from declines in mortality. Estimates of changes in full income are typically generated by adding the value of changes in annual mortality rates (calculated using VSL figures) to changes in annual GDP per capita. Even these full-income estimates are conservative, including only the value of changes in mortality while excluding the total value of changes in health status.

For the United States, Nordhaus (2003) rediscovered Usher's pioneering work and found that the economic value of increases in longevity in the last hundred years roughly equals the value of measured growth in nonhealth goods and services. Nordhaus tested the hypothesis that improvements in health status have made a major contribution to economic wealth (defined as full income) over the 20th century. A more detailed assessment reveals that "health income" probably contributed to changes in full income somewhat more than nonhealth goods and services before 1950 and marginally less than nonhealth goods and services afterwards. If the results of this and other related papers (e.g., Cutler and Richardson 1997; Miller 2000; Costa and Kahn 2004; Crafts 2003; Viscusi and Aldy 2003) are confirmed, then the role of health should be reconsidered: the social productivity of spending on health (via the health system and other sectors that impact on health) may be many times greater than that of other forms of investment.

The Results in Russia. It is straightforward to apply the approach to assess the welfare benefits of reducing adult mortality in Russia. The critical input is a value of a statistical life for Russia. The principle in developing such estimates is to ensure that the lower boundary of plausible estimates cannot be challenged. Real values will certainly be higher; however, the key issue is the minimal plausible figure. For the purpose of the present calculations, a very conservative estimate of US$ 500,000 was used for the value of a statistical life in Russia as of 2002.[19]

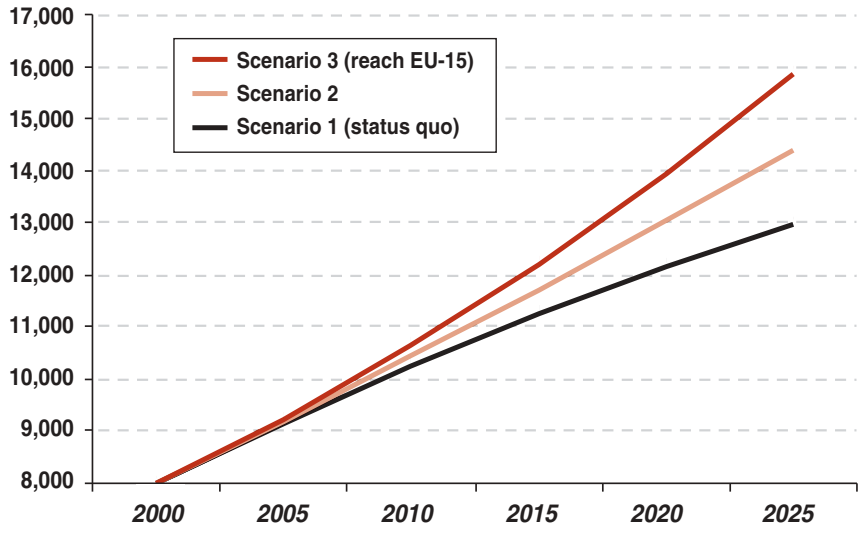
[19] To assess how conservative this is, see Miller (2000). Miller assembled a collection of VSL studies and estimated an equation that would predict the VSL in terms of GNP per capita and some other factors. Applying the parameters to Russia, he obtained a range of US$ 300,000 to US$ 800,000 with the best estimate being US$ 370,000. However, these figures were based on 1997 GDP data and expressed in 1995 dollars. By 2003/04, Russian GDP had increased by 30 percent since 1997. An updated VSL would be US$ 500,000 in 1995 dollars. Inflation in the United States between 1995 and 2004 has an accumulated value of 18 percent, so that in 2004 dollars, VSL in Russia would be US$ 590,000. Hence, the US$ 500,000 used here is certainly a lower bound. Based on a review of existing VSL studies, Crafts (2003) assumes that a conventional estimate of a country's VSL equals 132 times GDP per capita. For Russia this would give a 2002 VSL of 132 x US$ 8,230 = US $ 1,086,360, about double the estimate in this report. This calculation does, however, assume a unitary income elasticity of VSL, a result that other authors reject in favor of an income elasticity below 1 (see, for example, Viscusi and Aldy 2003), which would tend to reduce the VSL of countries with a lower GDP per capita. Yet even in this case our estimates remain the lower bound of the range of possible estimates.

Table 11.3 summarises the results from the welfare benefits estimation of scenarios 3 and 2, assuming a Russian VSL of US$500,000. In the calculations the same discount rate (3 percent) for future benefits was used. It was assumed that the VSL remains constant over the period 2002 to 2025, which is in line with the literature, if GDP per capita also remains constant. If GDP per capita grows over time, this will increase the VSL in future years, thereby even further increasing the welfare benefits to health.

Not surprisingly, the estimated welfare benefits are a multiple of the more narrow returns in the previous GDP-based calculations. Specifically, the accumulated effects of reductions in mortality from non-communicable diseases and injuries reductions is approximately six times higher than when using the narrow concept (i.e., the share of welfare benefits is about 28.9 percent of 2002 GDP under Scenario 3 as compared to the static economic benefits of about 4.8 percent of 2002 GDP under Scenario 3).

Figure 11.2 GDP per Capita Forecasts in the Three Scenarios

1996 constant U.S. dollars



Source: Suhrcke at al. 2005b.

Dynamic Effects: The Impact of Adult Health on Economic Growth

The Theoretical Framework. Recent worldwide empirical evidence strongly suggests that health is a robust determinant of economic growth. Such growth is driven by effects on savings (Bloom, Canning, and Graham 2003), on human capital investment (Kalemi-Ozcan, Ryder, and Weil 2000), on labor market participation (Thomas 2001), on foreign direct investment (Alsan, Bloom, and Canning 2004), and on productivity growth (Bloom, Canning, and Sevilla 2002). The combined effects of health on economic growth are confirmed in theoretic and empirical work by Barro (1996); Bhargava, Jamison, and Murray (2001); Bloom, Canning, and Seville (2001); Jamison, Lau, and Wang (2004), among others. Studies examining the impact of health on income levels or income growth differ substantially in terms of country samples, time frames, control variables, functional forms, data definitions and configurations, and estimation techniques. Nevertheless, parameter estimates of the effects of life expectancy on economic growth have been remarkably comparable and robust across studies, notwithstanding the observation that the empirical growth regression results are generally not very robust, given the high degree of multicollinearity between many of the explanatory variables used (Levine and Renelt 1992; Sala-I-Martin, Doppelhofer, and Miller 2004). In some studies, initial health status, typically proxied by life expectancy or adult mortality, proved to be a more significant and more important predictor of subsequent growth than the education indicators employed (Barro 1997). Bhargava, Jamison, and Murray (2001), for instance, show in the context of a panel regression that the 5-year growth rate of GDP per capita depends on a country's adult mortality rate, among other factors. They also show that the direction of causality runs unambiguously from adult mortality to growth. In this section , this empirical relationship is applied to Russia and then employs the empirical results to project different future pathways in GDP per capita under the above three scenarios. In doing so, an assumption is made that the empirical regularities that hold in a representative world sample of countries also hold for Russia (see appendix B section 8 for details).

The Results in Russia. Applied to the specific Russian context, the dynamic benefits of improving

adult health, i.e., the effect on economic growth rates, are massive and growing over time. Even if the future returns are discounted to the starting year value (2002), they represent a multiple of the static GDP effects. One conservative estimate indicates that while in 2005 the difference in the per capita GDP between the status quo scenario and the most optimistic scenario is only US$105-324 (depending on the estimation methodology used), by 2025 this difference would have grown to US$2,856-9,243. Even if these future returns are discounted to the starting year value, they represent a multiple of the static GDP effects. Figure 11.2 on page 99 illustrates the predicted path of GDP per capita under the three scenarios, using the very conservative lower bound of the growth estimates calculated. The area between the scenario 1 and scenario 3 lines indicates the likely economic benefit under the optimistic scenario.

Additional Estimates of the Macroeconomic Consequences of NCDs and Injuries in Russia

In addition to the economic assessment prepared for this study and discussed in the previous sections of this chapter, recent estimates undertaken by WHO (2005b) also show a very dire picture. According to the WHO estimates[20], the Russian Federation will lose in 2005 US$11.1 billion of national income as a result of the impact of deaths from heart disease, stroke and diabetes on labor supplies and savings. This figure is estimated to increase to US$66.4 billion by 2015. The magnitude of the estimated loss in Russia is better appreciated when it is compared with the significant lower estimated losses in the United Kingdom: US$1.6 billion in 2005 and US$6.4 billion by 2015. As these losses accumulate over time because each year more people die, the estimated accumulated loss in Russia during the 2005-15 period amounts to US$303.2 billion as compared to only US$32.8 billion in the United Kingdom.

When these losses are translated into percentage reduction in GDP, WHO estimates that in 2005 1 percent of the Russian GDP was reduced, and by 2015 the percentage reduction in GDP would be over 5 percent of GDP, far higher than the estimated reduction of 1 percent of GDP in other countries such as Brazil, China and the United Kingdom. In large measure the estimated large losses in Russia are due to higher rates of CVDs (the leading killer of the Russian working-age population as discussed in chapter 3) than in other countries.

Conclusion

Reducing NCDs and injury-related mortality rates among Russian working-age adults will have a major macroeconomic and poverty reduction impact, regardless of how this is measured. Based on the results of the assessment conducted for this study, as well as the recent WHO estimates described above, the expected economic benefits are of a magnitude that easily outweighs the costs of health promotion and disease prevention programs. Given the significant positive effect on economic growth from investing in health (Barro 1997, Suhrcke at al. 2005a), governmental intervention is urgently needed in Russia to develop health-enhancing policies and programs to address the alarmingly high mortality rates among the working-age population. These efforts should be seen as key investments to help improve the general welfare of the population and secure sustainable economic growth in the future.

[20] Three approaches were used: (i) systematic review on chronic disease costs of illness; (ii) elucidation of the human capital impact of chronic diseases through their impact on labor supply--the Solow growth model using the Cobb-Douglas function; and (iii) elucidation of the impact of chronic diseases on and growth in economic welfare—the full-income approach. (WHO 2005b; Annex 4 Economic Analysis Methods).

EPILOGUE

Epilogue

Russia is experiencing a major and complex demographic and health crisis characterized by premature mortality; ill health and disability among young adults, particularly males; dramatic decreases in life expectancy; and a reduction in population size, coupled with the aging of its population. The population at large, particularly in the less developed regions of the country is affected by risk factors associated with higher disease and disability levels due to non-communicable conditions and injuries. These conditions require treatment and care on a continuing basis to control them and prevent, if possible, disability. The health care system, individuals, families, and communities bear a heavy burden due to the chronic nature of these conditions. Poor adult health negatively affects economic well-being at the individual and household level, and, if effective action were taken in Russia, improved health would play an important role in sustaining high economic growth rates at the macro-level.

This report argues that most NCDs and injuries could be prevented and controlled through a comprehensive national program operating at the federal, regional, and municipal levels. Program features would include (a) addressing health as a multisectoral concern; (b) demand- and supply-side incentives to encourage healthy behaviors; (c) modern approaches to disease control, including strengthening the country's disease surveillance, research, and evaluation capacity; (d) an upgraded workforce and intersectoral institutional arrangements and structures to meet current needs; and (e) funding policies to support the scaling up of health promotion and NCDs and injuries prevention.

Much of the NCD and injury burden can be avoided with the adoption of good practices that have been proven at the international level. Similar to the significant and sustained achievements under the North Karelia Project in Finland, major health gains can be achieved in Russia in a short period by modest lifestyle changes if they are practiced by major segments of the population. In addition, interventions during the clinical stages of the disease have more impact and are less expensive to the health care system if treated early.

The time has come, therefore, to transform the concept of health care in Russia by acknowledging the limits of medicalization and the breadth of social and economic factors that affect health, including the responsibility of individuals for their own health and government responsibility for creating an enabling environment for its population to make healthier choices (Califano 1994).

APPENDIX A

Appendix A

Table A1. Estimated and Projected Number of Deaths Caused by NCDs and Injuries in Russia by Gender, 2000-2025

Year	Neo-plasmas	Endocrine, nutritional, and metabolic disorder	Diabetes mellitus	Mental disorders	Circulatory	Respiratory	Diseases of the liver	External causes	Traffic accidents	Accidental poisoning	Intentional self-harm	Assault	Pregnancy, childbirth, and puerperium complications	Total
MEN														
2000	163,994	4,217	3,469	5,712	543,219	71,679	17,278	245,771	28,738	45,935	47,520	30,127		1,203,442
2005	152,494	3,965	3,256	5,651	536,960	68,571	16,468	240,207	28,081	45,016	46,440	29,597		1,176,707
2010	181,118	4,450	3,698	5,939	621,337	78,565	18,280	245,549	28,138	46,188	47,478	29,896		1,310,638
2015	193,021	4,600	3,850	5,911	672,820	83,138	18,660	239,995	27,178	45,158	46,408	29,173		1,369,912
2020	204,582	4,754	3,945	5,800	692,365	86,283	19,087	232,740	26,024	43,859	45,152	27,962		1,392,552
2025	213,559	4,853	4,108	5,758	742,762	90,554	19,206	225,272	24,933	42,397	43,977	26,733		1,444,112
WOMEN														
2000	133,826	8,676	8,010	2,655	685,609	29,825	11,860	67,730	10,182	12,855	9,099	10,206	503	990,533
2005	140,018	8,953	8,282	2,808	766,578	32,083	12,066	68,588	10,266	12,887	9,354	10,306	502	1,082,691
2010	140,927	8,943	8,269	2,840	759,765	31,880	12,508	68,503	10,010	13,114	9,233	10,241	497	1,076,730
2015	146,251	9,207	8,535	2,935	821,739	33,571	12,797	67,808	9,737	12,912	9,168	10,068	485	1,145,213
2020	150,429	9,695	9,026	2,815	799,531	33,208	12,970	66,148	9,480	12,648	8,978	9,714	454	1,125,095
2025	155,552	9,984	9,321	2,849	855,495	34,765	12,926	64,889	9,285	12,279	8,932	9,398	427	1,186,100

Source: Bakilana (2005). Calculations based on World Health Organization (WHO) data and UN Population Database.

Note: A simple method was used to estimate the number of deaths from NCDs as a demonstration of the potential number of deaths should age-specific death rates (ASDRs) from specific causes remain the same. Russia's ASDRs for NCDs were obtained from the WHO Mortality Database. The ASDRs were then applied to Russia's projected population for the various years to 2025 (projected populations were obtained from the UN Population Database). The medium variant option was chosen (it uses a "medium" fertility assumption and a "normal" mortality assumption). The obtained number of deaths from NCDs up to 2025 very crudely show the expected number of deaths if Russia's 2000 ASDRs are applied to the medium variant populations up to 2025. As expected, in some cases the total number of deaths from NCDs actually declines and then increases simply because the population numbers in Russia have been declining for some years. The method used is crude but informative about the expected number of deaths if the size of the population has been accurately projected and if the ASDRs from NCDs remain at the 2000 level. It is very clear that the expected number of deaths from NCDs would be higher or lower depending on which UN population projection variant is used and whether the methodology takes into account the changing patterns of behavior leading to higher or lower risks of NCDs.

APPENDIX B

Appendix B. Data Sources, Methodologies, and Detailed Results for Chapters 6 and 11

Brief Description of Datasets Used for the Economic Analysis

Russian Longitudinal Monitoring Survey (RLMS)

The Russian Longitudinal Monitoring Survey (RLMS) was conducted with the support and assistance of the World Bank, the United States Agency for International Development (USAID), the National Science Foundation, the National Institute of Health, and the North Carolina Population Center.

RLMS covers the period from 1992 to 2003, but the survey changed considerably throughout this period: in a first phase (from 1992 to 1994), the main RLMS accomplishment was the creation of the first national sample frame allowing surveys to be representative at the national level. More recently, this sample frame has been extended to develop samples representative at the regional and oblast levels (RLMS 1998).

For the second phase, covering the period 1994-2003, the emphasis changed from institution-building to providing timely, high-quality information. The survey's main unit of observation is the household. RLMS covers primarily the European part of Russia, but the distribution of household size in the sample within urban and rural areas corresponds well to the figures from the 1989 census (for a detailed comparison of the 1989 census and the RLMS, see RLMS [1998]). At each round, data are collected on the household, each household member, and the residential community.

Households were selected on the basis of a multi-stage process, with the households being clustered into primary sampling units ("sites"). Although the target sample size was 4,000 households, the number of households drawn into the second phase sample was 4,728 in order to allow for a 15 percent nonresponse rate. The household response rate in the beginning of the second phase of the RLMS exceeded 80 percent, and individual questionnaires were obtained from about 97 percent of the individuals listed in the household rosters.

This dataset lacks a true panel design, as household are not followed if they move from their dwelling, and likewise individuals who leave a household are not followed. The effect of attrition is relatively modest and has been highest for the respondents from Moscow and St. Petersburg.

The information is rich on income and expenditures of households, labor force participation, health conditions, and individual risk factors.

National Survey of Household Welfare and Program Participation (NOBUS)

While the RLMS has the advantage of being repeated annually, which allows some comparison over time, the NOBUS survey, so far only held once in 2003, covers a far more comprehensive portion of the population. With a sample of about 44,500 households, it is representative both nationally and for 46 larger subjects of the Russian Federation. It captures differing aspects of household welfare and focuses on household access to social services. Its health measurement component, however, is small compared to the RLMS, so a direct comparison to the RLMS results is not possible.

Technical Details and Specific Results on the Analysis of the Labor Supply and Productivity Effect of Health

The methodologies that can be applied are largely determined by data availability and by the informed evaluation of the importance of the endogeneity problem,

Table B1. Calculation for Costs of Absenteeism

Year	Gender	Annual average working days missed due to illness	Average annual wage (among all jobholders)	Average annual wage (among those absent at least once)	GDP per capita (in current local currency units, in constant 2000 prices)	Average wage loss for a person absent the average number of days	Average production loss for a person who was absent the average number of days	Active population	Total income loss (billion)	Total production (GDP) loss (billion)
2000	*Male*	10.8	26,268	24,576		777	1,480	36,639,000	28.48	54.24
	Female	9.24	15,648	15,864		396	1,266	33,822,000	13.40	42.83
	Total	10.08	20,724	19,992	50,028	572	1,382	70,461,000	40.33	97.35
2001	*Male*	9.48	32,501	33,994		844	1,373	36,788,000	31.05	50.52
	Female	10.92	20,335	20,046		608	1,582	34,402,000	20.93	54.42
	Total	10.2	26,145	26,062	52,876	731	1,478	71,190,000	52.01	105.19
2002	*Male*	8.64	37,448	37,929		886	1,318	36,937,000	32.74	48.70
	Female	10.32	23,891	25,146		675	1,575	34,982,000	23.63	55.09
	Total	9.48	30,309	30,763	55,699	787	1,447	71,919,000	56.62	104.04
2003	*Male*	9.6	40,514	36,851		1,066	1,583	37,087,000	39.52	58.72
	Female	9.36	25,552	25,544		655	1,544	35,125,000	23.02	54.22
	Total	9.48	32,503	30,570	60,195	844	1,563	72,212,000	60.96	112.90
Sources:		RLMS	RLMS	RLMS	IMF					

Note: The population average wage was used in the cost calculations since there were no systematic patterns when comparing population average wage and absentees' average wage.

which tends to afflict many if not all efforts to establish a causal relationship in economic and social empirical research. In the given context the endogeneity problem means that there could be a simultaneous relationship between the chosen health proxy and labor market outcomes that would bias the statistical relationship that would be measured using the most common econometric technique (i.e., ordinary least squares estimation). The proposed solutions to the endogeneity problem also critically depend on the health indicator used and the potential measurement error associated with the given health indicator, because in some cases the particular kind of the measurement error can offset the bias resulting from the endogeneity problem.

The following three methods were used, all adopted from the existing literature. The methodologies were applied to the main data source, the RLMS, in particular for the four years from 1999 to 2002. The second methodology (instrumental variable estimation) was applied to the one-time (2003) NOBUS household survey, too. As health proxy, the different methodologies use a self-rated health indicator, medically diagnosed diseases, or workdays missed due to illness.

1. *Ordinary least squares (OLS) regressions.* This approach is based on a seminal paper by Bartel and Taubman (1979), which uses a Mincerian wage equation by adding to the usual variables (age, work experience, years of schooling, family background) and indicators of diseases, both physical and mental (heart disease and hypertension, psychoses and neuroses, arthritis, bronchitis, ulcers diseases of nerves, diseases of liver, and bone diseases). In particular, they analyze the effects of such diseases on the basis of their year of onset, in order to disentangle short-term from long-term effects. A similar exercise was performed for this study by regressing wage rates (in natural logarithms and at 2000 prices) and the number of hours worked per week (in natural logarithms) on a large set of the individual-specific health and non-health variables and environmental variables (see Table B2 for a list of these variables). The assumption of this approach-corroborated by a number of statistical tests-is that endogeneity does not really

Table B2. Independent Variables Used in the Regression Analysis Using the RLMS Data

Variable	Description	Instrumental variables*
gender	gender (male=1)	
age	Age	
age2	squared age	
highsc	high school diploma	
tecdp	technical or medical diploma	
insdp	institute or university diploma	
gradp	doctoral degree	
married	Married	
tenure	experience at current workplace	
tenure2	squared experience at current workplace	
pjemps	number of employees in enterprise	
ncat	number children under 7 y.o.	
private	private sector	
region_2	Northern and North Western	
region_3	Central and Central Black-Earth	
region_4	Volga-Vaytski and Volga Basin	
region_5	North Caucasian	
region_6	Ural	
region_7	Western Siberian	
region_8	Eastern Siberian and Far Eastern	
urban	urban area	
occupation_2	professionals (ISCO-88 code)	
occupation_3	technicians and associate professionals (ISCO-88 code)	
occupation_4	clerks (ISCO-88 code)	
occupation_5	service workers and market workers (ISCO-88 code)	
occupation_6	skilled agricultural (ISCO-88 code)	
occupation_7	craft and related trades (ISCO-88 code)	
occupation_8	plant and machine operators and assemblers (ISCO-88 code)	
occupation_9	elementary (Unskilled) occupations (ISCO-88 code)	
round_10	year 2001	
round_11	year 2002	
round_12	year 2003	
cheart	chronic heart disease	X
clungs	chronic lungs disease	X
cliver	chronic liver disease	X
ckidny	chronic kidney disease	X
cgi	chronic stomach disease	X
spine	chronic spine disease	X
cother	other chronic diseases	X

(continued on page 110)

Table B2. Independent Variables Used in the Regression Analysis Using the RLMS Data *(continued)*

Variable	Description	Instrumental variables*
diabetes_10	diabetes diagnosed between 10 and 5 years ago	X
diabetes_20	diabetes diagnosed between 20 and 10 years ago	
diabetes_5	diabetes diagnosed less than 5 years ago	
diabetes_b20	diabetes diagnosed more than 20 years ago	
heart_10	heart attack diagnosed between 10 and 5 years ago	X
heart_20	heart attack diagnosed between 20 and 10 years ago	
heart_5	heart attack diagnosed less than 5 years ago	
heart_b20	heart attack diagnosed more than 20 years ago	
hepatitis_10	hepatitis diagnosed between 10 and 5 years ago	X
hepatitis_20	hepatitis diagnosed between 20 and 10 years ago	
hepatitis_5	hepatitis diagnosed less than 5 years ago	
hepatitis_b20	hepatitis diagnosed more than 20 years ago	
stroke_10	stroke diagnosed between 10 and 5 years ago	X
stroke_20	stroke diagnosed between 20 and 10 years ago	
stroke_5	stroke diagnosed less than 5 years ago	
stroke_b20	stroke diagnosed more than 20 years ago	
tbc_10	tuberculosis diagnosed between 10 and 5 years ago	X
tbc_20	tuberculosis diagnosed between 20 and 10 years ago	
tbc_5	tuberculosis diagnosed less than 5 years ago	
tbc_b20	tuberculosis diagnosed more than 20 years ago	
healthGOOD	self-reported good health status	
misseddays	missed work days due to ill health	
school_1	high school diploma completed before 2000	
school_2	technical or medical diploma completed before 2000	
school_3	institute or university diploma completed before 2000	
school_4	doctoral degree completed before 2000	

*Instrumental variables have only been used in the regressions summarized in Tables B5 and B6.

matter given the specific health indicators used, so the use of OLS becomes justified.

Table B3 and Table B4 on page 113 report the results of four models that differ by the date of medical diagnosis for diabetes, heart attack, stroke, tuberculosis and hepatitis (the only diseases for which the diagnosis date is available in the dataset). As expected lung, kidney, and spine chronic diseases reduce the wage rate (and hence productivity). Surprisingly, chronic lung disease increases labor supply. Recently diagnosed heart attack and tuberculosis reduces wage rate, as expected. Hepatitis diagnosed very early reduces labor supply, while recently diagnosed tuberculosis increases labor supply. Indeed, respiratory and lung-related diseases (such as asthma and bronchitis) seem to have a positive effect on labor supply. Given the fact that respiratory diseases cause relatively little work limitations, a possible hypothesis explaining these findings could be that individuals seek to augment their revenues in order to compensate for the additional medical care expenditures they require.

Table B3. OLS - Dependent Variable: Log Hourly Wage Rate (Measured at 2000Prices)

Variable	Before20	Y20_10	Y10_5	Y5_0
gender	.30254066***	.30310181***	.3024037***	.30367693***
age	.03272136***	.03260822***	.03273228***	.03251867***
age2	-.00041325***	-.00041165***	-.00041368***	-.0004103***
highsc	.07731209***	.07729698***	.0775283***	.07760015***
tecdp	.08662943***	.08694422***	.08624272***	.08602663***
insdp	.32191213***	.32172709***	.32240742***	.32086648***
gradp	-.07311596	-.07601234	-.07762188	-.07221849
married	.04515979***	.04471361***	.04424292***	.04513566***
tenure	-.00126128	-.00124136	-.00126923	-.00110397
tenure2	.00011182*	.00011086*	.00011178*	.0001044*
pjemps	9.158e-06***	9.184e-06***	9.161e-06***	9.201e-06***
ncat	-.04025733***	-.04012284***	-.03946076***	-.04009372***
private	.17656016***	.17648686***	.17705347***	.17630873***
region_2	-.02601835	-.02536182	-.0264554	-.0255168
region_3	-.46472316***	-.46428774***	-.46488513***	-.46488793***
region_4	-.71409733***	-.71366399***	-.7137759***	-.71324021***
region_5	-.61041382***	-.60970428***	-.61063961***	-.60931095***
region_6	-.48056355***	-.48006629***	-.48088991***	-.48145873***
region_7	-.48499262***	-.48461688***	-.48570588***	-.48480409***
region_8	-.29421497***	-.29363089***	-.29479044***	-.29217805***
urban	.43861682***	.43867082***	.4389986***	.44019666***
occupation_2	-.01549473	-.0169319	-.01764095	-.01722858
occupation_3	-.1018942***	-.10313616***	-.10426042***	-.102774***
occupation_4	-.16137001***	-.16203158***	-.16283756***	-.16217807***
occupation_5	-.41726362***	-.41845074***	-.41930993***	-.41848629***
occupation_6	-.46935269***	-.47401677***	-.47384018***	-.47511778***
occupation_7	-.04230204	-.04379586	-.04411402	-.04298466
occupation_8	-.11553389***	-.11695315***	-.11749264***	-.11677098***
occupation_9	-.48967173***	-.48989482***	-.49126905***	-.49107733***
round_10	.17638925***	.17525387***	.17556241***	.17504897***
round_11	.38113833***	.38000061***	.38030253***	.37951903***
round_12	.47109966***	.46966934***	.47030324***	.46988307***
cheart	-.02067898	-.01857795	-.01968821	-.01338115
clungs	-.08023211**	-.07860568**	-.07878113**	-.07764093**
cliver	-.00480458	-.00782106	-.00376398	-.01182401
ckidny	-.04546527*	-.04487214*	-.04552355*	-.0444479*
cgi	.01611436	.01571097	.01533843	.01483718
cspine	-.03773294**	-.03885295**	-.0386692**	-.03875688**
cother	-.02434006	-.02327219	-.02333522	-.02540852

(continued on page 112)

Table B3. OLS - Dependent Variable: Log Hourly Wage Rate (Measured at 2000Prices) *(continued)*

Variable	Before20	Y20_10	Y10_5	Y5_0
diabetes_b~0	.08708819			
heart_b20	-			
stroke_b20	-.12886329			
tbc_b20	-.11782447			
hepatitis_b20	-.02362581			
diabetes_20		-.08324869		
heart_20		-.06870232		
stroke_20		-.23865608		
tbc_20		-.04481312		
hepatitis_20		.00727449		
diabetes_10			-.03340999	
heart_10			.0153402	
stroke_10			-.2775952	
tbc_10			-.12228027	
hepatitis_10			-.04278534	
diabetes_5				.05831311
heart_5				-.13975016*
stroke_5				-.10652745
tbc_5				-.23336728**
hepatitis_5				.10332314
constant	1.2241776***	1.2269543***	1.226739***	1.2266473***
R2	.3803084	.38032227	.38038093	.3806654
N	11297	11297	11297	11297

Note: Legend: * p<.1; ** p<.05; *** p<.01

Although this approach was used in the literature, its underlying assumptions are controversial. The following two methods address the endogeneity issue in more direct ways.

2. *Instrumental variables (IV) estimation.* When endogeneity is explicitly taken into account, simultaneous equation or instrumental variables approaches are typically the preferred option. Following this method, the endogenous variable (here: the health indicator) should be substituted by the predicted values coming from its own regression over a set of instrumental variables plus all the exogenous variables that are part of the model. The researcher must choose as instruments one or more variables that are correlated with the endogenous variable but uncorrelated with the error term. The predicted values will then contain part of the information of the original variable, but they will be purified from the correlation with errors. This approach was applied to both the RLMS and the NOBUS data. Since the surveys differ, the precise specification of the estimation methodology differs slightly, too.

RLMS

Individual self-reported health status was used as the health proxy in the first set of regressions, and the reported number of workdays missed due to illness in

Table B4. OLS - Dependent Variable: Log Weekly Hours

Variable	Before20	Y20_10	Y10_5	Y5_0
gender	.1082822***	.10816178***	.10869426***	.10820324***
age	.01699662***	.01691379***	.01676215***	.01688689***
age2	-.00020535***	-.00020482***	-.00020268***	-.00020421***
highsc	-.01192034	-.01158593	-.01202024	-.01188906
tecdp	.00299955	.0030822	.00286354	.00316107
insdp	.00574539	.00556812	.00571997	.00574958
gradp	.01750542	.01471094	.01609397	.01712725
married	-.02446514***	-.02487114***	-.02475416***	-.02468505***
tenure	-.00206881**	-.00206111**	-.00207175**	-.00207253**
tenure2	.00005766**	.00005736**	.0000583**	.00005743**
pjemps	-8.690e-07***	-8.490e-07***	-8.641e-07***	-8.489e-07***
ncat	.00040164	.00039929	.00030107	.00046486
private	.07633224***	.07656981***	.07671271***	.07617914***
region_2	.06115134***	.06051219***	.0609761***	.06085042***
region_3	.02044861*	.02015783*	.02036473*	.02046827*
region_4	.03674088***	.03693256***	.03682934***	.03713913***
region_5	.07975371***	.07938687***	.07960869***	.08008555***
region_6	.01340273	.01321734	.01336299	.01393258
region_7	.04322431***	.04314116***	.04295671***	.04327367***
region_8	.05036055***	.05051396***	.05041537***	.05130143***
urban	.02271182***	.02296056***	.02270854***	.02260605***
occupation_2	-.17578267***	-.17522752***	-.17577442***	-.1761433***
occupation_3	-.07078628***	-.07051406***	-.07101583***	-.07137268***
occupation_4	-.0686374***	-.0680209***	-.06813237***	-.06915404***
occupation_5	.08926562***	.0897478***	.08947398***	.08936801***
occupation_6	-.02700664	-.02734797	-.02807609	-.02808858
occupation_7	-.10144504***	-.10061856***	-.10121411***	-.10116903***
occupation_8	-.01019046	-.00971794	-.0104076	-.01010831
occupation_9	-.12541047***	-.12508277***	-.12513555***	-.12552281***
round_10	.0042041	.00258998	.00310756	.00281578
round_11	-.00524675	-.00687934	-.00644211	-.0065833
round_12	-.00674471	-.0082841	-.00784437	-.00816691
cheart	-.01282462	-.0135959	-.0118314	-.01302344
clungs	.03941723***	.03918327***	.04054747***	.03694418***
cliver	.01767289*	.01477509	.01618572	.01378418
ckidny	.0009254	.00122756	.00160304	.00111697
cgi	-.00062025	-.00079791	-.00106807	-.00058534
cspine	-.00464508	-.00489828	-.00504277	-.00521482
cother	-.00086547	-.00073189	-.00019993	-.00135145

(continued on page 114)

Table B4. OLS - Dependent Variable: Log Weekly Hours *(continued)*

Variable	Before20	Y20_10	Y10_5	Y5_0
diabetes_b20	-.03719927			
heart_b20	-			
stroke_b20	-.03803866			
tbc_b20	-.01698457			
hepatitis_b20	-.02917758**			
diabetes_20		-.02750776		
heart_20		.05839574		
stroke_20		.24507382*		
tbc_20		.01060056		
hepatitis_20		.00925964		
diabetes_10			-.04903766	
heart_10			-.01289033	
stroke_10			-.03361457	
tbc_10			-.11833582	
hepatitis_10			-.02558451	
diabetes_5				.02017598
heart_5				.00539258
stroke_5				-.01842532
tbc_5				.19298307***
hepatitis_5				.01203015
constant	4.8475018***	4.8493382***	4.8524877***	4.8500274***
R2	.14135195	.14153691	.14132912	.14158014
N	12009	12009	12009	12009

Note: Legend: * p<.1; ** p<.05; *** p<.01

the second. The latter is self-reported, too, and thus may be affected by measurement errors that are also systematically related to individuals' characteristics. This indicator was used because it could be considered a more specific indicator of work limitations than the overall health status. Schultz and Tansel (1995) used the same indicator in another country context, interpreting it as an "objective" measure of health status. Two kinds of estimations were performed for this study, and both follow Stern (1989) in the choice of instruments. Stern used medically diagnosed diseases to instrument for self-reported health indicators.

The variables in the third column of Table B1 are used as instruments for respectively self-evaluated health status and missed days due to ill health. Tables B4 and B5 report estimates for both the logarithm of wage rate and labor supply, separately by gender. Both indicators negatively affect the wage rate, but they do not have a significant influence on labor supply. A reported good health status increases the wage rate by 22% for women and by 18% for men, compared to those who were not in good health. Similarly, a workday missed due to illness reduces the wage rate by 3.7 percent in the male subsample and by 5.5 percent among females.

The Sargan test of overidentification does not reject the hypothesis of exogeneity of the selected instruments. Although this result must be interpreted only as an indication of exogeneity, because the Sargan test has only

Table B5. IV–Dependent Variables: Log Deflated Wage Rate (WR) at 2000 Prices and Log Weekly Worked Hours (LS)

Variable	WRfullsample	WRmale	WRfemale	LSfullsample	LSmale	LSfemale
healthGOOD	.20261634***	.1806543**	.22419709***	-.01000299	.02130741	-.02027266
gender	.27585464***			.1101072***		
age	.03614345***	.02352038***	.04389459***	.01683673***	.01700254***	.01448804***
age2	-.00043666***	-.00030836***	-.00051943***	-.00020515***	-.00020695***	-.00017566***
highsc	.07089832***	.07871912***	.04943325*	-.01161474	-.01891072**	-.00217997
tecdp	.08644842***	.10692356***	.06691908***	.0033794	-.01350005	.01483595*
insdp	.31426173***	.2392171***	.34637742***	.00540103	.02079802*	-.00123836
gradp	-.08415951	-.04194061	-.10088591	.01388915	-.02216501	.04175885
married	.05141418***	.15022216***	.01163241	-.02538585***	.01937082*	-.03886909***
tenure	-.00081092	-.00546021*	.00218432	-.00211222**	-.00426801***	-.00063797
tenure2	.00009809	.00019499**	.0000289	.00005859**	.00011212***	.00001423
pjemps	8.804e-06***	7.632e-06***	9.004e-06***	-8.013e-07	-9.378e-07	-2.854e-07
ncat	-.04521146***	.00215761	-.10828932***	.00057746	.01806025**	-.02033957**
private	.17277442***	.09955215***	.24806507***	.07645701***	.06493953***	.07887115***
region_2	-.0133603	.09148693*	-.0958643**	.05869207***	.06096713***	.05765205***
region_3	-.44289043***	-.40460824***	-.48610782***	.01849206*	.01404615	.01895777
region_4	-.70229557***	-.66428493***	-.7348911***	.03537858***	.01953694	.04064509***
region_5	-.61434647***	-.53340948***	-.67970519***	.07870559***	.05313381***	.09620142***
region_6	-.45873715***	-.33987848***	-.55962049***	.01230895	-.01643169	.03275026**
region_7	-.46645139***	-.45783094***	-.47691641***	.04152007***	.08148437***	.00841795
region_8	-.2853641***	-.2289622***	-.32352706***	.0502703***	.06153782***	.03448115**
urban	.43761558***	.62312852***	.2831659***	.02274333***	-.01505292*	.04760405***
occupation_2	-.01146613	-.02094595	-.00256181	-.17491303***	-.1825607***	-.17610764***
occupation_3	-.09973417***	-.04334927	-.10912741***	-.07085586***	-.0616262***	-.07649988***
occupation_4	-.15451163***	-.03652103	-.16638103***	-.06779682***	-.05827246*	-.06896023***
occupation_5	-.41975459***	-.31318111***	-.48718413***	.08981792***	.0592768***	.10308978***
occupation_6	-.47198821***	-.37263434***	-.84237456***	-.02883948	-.04088518	-.03736733
occupation_7	-.03552898	-.05105415	-.05908826	-.10097471***	-.10827515***	-.02649565
occupation_8	-.10721544***	-.12569034***	-.04698364	-.01031805	-.01859227	.00006369
occupation_9	-.48071172***	-.55627943***	-.42828469***	-.12501984***	-.0406391**	-.18950645***
round_10	.17584632***	.20261341***	.15252564***	.00302838	-.0035675	.00816274
round_11	.37643375***	.35788906***	.39169577***	-.00642209	-.00452699	-.00850983
round_12	.46681949***	.49302316***	.44638437***	-.00806578	-.01231146	-.00638784
constant	1.0524022***	1.3785507***	1.0700368***	4.8578013***	4.9607769***	4.8823667***
R2	.38005142	.37336365	.37954554	.14009513	.10294687	.13476493
N	11297	5081	6216	12009	5425	6584
sargan	13.573047	11.927898	12.401589	17.049472	13.678117	19.081833
sargan p	.25752479	.36908726	.33422615	.10642072	.25131896	.0596403

Note: Legend: * p<.1; ** p<.05; *** p<.01; health measure: self-reported health status

Table B6. IV–Dependent Variables: Log Deflated Wage Rate (WR) AT 2000 Prices and Log Weakly Worked Hours (LS)

Variable	WRfullsample	WRmale	WRfemale	LSfullsample	LSmale	LSfemale
misseddays	-.05380539***	-.03690035*	-.05546552***	.00821319	-.00709594	.01402738*
gender	.29772294***			.10998022***		
age	.03114485***	.01850996***	.04046707***	.01721108***	.01632242***	.0147364***
age2	-.00040003***	-.00026616***	-.00050769***	-.00020857***	-.00020076***	-.00017564***
highsc	.0764457***	.08810853***	.04997693*	-.01159807	-.01808813*	-.00146113
tecdp	.08665504***	.1073604***	.06226547***	.0031956	-.01300065	.01608852*
insdp	.31530499***	.24677968***	.33882159***	.00571132	.02204791*	.00141949
gradp	-.0787445	-.036784	-.08761471	.01393563	-.02159879	.04096062
married	.05356679***	.15083713***	.01173622	-.02579732***	.01930354*	-.03936297***
tenure	-.00122834	-.00524941	.00082434	-.00211588**	-.00420651***	-.00045703
tenure2	.00011241*	.00019362**	.00006644	.00005821**	.00011106***	8.823e-06
pjemps	9.280e-06***	8.407e-06***	8.816e-06***	-8.500e-07	-8.565e-07	-3.074e-07
ncat	-.04023962***	.00362648	-.09662369***	.000693	.01770139**	-.02175956***
private	.16724902***	.09387912***	.24856076***	.07756117***	.06402571***	.08025452***
region_2	-.01474598	.09875703**	-.11009453***	.0577796***	.06201305***	.057782***
region_3	-.4558448***	-.42070126***	-.49921143***	.01890107*	.01165807	.01929232
region_4	-.71430958***	-.66690059***	-.75631568***	.03665627***	.01863438	.04386867***
region_5	-.61081329***	-.5267249***	-.68255719***	.07879792***	.05402857***	.09821436***
region_6	-.47894979***	-.34875802***	-.59416784***	.01363934	-.0175098	.03771347**
region_7	-.48772765***	-.46787374***	-.51264077***	.04312625***	.08002961***	.01396134
region_8	-.29421679***	-.23611033***	-.33333955***	.05040509***	.06036483***	.03431264**
urban	.44175078***	.62699818***	.28492593***	.02193919***	-.01431369	.04659559***
occupation_2	-.0275641	-.04925416	-.00844466	-.17300785***	-.18745121***	-.1760129***
occupation_3	-.12230053***	-.05608059	-.1344305***	-.06794825***	-.06362624***	-.07169013***
occupation_4	-.17091698***	-.0763228	-.18042962***	-.06618904***	-.06534309**	-.0677314***
occupation_5	-.43565594***	-.2985637***	-.52124317***	.09266941***	.06085781***	.11050034***
occupation_6	-.48343043***	-.38829406***	-.7552105***	-.02690202	-.04387496	-.05866459
occupation_7	-.04122031	-.05320954	-.07698807	-.10081479***	-.10856194***	-.02472499
occupation_8	-.12073531***	-.13498605***	-.0576109	-.00918769	-.01997502	.00046696
occupation_9	-.50227005***	-.56088127***	-.46485105***	-.12261359***	-.04186336**	-.18370621***
round_10	.17854361***	.20508354***	.15430605***	.00259199	-.0038077	.00628939
round_11	.38042079***	.36002555***	.39748229***	-.00650397	-.00496189	-.00990774
round_12	.46644317***	.49288934***	.44663449***	-.00755301	-.01312552	-.00643482
constant	1.3008961***	1.6037212***	1.3262024***	4.8369351***	4.9923983***	4.8495011***
R2	.32233376	.34607243	.31337964	.13220628	.09785919	.11655025
N	11297	5081	6216	12009	5425	6584
sargan	10.582327	13.854043	8.4962567	15.267294	13.358761	15.893294
sargan p	.47888791	.24117537	.66828023	.17058417	.27052497	.14513876

Note: Legend: * p<.1; ** p<.05; *** p<.01; health measure: missed days due to ill health.

little power, it does support the Bartel and Taubman (1979) assumption of exogeneity of the health conditions they used in their OLS analysis.

NOBUS

The NOBUS was used exclusively for the instrumental variable procedure. Again, self-reported health status served as a health proxy: the dummy healthGOOD comprises both excellent and good self-rated health status (as was done in the case of the RLMS analysis). A two-stage least squares (2SLS) regression of the logarithm of monthly wage rate and the logarithm of worked hours per week were used, respectively, on age, gender, number of children, private sector employment, secondary school and university, length of work experience, location indicators, and urban/rural indicator. Secondary school and university are represented by the values 2 and 3 of the categorical variable schooling derived from a NOBUS categorical variable that is ordered in 8 levels. Work experience length comes directly from a NOBUS categorial variable ordered in 5 levels. The indicator urban assumes value 1 for all places with more that 20,000 inhabitants. For this study, one location indicator was included for each region.

Individual health status has been instrumented by the mother's and father's health status. This may be justified because many chronic diseases are inter-generationally transmitted-either biologically or socially. Therefore, parents' health can be correlated with the health of their offspring without necessarily being correlated with the child's individual-specific omitted variables absorbed by the error term. This choice, determined by data availability, meant having to limit the analysis for this study to the sub-sample of jobholders who lived in households with their parents. Clearly, this may have caused a selection bias, which is not easily addressed.

NOBUS (IV)

Table B7. IV - Dependent Variable: Log Monthly Wage Rate

Variable	Full	Male	Female
healthGOOD	.23073613***	.29161317***	.18554934***
age	.00194805	.00285506	.00034706
male	.2827457***		
children	-.0186142	.01235114	-.05409407***
private	.04593329**	-.02217283	.16266443***
schooling2	.17295232***	.18103981***	.14660409***
schooling3	.42042849***	.40874823***	.44509322***
experience 2	.15488742***	.21468458***	.09025464**
experience 3	.27605528***	.33826986***	.19469783***
experience 4	.29482454***	.3339668***	.24849332***
experience 5	.30288889***	.28737294***	.36047057***
[98 omitted regional dummies]			
urban	.36058887***	.45050028***	.20029591***
constant	6.3669247***	6.468474***	6.7210779***
R2	.35884352	.34130484	.41305857
N	4139	2410	1729
sargan	2.3231368	4.2421652	.15670567
sargan p	.12746276	.03943185	.69220781

Source: NOBUS Dataset round 1: sample of jobholders whose family includes the parents. healthGOOD instrumented by father and mother health status.

Note: Legend: * p<.1; ** p<.05; *** p<.01

The results, presented in Table B6 and Table B7, show that health impacts wages more than labor supply (recall: among individuals who participate into the labor force). In particular, males in good health earn about 30 percent more than the others (i.e., males with fair, bad, and very bad health) and females 18 percent more.

The Sargan tests reported in the bottom of Table B6 and Table B7 generally support the choice of instruments used here (especially for females). Other instruments-such as location indicators or the number of inhabitants to capture differences in the prevalence of communicable diseases, differences in the availability of medical facilities, differences in the prices of health inputs, and differences in environmental conditions-

Table B8. IV - Dependent Variable: Log of Weekly Worked Hours

Variable	Full	Male	Female
healthGOOD	.03167153	.03403846	.02639951
age	.00021789	-.00028859	.00090962
male	.04823373***		
children	.01161265**	.01740233**	.00588029
private	.04238258***	.02611874**	.06846073***
schooling 2	-.00202497	-.00121966	.0023968
schooling 3	-.0291298***	-.02807691*	-.02598168
experience 2	.02950427**	.03812825**	.01756524
experience 3	.04732545***	.05443608***	.04033184*
experience 4	.04869325***	.06112273***	.03543496
experience 5	.04743424**	.0745132***	.01398805
[98 omitted regional dummies]			
urban	.00093956	-.01060702	.02084233
constant	3.4491043***	3.4881173***	3.460679***
R2	.0451653	.04935113	.07885763
N	4488	2655	1833
sargan	2.9013272	1.909446	.56854037
sargan p	.08850665	.16702481	.45083952

Source: NOBUS Dataset round 1: Sample of jobholders whose family includes the parents. healthGOOD instrumented by father and mother health status

Note: Legend: * p<.1; ** p<.05; *** p<.01

were tried but were rejected by the Sargan test. Also, the inclusion of parents' age in addition to parents' health status increased the probability of the instruments' endogeneity.

Despite the positive signal previously offered by the Sargan test, concerns remain about the actual exogeneity of the chosen instruments. For instance, it seems reasonable to think that high levels of labor supply may increase the probability of stomach diseases and hypertension, because of the prolonged stress. Moreover, one may think that heart attacks, strokes, or chronic heart diseases are perhaps linked to individuals' risky lifestyle choices (smoking, drinking, little physical exercise), which may be correlated with individual specific error components. Addressing these concerns necessitated moving from cross-sectional to panel analysis in the next approach.

3. *Panel regressions.* The third approach exploits the longitudinal dimension of the dataset by using panel regression methods. Few studies on the relationship between health and labor market outcomes have explicitly adopted panel data estimators. Recently, Pelkowski and Berger (2004) have studied the impact of health on employment, wages, and hours worked distinguishing between temporary and permanent impairments by using fixed effects estimators. Here, another recent study was followed: it extensively adopts panel data analysis, i.e., Cotoyannis and Rice (2001). The authors suggest the use of Hausman-Taylor estimators. In terms of the previous problem of finding "good" instruments, the main advantage of this procedure is that it does not require finding valid instruments outside the model, because it uses the already-included exogenous variables to instrument the relevant endogenous variable. The only requirement is the inclusion of both time-varying and time-invariant variables, each of which has to be separated into exogenous and endogenous ones. Moreover, Hausman-Taylor estimators have the advantage over the usual within (fixed effects) estimators of allowing the effects of time-invariant variables to be consistently estimated. The disadvantage lies in the strong exogeneity assumptions to ensure consistency. For this reason, as in Cotoyannis and Rice (2001), such exogeneity assumptions were tested for this study by means of a Hausman (1978) test. Moreover, to further improve the precision of the estimates found here, the Amemiya-MaCurdy estimators were applied; they share the same spirit as Hausman-Taylor but make use of a more efficient set of instruments (essentially transformations of the HT instruments). A Hausman test between HT and AM estimators favored use of the latter.

(continued on page 123)

PANEL REGRESSIONS

Table B9. PANEL - Dependent Variable Log Deflated Wage Rate at Prices 2000: MALES

Variable	OLS	RE	FE	HT	AM
age	.02117373*	.03060971*	.03371538	.01813034	.0234186
age2	-.02543067**	-.03546528*	-.02382196	-.01311323	-.0213325
tenure	-.00772551	-.01517426**	-.0206151***	-.01909465**	-.01806072***
tenure2	.01210427	.04237933**	.06945062***	.06422693***	.0584895***
pjemps	9.530e-06***	9.788e-06**	9.429e-06	.0000118**	.00001127**
private	.04570286	.03499996	.03313663	.0309431	.02631349
married	.14033812**	-.03676585	-.22294367**	-.20775497**	-.15196781*
ncat	-.05326126	-.01793909	.00538132	.01683112	-.00097233
healthGOOD	.13197755***	.09158229***	.07569402**	.07786367**	.07551662**
occupation_2	-.01218971	.00225306	.0043603	.00617929	.00224176
occupation_3	-.05167111	.02008562	.05246994	.05219877	.05232641
occupation_4	-.19906217	.2181705	.39427491**	.39282628**	.37307211**
occupation_5	-.24020787**	-.02854871	.125755	.13997179	.11371703
occupation_6	-.94112994**	-.17614337	.10702769	.10056151	.0679691
occupation_7	.03866432	.10132112	.12744936	.12405609	.11974571
occupation_8	-.0429258	.00489442	.03180318	.03342481	.02176699
occupation_9	-.57218885***	-.28322658***	-.07798007	-.07972034	-.10124062
region_2	.27892274**	.29314799	-	.25565869	.26318595
region_3	-.29012799***	-.2805072*	-	-.41834883	-.32384047
region_4	-.48320866***	-.50339542***	-	-.62553843**	-.56938138**
region_5	-.39498039***	-.40471495**	-	-.37981395	-.37930179
region_6	-.13100975	-.13158781	-	-.26354191	-.16251081
region_7	-.65294516***	-.67053312***	-	-.70585965**	-.72745543***
region_8	-.08770838	-.05826851	-	-.12961441	-.09358942
urban	.53909976***	.52193122***	-	.32506656	.39969081***
round_10	.168135***	.16313149***	.14594161***	.15260468***	.15498627***
round_11	.38907013***	.37849082***	.34758368***	.36074622***	.36456176***
round_12	.49593055***	.485547***	.44142583***	.46017735***	.46584738***
school_1	.25757494***	.32212736***	-	.81691085	.83514246**
school_2	.40336141***	.49213283***	-	1.9765633**	1.2196359***
school_3	.63699184***	.7444805***	-	1.4499061	1.3256559***
school_4	.66247112***	.72739066***	-	.17519122	.57196294
constant	1.160447***	1.0129677**	1.3497267	.74809819	.74063887
N	1096	1096	1096	1096	1096

Note: Legend: * p<.1; ** p<.05; *** p<.01; FE is fixed effect
Hausman test fixed effects vs. random effect: chi2(20) = 40.65; Prob>chi2 = 0.0041
Hausman test fixed effects vs. Hausman-Taylor: chi2(19) = 1.12; Prob>chi2 = 1.0000
Hausman test Hausman-Taylor vs. Amemiya-Macurdy: chi2(19) = 3.08; Prob>chi2 = 1.0000

Table B10. PANEL - Dependent Variable: Log Weekly Worked Hours: MALES

Variable	OLS	RE	FE	HT	AM
age	.00968936**	.01011673	.0014124	.00773793	.00550749
age2	-.01130532**	-.01229069*	-.00820846	-.01072686	-.0061599
tenure	-.00395814*	-.00350348	-.00269069	-.0029343	-.00371731
tenure2	.01254271*	.01316617	.01322701	.01425271	.0161937*
pjemps	-1.109e-06	-5.444e-07	1.023e-06	2.967e-07	-1.640e-07
private	.05022197***	.02641639	.00345284	.00441571	.00623633
married	.09359559***	.07396736**	.04708204	.04284235	.05958309
ncat	.01429715	.02212276	.02753488	.02416649	.03011741
healthGOOD	-.01965858	-.01468967	-.0137866	-.01445042	-.0149034
occupation_2	-.21092642***	-.12738774***	-.04395166	-.04416019	-.04812057
occupation_3	-.1103376***	-.10051006***	-.09634389***	-.09603576***	-.0996362***
occupation_4	-.08852414	-.17208368***	-.20984353***	-.20838166***	-.20470985***
occupation_5	.03435495	.02383147	.01944352	.0153265	.01634753
occupation_6	-.00552382	-.04861333	-.0707335	-.06588934	-.05051898
occupation_7	-.17901824***	-.1455056***	-.11574215***	-.11468832***	-.11785297***
occupation_8	-.09831434***	-.08156896**	-.06571441	-.06633536	-.0683112
occupation_9	-.03111297	-.01936531	-.01017347	-.00940763	-.00781331
region_2	.07384698	.07319388	-	.08981761	.06052615
region_3	-.0642961*	-.06370392	-	-.07252672	-.07501232
region_4	-.07546378*	-.07729309	-	-.10336157	-.08865404
region_5	-.03169123	-.02565908	-	.03149358	-.04685389
region_6	-.08640749**	-.08861418	-	-.08514215	-.11174203
region_7	-.0443195	-.04286526	-	-.04661855	-.03856058
region_8	-.06315885	-.07427061	-	-.11929904	-.07699556
urban	-.01937896	-.01609842	-	-.07301517	-.01544788
round_10	.00777308	.01059797	.01816888	.0139167	.01233232
round_11	-.00697861	-.00330935	.00917258	.00074844	-.00239133
round_12	-.00645034	-.00263858	.01457219	.00227273	-.00210441
school_1	-.05903512**	-.0635665	-	.12727169	-.14966983
school_2	-.08106482***	-.08653917*	-	.22689688	-.03809073
school_3	-.05420356	-.0688878	-	.3848647	-.24634658
school_4	-.07648919	-.14565492	-	.39316961	-.92683147
constant	5.2020154***	5.1969917***	5.3382847***	5.0510247***	5.3499498***
N	1096	1096	1096	1096	1096

Note: Legend: * p<.1; ** p<.05; *** p<.01
Hausman test fixed effects vs. random effect: chi2(20)= 28.21; Prob>chi2 = 0.1046
Hausman test fixed effects vs. Hausman-Taylor: chi2(19)= 0.55; Prob>chi2 = 1.0000
Hausman test Hausman-Taylor vs. Amemiya-Macurdy: chi2(19) = 1.71; Prob>chi2 = 1.0000

Table B11. PANEL - Dependent Variable: Log Deflated Wage Rate at Prices 2000: FEMALE

Variable	OLS	RE	FE	HT	AM
age	.04884346***	.06736967***	.10066973***	.10790077***	.10325259***
age2	-.05421362***	-.07580477***	-.15605471***	-.15072374***	-.13079675***
tenure	-.00005831	-.00346258	-.00820986	-.00729327	-.00662808
tenure2	-.00103402	.00719763	.02147504	.01986644	.01643053
pjemps	.00001359***	.00001239***	-5.603e-06	1.181e-06	1.233e-06
private	.22376717***	.072317**	-.01437716	-.0136186	-.01310365
married	.00028125	.00738042	.01341194	.01071813	.01188477
ncat	-.10801699***	-.07377408**	-.04957205	-.05391545	-.05380167
healthGOOD	.00899523	.03121741	.02602269	.02761743	.02923847
occupation_2	.05577093	.07850739	.06758284	.06643888	.06439402
occupation_3	-.0153171	.02146124	.03148909	.03083616	.03104208
occupation_4	-.11040535*	-.06521419	-.04835037	-.04741679	-.04775724
occupation_5	-.54344458***	-.2801505***	.01557992	.02031464	.01952723
occupation_7	.08008339	.06526647	.00884341	.01068766	.01395186
occupation_8	-.05201295	-.03782227	-.07510576	-.06741964	-.0661714
occupation_9	-.45957353***	-.20444463**	.09278365	.09481375	.09614351
region_2	-.13999192*	-.20911144	-	-.48590165	-.34880907
region_3	-.50231503***	-.53116243***	-	-.45795033	-.53031251
region_4	-.74096226***	-.77493104***	-	-.89981922**	-.873309**
region_5	-.63540426***	-.69525462***	-	-.6915516	-.78563166*
region_6	-.5473698***	-.57912027***	-	-.78280566	-.71864947*
region_7	-.62834388***	-.66565366***	-	-.90982369	-.80104975*
region_8	-.37340449***	-.43559004***	-	-.56746261	-.56762899
urban	.15423442***	.18812914***	-	.36136134	.25022075
round_10	.18149427***	.19284666***	.2380016***	.22420629***	.21243407***
round_11	.45971719***	.47197908***	.55111916***	.52550048***	.50231554***
round_12	.51680043***	.53104055***	.64696711***	.60956004***	.5742841***
school_1	.19448843**	.18916976	-	-6.0365962	-1.5936188
school_2	.25540653***	.30060589*	-	-6.093138	-1.2300934
school_3	.57598761***	.6274978***	-	-4.4909463	-.75936396
school_4	.681436***	.74557585***	-	-.8708852	1.1328886
constant	.84034209***	.41563824	.38980734	5.8148068	1.4537398
N	1904	1904	1904	1904	1904

Note: Legend: * p<.1; ** p<.05; *** p<.01
Hausman test fixed effects vs. random effect: chi2(20) = 64.56; Prob>chi2 = 0.0000
Hausman test fixed effects vs. Hausman-Taylor: chi2(19) = 2.23; Prob>chi2 = 1.0000
Hausman test Hausman-Taylor vs. Amemiya-Macurdy: chi2(19) = 2.39; Prob>chi2 = 1.0000

Table B12. PANEL - Dependent Variable: Log Weekly Worked Hours: FEMALE

Variable	OLS	RE	FE	HT	AM
age	.01405474***	.00713686	-.02876607**	-.02768314**	-.02504998**
age2	-.01520261***	-.00682048	.04564225***	.04468031***	.03637539***
tenure	.00018417	.0015545	.00491668*	.0046434*	.00428144*
tenure2	-.00177468	-.00700912	-.01839697**	-.01760554*	-.0160395**
pjemps	-7.685e-07	-2.912e-07	-2.633e-06	-2.617e-06	-2.063e-06
private	.0723087***	.02815004*	-.00652035	-.00634699	-.00584964
married	-.06523011***	-.05414285***	-.01885375	-.01718639	-.02338578
ncat	-.04694642***	-.05493409***	-.06310345***	-.06328587***	-.06176603***
healthGOOD	-.01529577	-.02104664	-.02394817	-.02400828	-.02430819*
occupation_2	-.13872762***	-.07864605***	-.01027135	-.01049274	-.01060721
occupation_3	-.04832293**	-.02975507	-.02232382	-.02192721	-.02245031
occupation_4	.00178738	.01370745	-.01396924	-.01365074	-.01291123
occupation_5	.20324933***	.1690263***	.04756556	.04767363	.04907036
occupation_7	.00249755	.02887341	.02006936	.01969135	.01862799
occupation_8	.06178278**	.07571579**	.0622016	.06197632	.06119144
occupation_9	-.06500797**	-.05805535	-.11941641**	-.11816436**	-.11771333***
region_2	.04269644	.03478438	-	.14238722	.06589317
region_3	.00976103	.00053723	-	-.01808684	-.00896455
region_4	.05898428**	.05603467	-	.24275572	.09263906
region_5	.08703557***	.07217828	-	.19255138	.0737897
region_6	.01526735	.00665344	-	.26225193	.07547088
region_7	-.02668769	-.02780075	-	.2432143	.03633142
region_8	.0230401	.02041398	-	.21246341	.07272393
urban	.06394156***	.06786983***	-	.01321326	.07288475
round_10	-.00400421	-.00251684	-.00893178	-.00912039	-.004995
round_11	-.0074286	-.00476587	-.01726122	-.01767266	-.00950599
round_12	-.01834118	-.01732908	-.0406428*	-.04128489*	-.0286993*
school_1	.21837139***	.20248681***	-	5.6885155	.99684116
school_2	.2593469***	.23333548***	-	4.8112981*	.91200172
school_3	.2436505***	.194317***	-	5.1919824	.7156517
school_4	.298923***	.23065273**	-	2.1060542	-.56722012
constant	4.6019202***	4.7393288***	5.5207691***	.27965245	4.5953589***
N	1904	1904	1904	1904	1904

Note: Legend: * p<.1; ** p<.05; *** p<.01
Hausman test fixed effects vs. random effect: chi2(20) = 59.37; Prob>chi2 = 0.0000
Hausman test fixed effects vs. Hausman-Taylor: chi2(19) = 0.60; Prob>chi2 = 1.0000
Hausman test Hausman-Taylor vs. Amemiya-Macurdy: chi2(19) = 2.47; Prob>chi2 = 1.0000

(continued from page 118)

To perform this study, the sample of all individuals who were followed in all the rounds 9-12 and who provided answers to all the questions of the subject survey were used. This means only the sub-sample of jobholders could be considered. Due to attrition and the relatively high frequency of missing responses, the sub-sample of males is composed of only 274 individuals, each one observed four times, while the sub-sample of females has 476 individuals. To address the problem of an eventual selection bias, similar estimations were performed, whenever possible, on a significantly larger unbalanced panel that produced similar results, giving even greater credence to the underlying findings.

In general this study found that good health status increases wage rate for males, but it does not substantially affect labor supply. This result is in line with what obtained in the cross-sectional IV estimators of the preceding subsection. However, now the effect of good health is reduced: being in good health increases the wage rate by about 7.5%. Surprisingly, good health impacts neither wage rate nor labor supply among female workers, differing from what was obtained in the cross-sectional instrumental variables estimations, where the effect on female was even larger than the effect on male wage rate.

For the sake of completeness, the "missed days due to ill health" variable was used as alternative measure of health status. However, its coefficient was statistically insignificant both in the wage rate and in the labor supply model.

Table B13. Random Effects Panel Logit Regression Results

Variable	Coefficient	
Age	-0.492	***
Age squared	0.003	***
Reference: male		
Female	-0.423	***
Age*female	0.013	***
Married	-0.275	***
Cohabit	-0.129	
Widow or divorced	-0.262	***
Chronic illness	0.228	***
Poverty status	0.495	***
Household income	-0.012	***
Income*Chronic illness	-0.014	**
High school diploma	-0.447	***
Number of children in hous.	-0.123	
Female*N. children	0.378	***
Born in Russia	-0.141	***
Living in village	0.113	**
Constant	4.192	***
Rho	0.141	**

Note: *** 1%-significance level,
** 5%-significance level.

Table B14. Average Predicted Probability to Retire in the Subsequent Period, by Sex and Income Level

	MALES		*FEMALES*	
Income level	**Not chronically ill**	**Chronically ill**	**Not chronically ill**	**Chronically ill**
Over the 95th percentile	0.18	0.18	0.26	0.20
Between 75th and 95th percentile	0.21	0.29	0.24	0.35
Between 50th and 75th percentile	0.23	0.40	0.27	0.46
Between 25th and 50th percentile	0.32	0.56	0.35	0.58
Below the 25th percentile	0.43	0.62	0.52	0.75

Source: Calculations based on RLMS rounds 9-11.Note: Results refer to the hypothetical individual described in the text.

Technical Details and Specific Results on the Impact of Chronic Illness on Retirement

A Cox regression offers a means to estimate the precise moment that an event takes place, as time proceeds. It is usually employed in survival analysis, where the outcome considered is death, but it can also be used to estimate the timing of retirement. For this study, a Cox regression model was estimated on the age at retirement, using data from the 11th round of the RLMS (2002), which provides retrospective information on job retirement.

Estimating a Cox regression model on the age to retirement. This is a model of a hazard regression where the log hazard function of retirement log[h(t)] is assumed to be a linear function of a baseline hazard function and the effect of p covariates, formally

$$\log\left[h(t)\right] = \log\left[h_0(t)\right] + b_1x_1 = b_2x_2 + \mathrm{K} + b_px_p$$

Thus, the parameters estimated represent a proportional shift of the baseline hazard function due to the covariates. A positive parameter means an increase of the risk of retiring during the overall time period (since first employment). The results are shown in Table B15. The reported coefficients should be interpreted as follows: a positive coefficient means an increase in the risk of experiencing the event (retirement in this case) and a negative coefficient is associated with a decrease in the risk of experiencing the event. (The test based on Schoenfeld residuals showed that the null hypothesis-chronic illness effect is proportional-is not rejected.)

A set of demographic and socioeconomic indicators (e.g., age, gender, income, education) was controlled for. The health variable of particular interest is the presence of a chronic illness. A positive coefficient on the chronic illness variable indicates an increase in the probability (i.e., the hazard) of retiring, relative to the baseline first year of employment.

Those who are married are more likely to retire later from the job market than those who never married. Those who are widows or divorced also retire later than the never married. The effect of age is U-shaped. Females retire later but the effect is weak and decreases with age. Smoking brings a higher risk of retiring, but the effect decreases with age. The effect of weight is interesting: those who are below the normal weight (in terms of body mass index) retire earlier from the labor market, whereas those who are above it (overweight and obese) are more likely to retire later. Reported drinking does not have any significant effect, but chronic illness has a positive and highly significant effect. This means that after having controlled for the other factors, in contrast with findings from the Kaplan-Meier estimates, the research here indicates that those suffering from any chronic disease are more likely to retire earlier. Moreover, the effect of chronic illness interacts with income: the higher the income level, the weaker the effect of chronic illness. In addition, the research finds

Table B15. Results of Cox Regression Model on Age to Retirement

Variable	Coefficient
Age	-.492***
squared age	.003***
Female	-.423***
age*female	.0132***
Married	-.275***
Cohabit	-.129
widowed or divorced	-.262***
chronic illness	.228***
poverty status	.495***
household income	-.0116***
hh income*chronic illness	-.014**
high school diploma	-.447***
n. children under 7 y.o.	-.123
female*n. children under 7	.378***
born in Russia	-.141***
living in village	.113**

Note: *** 1%-significance level, ** 5%-significance level.
"hh" is household head.
Breslow method for ties
No. of subjects = 8266
No. of failures = 3225
Time at risk = 349639.2499
LR chi2(16) = 3706.30
Prob > chi2 = 0.0000
Log likelihood = -22630.901

that workers below the poverty line retire earlier and that income has a negative effect (i.e., the higher the income level the later a worker retires). The number of children has no significant effect for males, but it has a positive effect for females. Finally, the estimates from the Cox model suggest that people born in Moscow are more likely to retire later, and those living in a village are more likely to retire earlier.

Technical Details and Specific Results of Panel Probit Model on the Probability of Being Fired

A probit model was estimated for this study of the probability of being fired, which was made dependent on gender, age (in months), wage rate, possession of high school diploma, post-secondary years of schooling, work experience, type of enterprise ownership (state, foreigners, or private Russian owners), and, finally, daily alcohol consumption (in grams of pure alcohol) and squared daily alcohol consumption. The dummy variable "fired" was defined such that it takes the value 1 if an individual was employed in round 11 (2002), he was not employed in round 12 (2003), and yet he participated the workforce in round 12. An alternative definition embodying the condition of being unemployed in round 12 produced a very similar identification. Through the chosen setup, alcohol consumption was assumed to have a nonlinear effect on the probability of being fired. This supposition was confirmed by other analyses. The Huber/White/sandwich estimator of variance was applied in place of the traditional calculation to obtain robust standard errors. The detailed results are shown in Table B16.

Technical Details and Specific Results on the Analysis of the Impact of Chronic Illness on Income

In order to address the endogeneity problems involved in estimating the effect of health on economic outcomes, a strategy that does not employ instrumental variables was used here. A difference-in-differences estimator combined with a propensity score matching technique (Rosembaum and Rubin 1983; Heckman, Ichimura, and Todd 1997) was used. With this approach, every household experiencing a health problem is matched to a similar household that did not have health problems. Similarity is defined in terms of a propensity score, i.e. the propensity of experiencing a health adverse event given the household characteristics (for instance whether the household members suffer from chronic illness). In this way, by comparing the experiences of two similar households, the causal effect of health on income can be identified. The logic is essentially that of comparing two groups that differ only

Table B16. Panel Probit Results on Alcohol as Determinant of Being Fired

Variable	dF/dx	Robust Std. Err.	Z	P>z	x-bar
gender	-.0020767	.0023638	-0.89	0.373	1.54277
age	.0000553	.000028	2.10	0.036	472.353
wage rate	-1.53e-06	6.95e-07	-2.26	0.024	3422.47
diploma	-.0042912	.0035533	-1.25	0.213	1.14186
yrs sch.	-.0011318	.0005492	-2.04	0.042	3.28421
experience	-.001044	.0003576	-3.36	0.001	19.0252
state*	-.0020864	.0032861	-0.66	0.511	.679367
foreingn*	.0085151	.0085096	1.37	0.169	.047688
private*	.0050818	.0032222	1.72	0.086	.426312
alcohol	.0002961	.0001112	2.25	0.025	15.5616
alcohol2	-2.84e-06	1.10e-06	-2.04	0.042	1818.48
obs. P	.015816				
pred. P	.0081124	(at x-bar)			

Note: dF/dx is for discrete change of dummy variable from 0 to 1
z and P > |z| are the test of the underlying coefficient being 0
Number of obs = 4173 Pseudo R2 = 0.0812
Wald chi2(11) = 60.89 Log likelihood = -311.60966
Prob > chi2 = 0.0000

in relation to the variable of interest. This makes it possible to assess the impact of intervention free from most other contingent effects.

The results, reported in Table B17, show the effect on total income of two different events related to poor health: generic health problems and hospitalisation. Two separate estimates are made for the periods 1994-98 and 1998-2002, taking into account the economic crisis in Russia that began in 1998. The results confirm a negative effect of poor health on household economic well-being. This effect is greater in the later period.

Table B17. Results from Difference-in-Differences Estimator Combined with Propensity Score Technique: The Effect of Adverse Health on Total Income for Different Periods

	Total income 1994-1998	Total income 1998-2002	Total income full period
Health problems	-22.255	-135.98***	83.147***
Hospitalization	-136.19***	-105.83***	82.30***

Source: Suhrcke et al (2005).

Note: *** 1%-significance level, ** 5%-significance level.

To estimate the specific impact of chronic diseases, a logit model was used to assess whether and to what extent chronic illness increases the likelihood of experiencing adverse health events. The corresponding results are reported in the accompanying technical papers. It can be concluded that chronic illness increases the risk of health problems, hospitalization, and a surgical procedure.

The results confirm that chronic illness does indirectly and negatively affect the economic well-being of Russian households, especially since the economic crisis in 1998. But what can be said about the magnitude of the effect? It is not possible to provide a comprehensive answer, since the risk of health problems depends not only on the presence of chronically ill persons in the household, but also on other factors (number of smokers, household size, number of older people, etc.). However, a specific answer for a specific population can be provided: if there are households in urban areas with no smokers and no ex-smokers, no people aged over 60 nor below 14, with at least two workers and at least one person who has a high school diploma. For this restricted population the average difference in the probability of having health problems between households with chronically ill members and households without such people is 0.219. The difference in the probability of being hospitalized is 0.038, and the difference in the probability of undergoing a surgical procedure is 0.018. Multiplying these differences by the effect of health problems, hospitalization, and surgical procedure on economic outcomes gives the indirect effect of chronic illness on income. This gives an impact of chronic illness that corresponds to 5.6 percent of median per capita income.

Technical Details and Results of the Effect of a Household Member's Death on Depression

The first analysis was performed using a probit model. The dependent variable is a dummy, which indicates the status of depression. The explanatory variables are:

4. Gender (male = 1)
5. Age (in months)
6. Jobholder (yes = 1)
7. Difference in per-capita income (after and before death)
8. High school diploma (yes = 1)
9. Number of dead members throughout the past year
10. Number of dead members who were household-heads
11. Number of dead members who held a job
12. Age of dead members

Technical Details and Results of the Effect of a Household Member's Death on Alcohol Consumption

This analysis on alcohol consumption uses a tobit model. Pure alcohol consumption in grams per day was regressed on:

1. Gender (male = 1)

Table B18.Probit Results on the Effect on Depression

Variable	dF/dx	Std. Err.	z	P>z	x-bar
gender	-.0973314	.0085112	-11.05	0.000	.432762
age	.000119	.0000197	6.02	0.000	525.495
job hold	-.0199527	.0096232	-2.08	0.037	.554542
diff inc	6.60e-07	9.13e-07	0.72	0.470	675.682
high sch	.0232161	.0095614	2.39	0.017	.67891
N death	.5328651	.1086558	4.91	0.000	.032047
D hh head	.0377452	.0509147	0.78	0.433	.012819
D worker	.1132259	.1072779	1.19	0.233	.002712
dead age	-.0004461	.0001198	-3.73	0.000	26.545
obs. P	.1863676				
pred. P	.1777732	(at x-bar)			

Note: Number of obs = 8113 LR chi2(9) = 321.50
Prob > chi2 = 0.0000
Pseudo R2 = 0.0412
Log likelihood = -3740.8969

Table B19. Tobit Regression Result on Alcohol Consumption in Response the Household Member's Death

Variable	Coef.	Std. Err.	t	P>t
gender	36.46903	1.533006	23.79	0.000
age	-.0100391	.0036239	-2.77	0.006
jobholder	23.21008	1.68241	13.80	0.000
diff income	.0004966	.0001596	3.11	0.002
high school	10.74956	1.762026	6.10	0.000
n. deaths	10.54596	5.278959	2.00	0.046
d. hh head	4.400213	9.017779	0.49	0.626
d. worker	25.18829	14.66649	1.72	0.086
constant	-44.9459	2.830359	-15.88	0.000
se	60.72394	.6605658	(Ancillary parameter)	
Obs. Summary		3677	left-censored observations at alcohol<=0	
		4493	uncensored observations	

Note: Number of obs = 8170
LR chi2(8) = 1002.07
Prob > chi2 = 0.0000
Pseudo R2 = 0.0183
Log likelihood = -26843.276

2. Age (in months)
3. Jobholder (yes = 1)
4. Difference in per-capita income (after and before death)
5. High school diploma (yes = 1)
6. Number of dead members throughout the past year
7. Number of dead members who were household-heads
8. Number of dead members who held a job

Technical Details and Specific Results of Economic Growth Impact Estimates

This estimation starts by running a standard pooled ordinary least squares (OLS) panel growth regression for the period 1960 to 2000. The dependent variable is the annual average of the five-year growth rate of real GDP per capita. The other explanatory variables are the five-year time lag of GDP per capita, the lagged fertility rate, the lagged working age mortality rate,22 and the Warner-Sachs index of openness.23 The fertility rate is from the World Development Indicators and the adult mortality rate is constructed from the WHO mortality database.

Since OLS panel growth regressions yield downward biased estimates on the projected growth rate (Trognon 1978), a fixed effect (FE) estimator is applied to the same regression equation. The FE regression is known to yield upward biased estimates on the projected growth rate (Nickel 1981). Hence, the unbiased growth path is bounded by the OLS and FE estimates. The regression results of the OLS and FE regressions are shown in Table B20.

The results in Table B20 show a convergence rate of 14 percent with OLS or even 35 percent with fixed effect estimator, well above the 2 percent that is well-known in the empirical growth literature. However, as Islam (1995) noted, convergence rates increase dramatically in a panel data context. The long-run convergence rate is then mixed with business cycle effects. Concerning the variable of interest in this study, the lagged adult mortality rate is found to be highly significant for both estimators with negative sign as expected. Hence, the larger the mortality rate, the lower the GDP per capita growth.

To assess further the economic significance of this effect, these alternative growth regressions were used here to predict Russian GDP per capita up to the year 2025. This requires an assumption about the future path of the fertility rate, which was taken from the UN Population Division forecasts. The openness status of the Russian economy is assumed to stay constant over the next 20 years as the key question relates to the different mortality scenarios. An increase in openness would not change results dramatically, although the growth path would become somewhat steeper.

As for the adult mortality scenarios, the three different scenarios described in chapter 11 were used to separately carry out a forward prediction on the OLS and FE estimates. The results are shown in Figure B1. (The three scenarios with the more conservative results are identical to the results presented in Figure 11.2).

As Figure B1 illustrates, the predicted per capita GDP path is highly dependent on the choice of estimation methodology. As expected, the FE estimates produce a

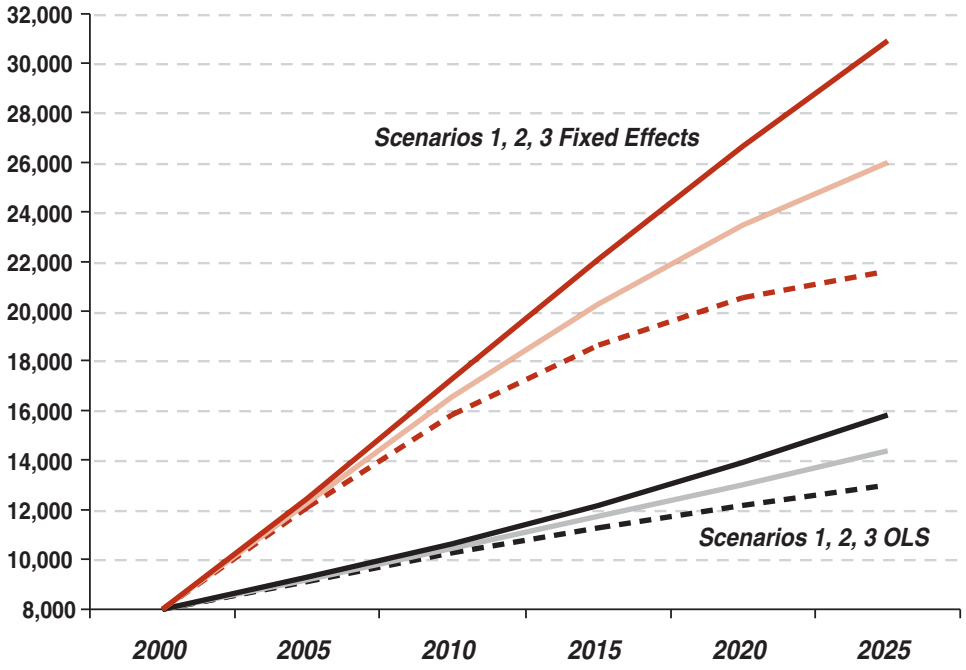
Table B20. Growth Regression Results

Dependent variable: GDP per capita.	OLS	FE
Lagged-GDP p.c.	.86*** (.02)	.65*** (.05)
Lagged fertility growth rate	-.05 (.03)	-.17*** (.06)
Openness	.16*** (.02)	-
Lagged adult mortality rate	-.08** (.04)	-.18*** (.06)
R2	0.97	0.98
No. of observations	302	332

Notes: Heteroscedasticity-consistent standard errors in parenthesis. *, **, *** denote significance at the 10%-, 5%-, and 1%-level, respectively. Constant terms are not reported.

steeper growth path than the OLS estimates, and the "true" effect will lie somewhere in between. In either type of estimate, however, there is a sizeable impact of the reduction of mortality rates on future incomes, and the effect grows over time. While in 2005 the difference in the per capita GDP between the first and the third is only US$105 in the OLS estimation (and US$325 in the FE estimates), by 2025 this difference would have grown to US$2,856 (respectively US$9,243). Even if these future returns are discounted to the starting year value, they do make the static GDP effects calculated in the more narrow approach of the previous section appear very small.

Figure B1. GDP per Capita Forecasts Based on OLS and FE Regression
US$ PPP



Source: Source: Suhrcke et al (2005). Calculations based on model presented in Table B8.

BIBLIOGRAPHY

Bibliography

Abelson, P. 2001."Returns on Investment in Public Health." An Epidemiological and Economic Analysis Prepared for the Department of Health and Ageing, Australia. *http://www.health.gov.au/internet/wcms/publishing.nsf.*

Abdullaev, N. 2004. "Men Show Little Regard for Their Own Safety." *The Moscow Times Newspaper.* December 8.

ADA (American Diabetes Association). 2003. "Economic Costs of Diabetes in the US in 2002," Diabetes Care 26: 917-32.

AHA (American Heart Association). 2003. "Heart and Stroke Statistics-2003 Update." AHA, Dallas, TX.

Alberti, K. G. M. M. 1991. "Role of Diabetes," *British Medical Journal* 303: 769-72

Allin, S., E. Mossialos, M. McKee, and W. Holland. 2004. "Making Decisions on Public Health: A Review of Eight Countries." European Observatory on Health Systems and Policies, World Health Organization, Geneva.

Alsan, M., D. E. Bloom, and D. Canning. 2004. "The Effect of Population Health on Foreign Direct Investment." NBER Working Paper 10596, National Bureau of Economic Research, Cambridge, MA.

Amemiya, T., and T. E. MaCurdy. 1986. "Instrumental-Variable Estimation of an Error Components Model," *Econometrica* 54: 869-81.

Anderson, P. 1991. "Alcohol as a Key Area" in "The Health of the Nation: Responses," *British Medical Journal* 303: 766-69.

Anderson, P., and G. Lehto. 1994. "Prevention Policies," *British Medical Bulletin* 50(1): 171-85.

Andreev, E. M. 2005. "Demographic Consequences of Mortality Reversal in Russia." Paper for the XXV IUSSP International Population Conference, Section 36: "Demographic and Socio-Economic Consequences of Adverse Mortality and Health Trends," Tours, France, July18.

Andreev, E. M., M. McKee, and V. M. Shkolnikov. 2003. "Health Expectancy in the Russian Federation: A New Perspective on the Health Divide in Europe," *Bulletin of the World Health Organization* 81(11): 778-87. Epub 2004 Jan 20.

Andreev, E., E. Nolte, V. M. Shkolnikov, E. Varavikova, and M. McKee. 2003. "The Evolving Pattern of Avoidable Mortality in Russia," *International Journal of Epidemiology* 32: 437-46.

AOA (American Obesity Association). 2005. "Obesity: A Global Epidemic." *AOA Fact Sheets.* Updated May 2. *http://www.obesity.org/subs/fastfacts/obesity_global_epidemic.shtml* (checked August 2005).

Arrow, K. J. 1963. "Uncertainty and the Welfare Economics of Medical Care." *The American Economic Review* LIII(5): 941-73.

Ashton, S. J., G. M. Mackay, and S. Camm. 1983. "Seat Belt Use in Britain under Voluntary and Mandatory Conditions." In *Proceedings of the 27th Conference of the American Association for Automotive Medicine.* Chicago, IL: 65-75.

Australia Commonwealth Department of Health and Aged Care. 2003. *Returns on Investment in Public Health.* ISBN: 0 6428219 1 7.

Babor, T. F., R. Caetano, S. Casswell, G. Edwards, N. Giesbrecht, K. Graham, J. W. Grube, P. J. Gruenewald, L. Hill, H. D. Holder, R. Homel, E. Österberg, J. Rehm, R. Room, and I. Rossow. 2003. *Alcohol: No Ordinary Commodity.* Research and Public Policy, Oxford Medical Publication, Oxford University Press, Oxford.

Babor, T. F., and M. Grant (eds). 1992. *Project on Identification and Management of Alcohol-Related Problems. Report on Phase II: A Randomised Clinical Trial of Brief Interventions in Primary Health Care.* Geneva: World Health Organization.

Babor, T. F., A. Wilson, C. Campillo, F. K. Del Boca, et al. 1996. "A Cross-National Trial of Brief Interventions with Heavy Drinkers," *American Journal of Public Health* 86(7): 948-55.

Bakilana, A.M. 2005. "The Demographic Situation in Russia." A Background paper prepared for this study. World Bank. Washington, D.C.

Baldwin, M., L. Zeager, and P. Flacco. 1994. "Gender Differences in Wage Losses from Impairments," *Journal of Human Resources* 29: 865-87.

Barr, N. 1994. "The Role of Government in a Market Economy." In *Labor Markets and Social Policy in Central and Eastern Europe. The Transition and Beyond,* ed. N. Barr. New York: Oxford University Press. Published for the World Bank and the London School of Economics and Political Science.

——. 1998. *The Economics of the Welfare State.* Oxford: Oxford University Press.

Barro, R. 1991. "Economic Growth in a Cross-Section of Countries," *Quarterly Journal of Economics,* CVI(425): 407-43.

——. 1996. "Health and Economic Growth." PAHO (Pan American Health Organization) Program on Public Policy and Health. Washington, D.C.

——. 1997. Determinants of Economic Growth: A Cross-Country Empirical Study. Cambridge, MA: MIT Press.

Bartel, A., and P. Taubman. 1979. "Health and Labor Market Success: The Role of Various Diseases," *The Review of Economics and Statistics* 61(1): 1-8.

Baskakov, V., and E. Yanenko. 2005. "The Evaluation of Insurance Risks and Disability Pension Insurance," *Pension Funds and Investments* No. 1.

Bazzoli, G. J. 1985. "The Early Retirement Decision: New Empirical Evidence on the Influence of Health," *Journal of Human Resources* 20: 214-34.

Beaglehole, L. 2004. "Diabetes Action Now : an initiative of the World Health Organization and International Diabetes Federation" World Health Organization and International Diabetes Federation. http://www.who.int/diabetes/actionnow/en/DANbooklet.pdf.

Beaglehole, R., and D. Yach. 2003. "Globalisation and the Prevention and Control of Non-communicable Disease: The Neglected Chronic Disease of Adults," *The Lancet* 362: 903-08.

Bennett, J. 2003. "Investment in Population Health in Five OECD Countries," OECD Health Working Paper 2, Organisation for Economic Co-operation and Development, Paris.

Berkovec, J., and S. Stern. 1991. "Job Exit Behavior of Older Men," *Econometrica* 59: 189-210.

Bhargava, A., D. T. Jamison, and C. Murray. 2001. "Modelling the Effects of Health on Economic Growth," *Journal of Health Economics* 20: 423-40.

Bliss, T. 2004 "Lessons Learned from Road Safety Management in New Zealand and Their Application to Vietnam." Presentation at World Bank Institute, The World Bank, Washington, DC, November 18.

——. 2004. "Implementing the Recommendations of the World Report on Road Traffic Injury Prevention," *Transport Notes* TN-1

Bloom, D.E., D. Canning, and B. Graham. 2003. "Longevity and Life-Cycle Savings," *Scandinavian Journal of Economics* 105: 319-38.

Bloom, D. E., D. Canning, and D. T. Jamison. 2004. "Health, Wealth, and Welfare; Finance and Development." International Monetary Fund. *http://www.imf.org/external/pubs/ft/fandd/2004/03/pdf/bloom.pdf.*

Bloom, D., D. Canning, and J Sevilla. 2001. "The Effect of Health on Economic Growth: Theory and Evidence." NBER Working Paper 8587, National Bureau of Economic Research, Cambridge, MA. www.nber.org/papers/w8587.

——. 2002. "Health, Worker Productivity, and Economic Growth."School of Public Policy and Management, Carnegie Mellon University, Pittsburgh.

Bobadilla, J. L., J. Frenk, T. Frejka, R. Lozano, and C. Stern. 1993. "The Epidemiological Transition and Health Priorities." In *Disease Control Priorities in Developing Countries,* eds. D. T. Jamison, W. H. Mosley, A. R. Measham, and J. L. Bobadilla, eds. New York: Oxford University Press.

Bobak, M., M. Kristenson, H. Pikhart, and M. Marmot. 2004. "Life Span and Disability: A Cross Sectional Comparison of Russian and Swedish Community Based Data," *British Medical Journal* 329(7469): 767.

Bobak, M., H. Pikhart, C. Hertzman, R. Rose, and M. Marmot. 1998. "Socioeconomic Factors, Perceived Control and Self-reported Health in Russia. A Cross-sectional Survey," *Social Science Medicine,* 47(2): 269-79.

Bonita, R., M. de Courten, T. Dwyer, K. Jamrozik, and R. Winkelmann. 2001. "Surveillance of Risk Factors for NCDs:" *The WHO STEPwise Approach.* Summary. World Health Organization, Geneva.

Bound, J. 1991. "Self-reported versus Objective Measures of Health in Retirement Models," *Journal of Human Resources.* 26: 106-38.

Bound, J., T. Stinebrickner, and T. Waidmann. 2003. "Health, Economic Resources and the Work Decisions of Older Men," National Institute on Aging. *http://socserv.socsci.mcmaster.ca/cesg2003/stinepaper.pdf.*

Bozicevic, I., B. Lokrantz, M. McKee, and M. Suhrcke, 2004 "Evidence Base on How to Reduce the Burden of Disease due to Injuries in Low-Resource Settings with Special Attention to Eastern Europe and Central Asia." Draft Report, World Health Organization, Geneva.

Brainerd, E., and D. M. Cutler. 2004. "Autopsy on an Empire: Understanding Mortality in Russia and the Former Soviet Union." NBER Working Paper 10868, National Bureau of Economic Research, Cambridge, MA. *http://www.nber.org/papers/w10868.*

Brooks, D. "Mourning Mother Russia." *Washington (DC) Post,* April 28, 2005.

Broughton, J.; Allsop, R. E.; Lynam, D. A. 2000. "The Numerical Context for Setting National Casualty Reduction Targets." TRL Report 382, Transport Research Laboratory Ltd, Crowthorne, Berkshire, United Kingdom.

Caballero, B. 2005. "A Nutrition Paradox-Underweight and Obesity in Developing Countries," *New England Journal of Medicine* 352(15): 1514-16.

Califano, J. A. 1994. *Radical Surgery. What's Next for America's Health Care.* New York: Times Books, Random House.

Casey, B., H. Oxley, E. Whitehouse, P. Antolin, R. Duval, and W. Leibfritz. 2003. "Policies for an Aging Society: Recent Measures and Areas for Further Reform." OECD Economics Department Working Paper 369, Organization for Economic Co-operation and Development, Paris.

Cercone, J. A. 1994. "Alcohol-Related Problems as an Obstacle to the Development of Human Capital." World Bank Technical Paper 219, The World Bank, Washington, DC.

Cha A. E. 2005. "Firms Make It Their Business to Push Health: Incentives, Monitoring Aimed at Cutting Costs." *Washington (DC) Post.* February 20.

Chaloupka, F. J., M. Grossman, and H. Saffer. 2002. "The Effects of Price on Alcohol Consumption and Alcohol-Related Problems," National Institute on Alcohol Abuse and Alcoholism. *http://www.niaaa.nih.gov/publications/arh26-1/22-34.htm.*

Chenet, L., M. McKee, D. Leon, V. Shkolnikov, and S. Vassin, 1998. "Alcohol and Cardiovascular Mortality in Moscow; New Evidence of a Causal Association." *Journal of Epidemioogy and Community Health* 52: 772-74.

Cherkesov, V. 2005. "On Investigation Operations of the Russian Federation Federal Services for Control Over Drug Turnover in 2004 and Objectives for 2005." Report at the full-scale meeting of the Board of the Russian Federation Federal Services for Control Over Drugs Turnover: Press release. February 18.

Chervyakov, V.V., V. M. Shkolnikov, W. A. Pridemore, and M. McKee. 2002. "The Changing Nature of Murder in Russia," *Social Science & Medicine* 55(10): 1713-24.

Chopra, M., and I. Darnton-Hill. 2004. "Tobacco and Obesity Epidemics: Not So Different After All?" *British Medical Journal* 328(7455): 1558-60.

CINDI (Countrywide Integrated Noncommunicable Diseases Intervention) Program. 2004. "Behavioral Risk Factor Surveillance System Development in Russia in 2004." Technical Report. *http://www.cindi.ru.*

Cirillo, J. A., and F. M. Council. 1986. "Highway Safety: Twenty Years Later," *Transportation Research Record,* 1068: 90-95.

Clark, G. L. 2004. *The Macro-Economic Context.* University of Oxford. Oxford, United Kingdom.

CMH (Commission on Macroeconomics and Health). 2001. "Macroeconomics and Health: Investing in Health for Economic Development." Report of the Commission on Macroeconomics and Health, chaired by Jeffrey Sachs, World Health Organization, Geneva.

Cohen, L., and S. Swift. 1997. "Beyond Brochures: Preventing Alcohol-Related Violence and Injuries. Draft Report, Prevention Institute, Berkeley, CA.

Coile, C. 2003. "Health Shocks and Couples' Labor Supply Decisions." CRR Working Paper 08, Center for Retirement Research, Boston College, Boston, MA.

Commission on the Future of Health Care in Canada. 2002. "Building on Values: The Future of Health Care in Canada." Final Report. Commission on Future of Health Care in Canada, Saskatoon, Canada. *http://www.hc-sc.gc.ca/english/pdf/romanow/pdfs/HCC_Final_Report.pdf*

Cook, I. G., and T. J. B. Dummer. 2004. "Changing Health in China: Re-evaluating the Epidemiological Transition Model," *Health Policy* 67(3): 329-43.

Coote, A. 2004. Prevention Rather Than Cure: Making the Case for Choosing Health. ISBN 1 85717 485 2, Kings Fund, London.

Coote, A., J. Allen, and D. Woodhead. 2004. Finding Out What Works. Building Knowledge about Complex, Community-Based Initiatives. King's Fund, London.

Cornia, G. A. 2002. "The Forgotten Crisis: Transition, Psychosocial Stress and Mortality over the 1990s in the Former Soviet Block." In *Investment for Health: A Discussion of the Role of Economic and Social Determinants.* Geneva: World Health Organization.

Costa, D. L., and M. E. Kahn. 2004. "Changes in the Value of Life, 1940-1980," *Journal of Risk and Uncertainty* 29(2).

Cotoyannis, P., and N. Rice. 2001. "The Impact of Health on Wages: Evidence from the British Household Panel Survey," *Empirical Economics* 26: 599-622.

Crafts, N. 2003. "The Contribution of Increased Life Expectancy to Growth of Living Standards in the UK, 1870-2001." Unpublished manuscript, London School of Economics, London.

Currie, Janet M., and Brigitte C. Madrian. 1999. "Health, Health Insurance, and the Labor Market." In *Handbook of Labor Economics,* vol. 3, edited by Orley Ashenfelter and David Card (3309-3416). Amsterdam: Elsevier Science.

Cutler, D.M. 2004. *Your Money or Your Life. Strong Medicine for America's Health Care System.* New York: Oxford University Press.

Cutler, D. M., and S. Kadiyala. 1999. "The Economics of Better Health: The Case of Cardiovascular Disease." Technical Report, National Bureau of Economic Research, Cambridge, MA, November.

Cutler, D., and E. Richardson. 1997. "Measuring the Health of the U.S. Population" in Brookings Papers on Economic Activity, *Microeconomics* 29: 519-39.

Danishevski, K., and M. McKee. 2002. "Campaigners Fear That Russia's New Tobacco Law Won't Work," *British Medical Journal* 324(7334): 382.

——. 2005. "Reforming the Russian Health-Care System," *Lancet* 365(9464): 1012-14.

Davis, C. 2005. "Economic Consequences of Changes in the Health Status of the Population and Economic Benefits of Medical Programmes in the USSR during 1950-1991." Background Paper prepared for the Macroeconomics and Health Report for Eastern Europe and Central Asia. European Office for Investment for Health and Development, World Health Organization, Venice.

Daynard, R. A. 2003. "Commentary: Lessons from Tobacco Control for the Obesity Control Movement," *Journal of Public Health Policy* 24 (3-4): 291-95.

Demin, A. K. 1993. "Premature Population Mortality Patterns on the Territories of Russia: Implications from Action." IIKTL Symposium, Publications of the National Public Health Institute B4/93, Helsinki.

Dinh-Zarr, T.B., D.A. Sleet, R.A. Shults, et al. 2001. "Reviews of Evidence Regarding Interventions to Increase the Use of Safety Belts," *American Journal of Preventive Medicine* 21(4S): 48-65.

Drucker, P. F. 1999. *Management Challenges for the 21st Century.* Burlington, MA: Butterworth-Heinemann.

Druss, B. G., S. C. Marcus, M. Olfson, and H. A. Pincus. 2002. "The Most Expensive Medical Conditions in America." *Health Affairs* 21(4): 105-11.

Eberstadt, N. 2005. "Health and Demography: The Achilles' Heel of Post-Socialist Development in Europe." Presentation at "Advancing Economic Growth: Investing in Health," Chatham House, London, June 22-23.

The Economist. 2004. "Death Wish." September 30. *http://www.uwec.edu/geography/Ivogeler/w111/articles/russia-death-rates.htm.*

Edlin, A. S. 2002. "Per-Mile Premiums for Auto Insurance." Working Paper E02-318, Department of Economics, University of California, Berkeley, CA. *http://repositories.cdlib.org/iber/econ/E02-318,* accessed 5 December 2003.

Elvik, R., and T. Vaa. In press. *Handbook of Road Safety Measures.* Amsterdam: Elsevier.

Eroshina, K., K. Danishevski, P. Wilkinson, and M. McKee. 2004. "Environmental and Social Factors as Determinants of Respiratory Dysfunction in Junior Schoolchildren in Moscow," *Journal of Public Health* 26(2): 197-204.

EU (European Union). 2001. "Transport Policy for 2010: Time to Decide." White Paper, Luxembourg. *http://europa.eu.int/comm/energy_transport/library/lb_texte_complet_en.pdf*

European Foundation for the Improvement of Living and Working Conditions. 1997. "Preventing Absenteeism at the Workplace." Luxembourg. *http://www.eurofound.eu.int/publications/files/EF9715EN.pdf.*

European Health for All Database (HFA-DB). World Health Organization. *http://www.who.dk/hfadb.*

European Transport Safety Council. 1993. "Reducing Traffic Injuries through Vehicle Safety Improvements: The Role of Car Design." Review, European Transport Safety Council, Brussels.

——. 1995. "Reducing Injuries from Excess and Inappropriate Speed." Report, Working Party on Road Infrastructure, European Transport Safety Council, Brussels.

——. 1996. "Seat-Belts and Child Restraints: Increasing Use and Optimizing Performance."European Transport Safety Council, Brussels.

——. 1998. "Forgiving Roadsides." Briefing, European Transport Safety Council, Brussels. *http://www.etsc.be/documents/bri_road5.pdf* (checked August 12, 2005).

Ezzati, M., A. D. Lopez, A. Rodgers, S. Vander Hoorn, C. J. Murray; and the Comparative Risk Assessment Collaborating Group. 2002. "Selected Major Risk Factors and Global and Regional Burden of Disease," *Lancet* 360(9343): 1347-60.

Feachem, R. G. A., T. Kjellstrom, C. J. L. Murray, M. Over, and M. A. Phillips. 1992. *The Health of Adults in the Developing World.* New York: Oxford University Press for the World Bank.

Finch, D. J., et al. 1994. "Speed, Speed Limits and Accidents." Project Report 58, Transport Research Laboratory, Ltd., Crowthorne, Berkshire, United Kingdom.

Fontaine, K. R., D. T. Redden, C. Wang, A. O. Westfall, and D. B. Allison. 2003. "Years of Life Lost Due to Obesity," *Journal of the American Medical Association* 289: 187-93.

Foxcroft, D. R., D. Ireland, G. Lowe, and R. Breen. 2002. "Primary Prevention for Alcohol Misuse in Young People," *The Cochrane Database of Systematic Reviews.* Issue 3. Art. No. CD003024. DOI:10.1002/14651858.CD003024.

Frenk, J., J. L. Bobadilla, and M. Lopez Cervantes. 1989. "Health Transition in Middle-Income Countries: New Challenges for Health Care," *Health Policy and Planning* 4(1): 29-39.

Frid, E. 2005. "Health Care Costs in the Russian Federation." Background assessment prepared for the World Bank, Moscow, March.

Gerasimenko, N. F., and A. K. Demine. 2001. "Tobacco Policy and Politics in Russia." Russian Public Health Association, Moscow.

Gilmore, A. B., and M. McKee. 2004a. "Tobacco and Transition: An Overview of Industry Investments, Impact and Influence in the Former Soviet Union," *Tobacco Control* 13(2): 136-42.

——.2004b. "Moving East: How the Transnational Tobacco Industry Gained Entry to the Emerging Markets of the Former Soviet Union-Part II: An Overview of Priorities and Tactics Used to Establish a Manufacturing Presence," *Tobacco Control* 13(2): 151-60.

Gilmore, A., J. Pomerleau, M. McKee, R. Rose, C. W. Haerpfer, D. Rotman, and S. Tumanov. 2004. "Prevalence of Smoking in 8 Countries of the Former Soviet Union: Results from the Living Conditions, Lifestyles and Health Study," *American Journal of Public Health* 94(12): 2177-87.

Glasunov, I. S., V. Grabauskas , W. W. Holland, and F. H. Epstein. 1983. "An Integrated Programme for the Prevention and Control of NCDs: A Kaunas Report of a Meeting, Nov. 16-20, 1981." *Journal of Chronic Disease* 36(5): 419-26.

Goskomstat (Russian State Statistical Bureau). 2000. Regions of Russia. Report. Moscow.

——. 2002. Demographic Yearbook of Russia: Collection of Articles. Report. Moscow.

——. 2003. *Russia in Figures.* Report. Moscow.

Gribble, J. N., and S. H. Preston, eds. 1993. *The Epidemiological Transition: Policy and Planning Implications for Developing Countries.* Committee on Population, National Research Council, National Academy Press, Washington, DC. http://www.nap.edu/books/0309048397/html/.

Guindon, G.E., S. Tobin, and D. Yach. 2002. "Trends and Affordability of Cigarette Prices," *Tobacco Control* 11: 25-43. www.tobaccocontrol.com.

Gyarfas, I. 1992. "Review of Community Intervention Studies on Cardiovascular Risk Factors," *Clin Exp Hypertens* A. 14(1-2): 223-37.

Hardy GE Jr. The burden of chronic disease: the future is prevention. Introduction to Dr. James Marks' presentation, The Burden of Chronic Disease and the Future of Public Health. Prev Chronic Dis [serial online] 2004 April [date cited]. Available from URL: *http://www.cdc.gov/pcd/issues/2004/apr/04_0006.htm.*

Hausman, J. A. 1978. "Specification Tests in Econometrics," *Econometrica* 46: 1251-71.

Hausman, J. A., and W. E. Taylor. 1981. "Panel Data and Unobservable Individual Effects," *Econometrica* 49: 1377-98.

Haveman, R, M. Stone, and B. Wolfe. 1994. "Market Work, Wages and Men's Health," *Journal of Health Economics* 13: 163-82.

Haveman, R., B. Wolfe, and F. M. Huang. 1989. "Disability Status as an Unobservable: Estimates from a Structural Model." Working Paper 2831, National Bureau of Economic Research, Cambridge, MA.

Hawkes, C. 2004. "Food: A Determinant of Nutrition and Health in the ECA Region." Background paper prepared for WHO European Office, Geneva.

Heckman, J., H. Ichimura, and P. Todd. 1997. "Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme," *Review of Economic Studies* 64: 605-54.

Heleniak, T. 2005. *Russia's Demographic Decline Continues.* Population Reference Bureau. *http://www.prb.org* (accessed June 06, 2005).

Hellermann, J. P., T. Y. Goraya, S. J. Jacobsen, S. A. Weston, G. S. Reeder, B. J. Gersh, M. M. Redfield, R. J. Rodeheffer, B. P. Yawn, and V. L. Roger. 1997. "Incidence of Heart Failure after Myocardial Infarction: Is It Changing over Time?" *Archives of Internal Medicine* 157: 2413-46.

Holder, H. 1994. "Mass Communication as an Essential Aspect of Community Prevention to Reduce Alcohol in Traffic Crashes," *Alcohol, Drugs and Driving* 10(3-4): 295-307.

House of Commons Health Committee. 2004. *Obesity.* Third Report of Session 2003-04, Volume 1, Report and Formal Minutes, London, Great Britain, May 10. *http://www.publications.parliament.uk/pa/cm200304/cmselect/cmhealth/23/23.pdf*

ILO (International Labor Organization). 2005. "Global Estimates of Fatal Work Related Diseases and Occupational Accidents, World Bank Regions." Geneva. *http://www.ilo.org/public/english/protection/safework/accidis/globesti.pdf*

IMF (International Monetary Fund). 2004. World Economic Outlook: The Global Demographic Transition. Washington, DC.

Institute for Alternative Futures. 2003. "Preliminary Summary Survey on Key Levers of Change to Prevent and Control Chronic Disease." Preliminary survey prepared for WHO Noncommunicable Disease Strategy Development and Oxford Vision 2020. *http://www.oxfordvision2020.org/getMedia.asp?mb_GUID=731BFF11-958E-4283-9D3C-9D5BF2FC05D3.pdf* (accessed July 27, 2005).

Islam, N. 1995. "Growth Empirics: A Panel Data Approach," *Quarterly Journal of Economic* 110(4), 1127-70.

Ivaschenko, O. 2003. "Mortality in Russian Regions: Do Poverty and Low Public Health Spending Kill? Pre-publication draft, Washington, DC, The World Bank.

Jamison, D., L. Lau, and J. Wang. 2004. "Health's Contribution to Economic Growth in an Environment of Partially Endogenous Technical Progress." Disease Control Priorities Project Working Paper 10, Fogarty International Centre, National Institutes of Health. Bethesda, MD. *www.fic.nih.gov/dcpp.*

Jiménez-Martín, S., J. M. Labeaga, and M. Martínez. 1999. "Health Status and Retirement Decisions for Older European Couples." Paper, TMR Programme, European Commission, Brussels. *http://www.ceps.lu/iriss/documents/irisswp1.pdf.*

Kalemli-Ozcan, S., H. E. Ryder, and D. N. Weil. 2000. "Mortality Decline, Human Capital Investment, and Economic Growth," *Journal of Development Economics* 62: 1-23.

Kearney, P. M., M. Whelton, K. Reynolds, P. Muntner, P. K. Whelton, and J. He. 2005. "Global Burden of Hypertension: Analysis of Worldwide Data," *Lancet* 365: 217-23.

Kelley E, E. Moy, B. Kosiak, D. McNeill, C. Zhan, D. Stryer, and C. Clancy. 2004. "Prevention Health Care Quality in America: Findings from the First National Healthcare Quality and Disparities Reports," *Preventing Chronic Disease: Public Health Research, Practice, and Policy* 1(3): Epub 2004 Jun 15. *www.cdc.gov/pcd/issues/204/jul/pdf/04_0031.pdf.*

Kingkade, W. W., and E. E. Arriagada. 1997. "Mortality in the New Independent States: Patterns and Impacts." In *Premature Death in the New Independent States,* eds. J. L. Bobadilla, C. A. Costello, and F. Mitchell, 156-83. Washington, DC: National Academy Press.

Kirchberger, M., and M. Fiorin. 2004. "Is There an Economic Rationale for Public Policy against Alcohol and Tobacco Consumption in Central and Eastern Europe?" Degree thesis, Free University of Bolzano.

Klein, R. 2004. "Britain's National Health Service Revisited," *New England Journal of Medicine* 350(9): 937-42.

Knai, C., M. McKee, and M. Bobak. 2004. "Evidence Base on How to Improve Health in Low-Resource Settings with Special Attention to ECA: CVD Prevention, Management, Rehabilitation." Draft report, World Health Organization, Geneva.

Laatikainen, T. 2000. "Cardiovascular Risk in the Republic of Karelia, Russia: Comparison of Major Risk Factors with North Karelia, Finland." Thesis, National Public Health Institute, Helsinki.

Laatikainen, T., H. Alho, E. Vartianinen, P. Jousilahti, P. Sillanaukee, and P. Puska. 2002a. "Self-reported Alcohol Consumption and Association to Carbohydrate-Deficient Transferring and Gamma-Glutamyltransferase in a Random Sample of the General Population in the Republic of Karelia, Russia and in North Karelia, Finland." *Alcohol and Alcoholism* 37(3): 282-88.

Laatikainen, T., L. Delong, S. Pokusajeva, M. Uhanov, E. Vartiainen, and P. Puska. 2002b. "Changes in Cardiovascular Risk Factors and Health Behaviours from 1992 to 1997 in the Republic of Karelia, Russia," *European Journal of Public Health* 12(1): 37-43.

Laatikainen, T., V. Korpelainen, T. Vlasoff, M. Uhanov, and P. Puska. 2005. *The Pitkäranta Project: A Successful Pilot Programme in Non-communicable Disease Prevention in the Republic of Karelia, Russia.* Draft Report by the National Public Health Institute, Finland.

Ladnaia, N., V. Pokrovsky, and C. Rühl. 2003. "The Economic Consequences of HIV in Russia: An Interactive Simulation Approach." Moscow, The World Bank.

Lang, T., and M. Heasman. 2004. "Diet and Nutrition Policy: A Clash of Ideas or Investment?" Development, 47(2): 64-74. *http://www.oxfordvision2020.org/getMedia.asp?mb_GUID=11845FE1-D5E8-4B01-B5C3-5FC02F8A661D.pdf* accessed July 27, 2005.

Lechner, M., and R. Vasquez-Alvarez. 2004. "The Effect of Disability on Labor Market Outcomes in Germany: Evidence from Matching," Center for Economic Policy Research (CEPR) Discussion Paper Series 4223.

Leeder, S., S. Raymond, H. Greenberg, H. Liu, and K. Esson. 2004. *A Race against Time: The Challenge of Cardiovascular Disease in Developing Economies.* New York, NY: Columbia University.

Leon, D. 2005. Personal communication. London School of Tropical Medicine, April.

Leon, D., Andreev, E., Kiryanov, N., McKee, M., Suburova, V., Shkolnikov, V., and Tomkins, S. 2005. "Izhevsk Family Study." Interim Report. London School of Hygiene and Tropical Medicine.

Leon, D., L. Chenet, V. M. Shkolnikov, S. Zakharov, J. Shapiro, G. Rakhmanova, S. Vassin, and M. McKee. 1997. "Huge Variation in Russian Mortality Rates 1984-1994: Artefact, Alcohol, or What?" *Lancet* 350: 383-88.

Leon, D., and M. Mckee. 2005. Personal communication. London School of Hygiene and Tropical Medicine, April.

Levine, R., and D. Renelt. 1992. "A Sensitivity Analysis of Cross-Country Growth Regressions," *American Economic Review* 82: 942-63.

Levintova, M., and T. Novotny. 2004. "Noncommunicable Disease Mortality in the Russian Federation: From Legislation to Policy," *Bulletin of the World Health Organization* 82: 875-80.

Litman, T. 2000. "Distance-Based Vehicle Insurance: Feasibility, Costs and Benefits." Comprehensive Technical Report, Victoria Transport Policy Institute, Victoria, BC. *http://www.vtpi.org/dbvi_com.pdf,* accessed 5 December 2003.

Lock, K., E. Andreev, V. M. Shkolnikov, and M. McKee. 2002. "What Targets for International Development Policies Are Appropriate for Improving Health in Russia?" *Health Policy & Planning* 17: 257-63.

Macaulay, J., and R. McInerney. 2002. "Evaluation of the Proposed Actions Emanating from Road Safety Audits." Austroads Publication AP-R209/02, Sydney.

Magnus, P., and R. Beaglehole. 2001. "The Real Contribution of the Major Risk Factors to the Coronary Epidemics," *Archives of Internal Medicine* 161: 2657-60.

Marmot, M. 2002. "The Influence of Income on Health: Views of an Epidemiologist." *Health Affairs* 21(2): 31-46.

Marquez, P., and M. Suhrcke. 2005. "Combating non-communicable diseases." *British Medical Journal* 331: p. 174-174.

Maslennikova, G. Ya, S. A. Martynchick, S. A. Shalnova, A. D. Deyev, and R. G. Oganov. 2005. Unpublished paper. National Research Centre for Preventive Medicine, MOHSD, Moscow.

McKee, M. 2004. "Learning from Tobacco to Address Diet and Nutrition more effectively." PPL. Report of the Oxford Vision 2020 Tobacco Working Group. *http://www.oxfordvision2020.org/getMedia.asp?mb_GUID=4B5356F7-1E61-4380-AACB-0EC1B3CE3E31.ppt*

——. 2005. Personal communication. London School of Tropical Medicine, March.

McKee, M, M. Bobak, R. Rose, V. Shkolnikov, L. Chenet, and D. Leon. 1998. "Patterns of Smoking in Russia, *Tobacco Control* 7: 22-26.

McKee, M, D. A. Leon, S. Tomkins, V. M. Shkolnikov, and E. Andreev. 2005. "INTERHEALTH. Correspondence," *The Lancet* 365: 117-18.

McKee, M., V, Shkolnikov, and D. A. Leon. 2001. "Alcohol Is Implicated in the Fluctuations in Cardiovascular Disease in Russia since the 1980s," *Annals of Epidemiology* 11(1): 1-6.

McKeown, T. 1985. "Looking at Disease in the Light of Human Development," *World Health Forum* 6: 70-75.

McKinlay, J. 1993. "The Promotion of Health through Planned Socio-Political Change: Challenges for Research and Policy," *Social Science and Medicine* 36: 109-17.

McMichael, A.J., M. McKee, V. Shkolnikov, and V. Valkonen. 2004. "Mortality Trends and Setbacks: Global Convergence or Divergence?" *Lancet* 363: 1155-59.

Mesle, F. 2002. "Mortality in Central and Eastern Europe: Long-Term Trends and Recent Upturn." *Demographic Research Special Collection 2* Article 3. Rostock, Germany: Max Planck Institute for Demographic Research.

Mesle, F., V. Shkolnikov, V. Hertrich, and J. Vallin. 1996. Tedances recentes de la mortalite par cause en Russie, 1965-1994. Paris, Institut National d'Études Demographiques.

Miller, T. R. 2000. "Variations between Countries in Values of Statistical Life," *Journal of Transport Economics and Policy* 34(2): 169-88.

Mintz, P. H. 1999 "Managing Acute, Chronic, and Catastrophic Health Care Costs. Experience and Policy Issues in the U.S. Context of Managed Care and Comparative Analysis of the Chilean Regulatory Framework."A report prepared for the World Bank, Washington, DC, June.

Mitchell, J., and R. Burkhauser. 1990. "Disentangling the Effect of Arthritis on Earnings: A Simultaneous Estimate of Wage Rates and Hours Worked," *Applied Economics Letters* 22: 1291-310.

MOH (Ministry of Health, Russia). 1994. Towards a Healthy Russia: Policy for Health Promotion and Disease Prevention; Focus on Major Noncommunicable Diseases. State Research Center for Preventive Medicine. Moscow.

MOPH (Ministry of Public Health, Russia). 1997. "Towards a Healthy Russia: Policies and Strategies for the Prevention of Cardivascular and Other Noncommunicable Diseases within the Context of Public Health Reform in Russia." Moscow.

——. 1999. "Monitoring of Risk Factors for Non-communicable Diseases, Mortality and Other Indicators of the CINDI Program Development." CINDI-Russia Final Report. Moscow.

Mossey, J. M., and E. Shapiro. 1982. "Self-rated Health: A Predictor of Mortality among the Elderly," *American Journal of Public Health.*72: 800-08.

Mullahy, J. 1991. "Gender Differences in Labor Market Effects of Alcoholism," *American Economic Review: Papers and Proceedings* 81: 161-65.

Murray, C. 1993. "Quantifying the Burden of Disease: The Technical Basis for Disability Adjusted Life Years." Health Transition Working Paper Series 93.03. Cambridge, MA: Harvard University.

Murray, C.J.L., and J. L. Bobadilla. 1997. "Epidemiological Transitions in the Formerly Socialist Economies: Divergent Patterns of Mortality and Cuases of Death." In *Premature Death in the New Independent States,* eds. J. L. Bobadilla, C. A. Costello, and F. Mitchell, 184-219. Washington, DC: National Academy Press.

Murray, C., and A. Lopez. 1993. "Quantifying the Burden of Disease: Data, Methods, and Results." Health Transition Working Paper Series 93.05. Cambridge, MA: Harvard University.

Musgrove, P. 1996. "Public and Private Roles in Health: Theory and Financing Patterns." World Bank Discussion Paper WDP 339, Washington, DC: The World Bank.

Naik, G. 2003. "Finns Use Group Effort to Come Up with Fix for Heart Disease." *Wall Street Journal* (New York). January 14.

NHS (National Health Service). 2004. *Choosing Health: Making Healthy Choices Easier. Executive Summary.* Department of Health, Her Majesty's Government, United Kingdom.

Nickel, S. 1981. "Biases in Dynamic Models with Fixed Effects," *Econometrica* 49: 1117-26.

NOBUS (National Survey of Household Welfare and Program Participation). 2003. Federal State Statistics Service. Moscow.

Nolte, E., McKee, M, and Gilmore, A. 2004. "Morbidity and Mortality in Transition Countries in the European Context. Background Paper for the Thematic Session on Morbidity, Mortality and Reproductive Health at the Euroepan Population Forum." Geneva, January 12-14.

——. 2005. "Morbidity and Mortality in Transition Countries in the European Context." In *The New Demographic Regime: Population Challenges and Policy Responses,* eds. M. Macura, A. MacDonald, and W. Haug. New York and Geneva: United Nations.

Nordhaus, W. 2003. "The Health of Nations: The Contribution of Improved Health to Living Standards." In *The Measurement of Economic and Social Performance,* ed. M. Moss. New York: Columbia University Press for the National Bureau of Economic Research.

North Karelia Project. 2005. Power Point Presentation. National Public Health Institute, Finland.

Notzon, F. C., Y. M. Komarov, S. P. Ermakov, C. T. Sempos, J. S. Marks, E. V. Sempos. 1998. "Causes of Declining Life Expectancy in Russia." *Journal of the American Medical Association* 279: 793-800.

OECD (Organisation for Economic Co-operation and Development). 2003. Health Data 2003. *http://caliban.sourceoecd.com/vl=11322400/cl=42/nw=1/rpsv/~9294/v1n1/s1/p1.*

Oganov, R. G. 2005. "CVD Mortality at the End of the 20th Century: Russian Paradox." Presentation at the National Research Center for Preventive Medicine. Moscow.

Oganov, R. G., and G. Y. Maslennikova. 1999. "Cardiovascular Disease Mortality in the Russian Federation during the Second Half of the 20th Century." *CVD Prevention* 2: 37-43.

——. 2005a. "Key Role of Caridovascular and other Non-Communicble Disease Prevention in Improving the Demographic Sitaution in Russia." Unpublished paper. National Research Centre for Preventive Medicine, MOHSD. Moscow.

——. 2005b. "Smoking Health Effects: A Place of Russia in Europe." Presentation at the State Research Center for Preventive Medicine, Moscow.

Olshansky, S. J., D. J. Passaro, R. C. Hershow, J. Layden, B. A. Carnes, J. Brody, L. Hayflick, et al. 2005. "A Potential Decline in Life Expectancy in the United States in the 21st Century," *New England Journal of Medicine* 352(11): 1138-45.

Omran, A. R. 1971. "The Epidemiologic Transition: A Theory of the Epidemiology of Population Change," *The Milbank Memorial Fund Quarterly* 49: 509-38.

——. 1999. The Epidemiologic Transition Theory Revisited Thirty Years Later. Washington, DC: George Washington University.

Owen, L. 2000. "Impact of a Telephone Helpline for Smokers Who Called during a Mass Media Campaign," *Tobacco Control* 9: 148-54.

PAHO (Pan American Health Organization). 2003. "Report from 37th Session of the Subcommittee on Planning and Programming of the Executive Committee." Washington, DC, March 26-28.

Palosuo, H. 2003. "Health and Well-Being in Moscow and Helsinki." *STAKES Research Report* 129 Helsinki, Finland.

Paoli, P., and Merllié, D. 2003. "Third European Survey on Working Conditions 2000." European Foundation for the Improvement of Living and Working Conditions. *www.eurofound.eu.int.*

Pauly, M., S. Nicholson, J. Xu, D. Polsky, P. M. Danzon, J. F. Murray, and M. Berger. 2002. "A General Model of the Impact of Absenteeism on Employers and Employees," *Health Economics* 11: 221-31.

Peden, M, R. Scurfield, D. Sleet, D. Mohan, A. A. Hyder, E. Jarawan, and C. Mathers. 2004. *World Report on Road Traffic Injury Prevention.* ISBN: 92 4 156260 9. Geneva: The World Health Organization.

Pekka, P., P. Pirjo, and U. Ulla. 2002. "Influencing Public Nutrition for Noncommunicable Disease Prevention: From Community Intervention to National Programme-Experiences from Finland," *Public Health Nutrition* 5(1A): 245-51.

Pelkowski, J. M., and M. C. Berger. 2004. "The Impact of Health on Employment, Wages, and Hours Worked over the Life Cycle," *Quarterly Review of Economics and Finance* 44: 102-21.

Peto, R., A. D. Lopez, J. Boreham, M. Thun, and C. Heath. 1994. *Mortality from Smoking in Developed Countries 1950-2000.* Oxford: Oxford University Press.

Pietinen, P., M. Lahti-Koski, E. Vartiainen, and P. Puska. 2001. "Nutrition and Cardiovascular Disease in Finland since the Early 1970s: A Success Story," *J Nutr Health Aging* 5(3): 150-54.

Plavinski, S. L., S. I. Plavinskaya, and A. N. Klimov. 2003. "Social Factors and Increases in Mortality in Russia in the 1990s: Prospective Cohort Study." *British Medical Journal* 326(7401): 1240-42.

Plavinski, S. L., S. I. Plavinskaya, V. Richter, et al. 1999. "The Total and HDL-Cholesterol Levels in Populations of St. Petersburg (Russia) and Leipzig (Germany)," *Nutr Metb Cardiovasc Dis* 9: 184-91.

Poikolainen K. 1999. "Effectiveness of Brief Interventions to Reduce Alcohol Intake in Primary Health Care Populations: A Meta Analysis," *Preventive Medicine* 28: 503-09.

Pomerleau, J., A. Gilmore, M. McKee, R. Rose, and C. W. Haerpfer. 2004. "Determinants of Smoking in Eight Countries of the Former Soviet Union: Results from the Living Conditions, Lifestyles and Health Study," *Addiction.* 99(12): 1577-85.

Posten, W. S. C., and J. P. Foreyt. 1999. "Obesity Is an Environmental Issue," *Atherosclerosis* 146: 201-09.

Pramming, S., and N. Nordisk. 2004. "The Journey So Far: A Personal Perspective." Presented at Oxford Vision 2020 Summit, Saïd Business School, Oxford, September. *http://www.oxfordvision2020.org/getMedia.asp?mb_GUID=1CEE172D-DDB3-4C2C-B29A-10E9BF9DD9A5.ppt.*

Puska, P. 1995. "Health Promotion Challenges for Countries of the Former Soviet Union: Results from Collaboration between Estonia, Russian Karelia, and Finland," *Health Promotion International* 10(3).

——. 1996. "Development of Public Policy on the Prevention and Control of Elevated Blood Cholesterol," *Cardiovascular Risk Factors* 6(4): 203-10.

——. 2000. "Nutrition and Mortality: The Finnish Experience," *Acta Cardiol* 55(4): 213-20.

——. 2002. "Successful Prevention of NCDs: 25 Year Experience with North Karelia Project in Finland," *Public Health Medicine* 4(1): 5-7.

Puska, P, J. Tuomilehto, A. Nissinen, and E. Vartiainen (eds.). 1995. *The North Karelia Project: 20 Year Results and Experiences.* The National Public Health Institute. Helsinki, Finland.

Puska, P., E. Vartiainen, J. Tuomilehto, V. Salomaa, and A. Nissinen. 1998. "Changes in Premature Deaths in Finland: Successful Long-Term Prevention of Cardiovascular Diseases," *Bulletin of the World Health Organization* 76(4): 419-25.

Putin, V. 2004. "Annual Address to the Federal Assembly of the Russian Federation." *Federal News Service.* May 26.

Raistrick, D., R. Hodgson, and B. Ritson (eds.). 1999. *Tackling Alcohol Together: The Evidence Base for a UK Alcohol Policy.* Society for the Study of Addiction. London: Free Association Books.

Raw, M., A. McNeill, and R. West. 1999. "Smoking Cessation: Evidence Based Recommendations for the Healthcare System," *British Medical Journal* 318(7177): 182-85.

Rechel B., L. Shapo, and M. McKee. 2004. *Millennium Development Goals for health in Europe and Central Asia: relevance and policy implications.* Washington, D.C.: World Bank.

Reddy, K. S. 2004. "Cardiovascular Disease in Non-Western Countries," *New England Journal of Medicine* 350(24): 2438-40.

Rehm, J., and G. Gmel. 2002. "Average Volume of Alcohol Consumption: Patterns of Drinking and Mortality among Young Europeans in 1999," *Addiction,* Letters to the Editor 97(1): 105-09.

Rivera, B., and L. Currais. 1999. "Economic Growth and Health: Direct Impact or Reverse Causation?" *Applied Economics Letters* 6: 761-64.

RLMS (Russian Longitudinal Monitoring Survey). 1998, 2004, 2005.

Rodríguez, D. Y., F. J. Fernandez, and H. A. Velasquez. 2003. "Road Traffic Injuries in Colombia," *Injury Control and Safety Promotion* 10: 29-35.

Roland, M. 2004. "Linking Physicians' Pay to the Quality of Care: A Major Experiment in the United Kingdom," *New England Journal of Medicine* 351: 14.

Rose, G.. 1992. *The Strategy of Preventive Medicine.* Oxford, England: Oxford University Press.

Rosembaum, P., and D. Rubin. 1983. "The Central Role of the Propensity Score in Observational Studies for Causal Effects," *Biometrika* 70: 41-55.

Ross, H. 2004. "Russia (Moscow) 1999 Global Youth Tobacco Survey: Economic Aspects." HNP Discussion Paper: Economics of Tobacco Control Paper 23, The World Bank, Washington, DC.

Sachs, J. 2001. Macroeconomics and Health: Investing in Health for Economic Development. Geneva: World Health Organization.

Sachs, J., and A. Warner. 1995. "Economic Reform and the Process of Global Integration," B*rookings Papers on Economic Activity.* 1-118.

Saffer, H. 1995a. "Alcohol Advertising and Alcohol Consumption: Econometric Studies." In *The Effects of the Mass Media on the Use and Abuse of Alcohol,* ed. S. E. Martin. Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism.

——. 1995b. The Control of Tobacco Advertising and Promotion. Background paper. Publisher information unavailable.

Sakevich, V. 2005. "Maternal Mortality Worldwide." Demoskop Weekly/Population and Society Bulletin, Electronic Version. The Center for Demography and Human Ecology, Institute of Economic Forecasting, Russian Academy of Sciences. N.199-200, 18 April-1 May 2005. *http://www.demoscope.ru/weekly/2005/0199/reprod01.php*

Sala-I-Martin, X., G. Doppelhofer, and R. I. Miller. 2004. "Determinants of Long-Term Growth: A Bayesian Averaging of Classical Estimates (BACE) Approach," *American Economic Review* 94(4): 813-35.

Sammartino, F. J. 1987. "The Effect of Health on Retirement," *Social Security Bulletin* 50(2).

Schultz, T. P., and A. Tansel. 1995. "Measurement of Returns to Adult Health: Morbidity Effects on Wage Rates in Cote d'Ivoire and Ghana," Living Standards Measurement Study Working Paper, N. 95, The World Bank, Washington, DC.

——. 1996. "Wage and Labor Supply Effects of Illness in Côte d'Ivoire and Ghana: Instrumental Variable Estimates for Days Disabled," *Journal of Development Economics* 53: 251-86.

Shafey, O., S. Dolwick, and G. E. Guidon, eds. 2003. *Tobacco Control Country Profiles, 2nd ed.* 12th World Conference on Tobacco and Health, Helsinki, Finland. Atlanta, GA: WHO Tobacco Free Initiative, Americana Cancer Society, and International Union against Cancer.

Shishkina, S., G. Besstremyannaya, M. Krasilnikova, et.al. 2004. "Russian Health Care: Payments in Cash." Independent Institute of Social Policy, Moscow.

Shkolnikov, V., E. M. Andreev, D. A. Leon, M. McKee, F. Meslé, and J. Vallin. 2004. "Mortality Reversal in Russia: The Story So Far," *Hygeia Internationalis* 4: 29-80.

Shkolnikov V., V. V. Chervyakov, M. McKee, and D.A. Leon. 2004. "Russian Mortality beyond Vital Statistics: Effects of Social Status and Behaviors on Deaths from Circulatory Disease and External Causes-A Case-Control Study of Men Aged 20-55 Years in Udmurtia, 1998-99." Max-Planck-Gesellschaft, Rostock, Germany.

Shkolnikov, V., and D. A. Leon. 2005. "World Mortality 1950-2000: Divergence Replaces Convergence from the Late 1980s." *Bulletin of the World Health Organization* 83: 202-09.

Shkolnikov, V., M. McKee, and D. A. Leon. 2001. "Changes in Life Expectancy in Russia in the Mid-1990s," Lancet 357: 917-21.

Shkolnikov,V., M. McKee, D.A. Leon, and L. Chenet. 1999. "Why Is the Death Rate from Lung Cancer Falling in the Russian Federation?" *European Journal of Epidemiology* 15: 203-06.

Shkolnikov V., F. Mesle, and J. Vallin. 1997. "Recent Trends in Life Expectancy and Causes of Death in Russia, 1970-1993." *In Premature Death in the New Independent States,* eds. J. L. Bobadilla, C. A. Costello, and F. Mitchell, 34-65. Washington, DC: National Academy Press.

Shkolnikov, V., and A. Nemtsov. 1997. "The Anti-alcohol Campaign and Variations in Russian Mortality." In *Premature Death in the New Independent States,* ed. J. L. Bobadilla, C. A. Costello, and F. Mitchell, 239-61. Washington, DC: National Academy Press.

Siddiqui, S. 1997. "The Impact of Health on Retirement Behaviour: Empirical Evidence from West Germany," *Econometrics and Health Economics* 6: 425-38.

Specter, M. 2004. "The Devastation." *The New Yorker,* October 11, 58-69.

——. 1996. "Measuring Child Work and Residence Adjustments to Parent's Long-Term Care Needs," *Gerontologist* 36: 76-87.

State Federal Statistics Service (Rosstat). 2004. Russian Yearbook of Statistics. Moscow.

Stern, S. 1989. "Measuring the Effect of Disability on Labor Force Participation," *Journal of Human Resources* 24(3): 361-95.

——. 1996. "Semiparametric Estimates of the Supply and Demand Effects of Disability on Labor Force Participation," *Journal of Econometrics* 71: 49*70.

Strauss, J., P. Gertler, O. Rahman, and K. Fox. 1992. "Gender and Life-Cycle Differentials in the Patterns and Determinants of Adult Health," *Journal of Human Resources* 28(4). Also available at *http://www.rand.org/cgi-bin/Abstracts/ordi/getabbydoc.pl?doc=RP-301.*

Strauss, J., and D. Thomas. 1998. "Health, Nutrition and Economic Development," Journal of Economic Literature 36: 766-77.

Suhrcke, M., M. McKee, R. Sauto Arce, S. Tsolova, and J. Mortensen. 2005a. "The Contribution of Health to the Economy in the European Union." Report commissioned by the European Commission. Brussels, Belgium.

Suhrcke M, Rocco L, McKee M, Urban D, Mazzucco S, and A. Steinherr. 2005b. "Economic Consequences of Non-communicable Diseases and Injuries in the Russian Federation." WHO European Office for Investment for Health and Development, Venice. Background paper prepared for this study.

Suslina, Z.A. 2005. "Urgent Measures to Reduce Cerebrovascular Disease and Coronary Heart Disease Morbidity and Mortality among Russians of Working Age." Unpublished paper. RMAS Neurology Research Institute, MOHSD. Moscow.

Thomas, D. 2001. "Health, Nutrition and Economic Prosperity: A Microeconomic Perspective." CMH Working Paper WG1:7, Commission on Macroeconomics and Health, World Health Organization, Geneva.

Tobacco Control Country Profiles. *http://www.globalink.org/tccp/.*

Tragakes, E., and S. Lessof. 2003. *Health Care Systems in Transition: Russian Federation.* European Observatory on Health Care Systems, Copenhagen.

Transit New Zealand. 1992. "Accident Countermeasures: Literature Review." Research Report Number 10, Wellington, New Zealand. Available at http://www.Itsa.govt.nz/about/contracts.html.

Trans-Milenio, S. A. 2001. "A high capacity/low cost bus rapid transit system developed for Bogotá, Colombia." Bogotá. See also: E. El Sandoval and D. Hildalgo. Not dated. "TransMilenio: A High Capacity - Low Cost Bus Rapid Transit System Developed for Bogotá, Colombia." Conference Proceeding Paper, *Urban Public Transportation System: Ensuring Sustainability Through Mass Transit,* American Society of Civil Engineers, Reston, VA.

Treml, V. G. 1997. "Soviet and Russian Statistics on Alcohol Consumption and Abuse." In *Premature Death in the New Independent States,* eds. J. L. Bobadilla, C. A. Costello, and F. Mitchell, 220-38. Washington, DC: National Academy Press.

Trognon, A. 1978. "Miscellaneous Asymptotic Properties of Ordinary Least Squares and Maximum Likelihood Estimators in Dynamic Error Components Models," *Annales d l'INSEE* 30/31: 631-57.

Tunstall-Pedoe, H., K. Kuulasmaa, M. Mahonen, H. Tolonen, and E. Ruokokoski. 1999. "Contribution of Trends in Survival and Coronary Event Rates to Changes in Coronary Heart Disease Mortality: 10-Year Results from 37 WHO MONICA Project Populations," Lancet 353: 1547-57.

Twigg, J. 2004. "National Security Implications of Russia's Health and Demographic Crisis," *PONARS Policy Memo* 360: 1-5.

UN (United Nations). Population Database. *World Population Prospects.* U. N. Population Division. *http://esa.un.org.unpp.*

——. 2002. "Aging Index 1990-2025." World Population Prospects: The 2002 Revision. United Nations, New York, NY.

——. 2003. *World Population Prospects: The 2002 Revision.* United Nations, New York, NY.

——. 2004. *World Population Prospects: The 2003 Revision.* Population Database. UN Population Division. *http://esa.un.org.unpp.*

United Nations Development Program (UNDP). Human Development Report (various years). New York: Oxford University Press for the UNDP.

UNICEF (United Nations Children's Fund). 2004. "Economic Growth and Child Poverty in the CEE/CIS and the Baltic States," *Social Monitor 2004.* Florence: UNICEF Innocenti Research Centre.

USA Today. 2005. "Social Security and You. As Lives Get Longer, Benefits Should Come Later," May 20.

U.S. CDC (Centers for Disease Control and Prevention). Not dated. *http://www.cdc.gov/nccdphp/dnpa/obesity/faq.htm#adults,* citing the National Health and Nutrition Examination Survey 1999-2000 (cite visited June 2005), Atlanta, GA.

——. 2004. *Physical Activity Fact Sheet.* Division of Nutrition and Physical Activity. Atlanta, GA: *http://www.cdc.gov/nccdphp/dnpa.*

Usher, D. 1973. "An Imputation to the Measure of Economic Growth for Changes in Life Expectancy." In *The Measurement of Economic and Social Performance,* ed. M. Moss, 193-226. New York: Columbia University Press for the National Bureau of Economic Research.

U.S. HHS (U.S. Department of Health and Human Services). 2000. "Reducing Tobacco Use: A Report of the Surgeon General." Office on Smoking and Health, Centers for Disease Control and Prevention, National Centers for Chronic Disease Prevention and Health Promotion, Rockville, MD.

Vallin, J., and F. Mesle. 2001. Trends in Mortality in Europe since 1950: Age, Sex and Cause-Specific Mortality, in Trends in Mortality and Differential Mortality. Strasbourg: Council of Europe Publishing.

Vartiainen, E., P. Jousilahti, G. Alfthan, J. Sundvall, P. Pietinen, and P. Puska. 2000. "Cardiovascular Risk Factor Changes in Finland 1972-1997," International Journal of Epidemiology 29: 49-56.

Vartiainen, E., P. Puska, J. Pekkanen, J. Toumilehto, and P. Jousilahti. 1994. "Changes in Risk Factors Explain Changes in Mortality from Ischemic Heart Disease in Finland," *British Medical Journal* 309: 23-27.

Vergnano, M, 2004. "Achieving Behavior Modification: Potential Contributions from Communications Practitioners." Oxford Vision 2020. *http://www.oxha.org/archive.*

Viscusi, W. K., and J. E. Aldy. 2003. "The Value of Statistical Life: A Critical Review of Market Estimates throughout the World." NBER Working Paper 9487, National Bureau of Economic Research, Cambridge, MA.

Wagenaar, A. C. 1993. "Research Affects Public Policy: The Case of the Legal Drinking Age in the United States," *Addiction 88* (supplement): 75-81.

Walberg, P., M. McKee, V. Shkolnikov, L. Chenet, and D.A. Leon. 1998. "Economic Change, Crime, and Mortality Crisis in Russia: Regional Analysis," *British Medical Journal* 317: 312-18.

Wanless, D. 2004. "Securing Good Health for the Whole Population." Final Report, Her Majesty's Treasury, London.

West, R., A. McNeill, and M. Raw. 2000. "Smoking Cessation Guidelines for Health Professionals: An Update," *Thorax* 55: 987-99.

Whelton, P. K., J. He, L. J. Appel, J. A. Cutler, S. Havas, T. A. Kotchen, E. J. Roccella, R. Stout, C. Vallbona, M. C. Winston, and J. Karimbakas for the National High Blood Pressure Education Program Coordinating Committee. 2002. "Primary Prevention of Hypertension: Clinical and Public Health Advisory from the National High Blood Pressure Education Program," *Journal of the American Medical Association* 288: 1882-88.

WHO (World Health Organization). European Health for All Database (HFA-DB). *http://data.euro.who.int/hfadb/.*

——. WHO Mortality Database. *http://www3.who.int/whosis/menu.cfm?path=whosis,mort&language=english.* Copenhagen: World Health Organization Regional Office for Europe.

——. ICD *(International Statistical Classification of Diseases and Related Health Problems).* Online edition available at *http://www.who.int/classifications/icd/en/.*

——. 1996. "The Tobacco Epidemic: A Global Public Health Emergency." Tobacco Alert, Tobacco or Health Programme, Geneva.

——. 2001a. "Assessment of National Capacity for Noncommunicable Disease Prevention and Control." The Report of a Global Survey, The World Health Organization, Geneva.

——. 2001b. "Macroeconomics and Health: Investing in health for Economic Development." Commission on Macroeconomic and Health, World Health Organization, Geneva.

——. 2001c. *The World Health Report 2001.* Geneva. See annex: Healthy Life Expectancy, available at *http://www.who.int/whr/2002/en/whr2002_annex4.pdf.*

——. 2002a. *The European Health Report 2002.* Copenhagen: World Health Organization Regional Office for Europe.

——. 2002b. The World Health Report 2002: Reducing Risks to Health, Promoting Healthy Life. Geneva: World Health Organization.

——. 2002c. CINDI Highlights 2002, Number 8. Geneva: World Health Organization

——. 2002d. Investment for Health: A Discussion of the Role of Economic and Social Determinants. Geneva: The World Health Organization

——. 2003a The World Health Report 2003: Shaping the Future. Geneva: World Health Organization.

——. 2003b. *Atlas of Health in Europe.* Geneva: World Health Organization.

——. 20003c. "MDG Proposal Report for Improving Baseline Information." Moscow, World Health Organization.

——. 2003. "Consultation Document to Guide Development of a WHO Global Strategy for Diet, Physical Activity and Health." The World Health Organization, Geneva. Available at *http://www.who.int//hpr/gs.consultation.document.shtml#Consultation%20Document.*

——. 2004a. "Diabetes Program Fact Sheet." World Health Organization, Geneva. *http://www.who.int/diabetes/en/index.html.*

——. 2004b. "The CINDI Health Monitor: A Study of Feasibility of a Health Behavior Monitoring Survey across CINDI Countries." Data Book, WHO Regional office for Europe, Copenhagen.

——. 2004c. Atlas of Heart Disease and Stroke. Geneva: WHO.

——. 2004d. *Global Status Report: Alcohol Policy.* Department of Mental Health and Substance Abuse. Geneva: World Health Organization.

——. 2004e. "Diabetes Action Now: An Initiative of the World Health Organization and the International Diabetes Federation." World Health Organization, Geneva. *http://www.who.int/diabetes/actionnow/en/DANbooklet.pdf* (checked July 27, 2005).

——-. 2005a. *European Health Report 2005.* Copenhagen: World Health Organization Regional Office for Europe. *http://www.euro.who.int/eprise/main/who/progs/ehros/home*.

——. 2005b. *Preventing Chronic Diseases. A Vital Investment.* World Health Organization, Geneva.

Wild, S., G. Roglic, A. Green, R. Sicree, and H. King. 2004. "Global Prevalence of Diabetes Estimates for the Year 2000 and Projections for 2030," *Diabetes Care* 27: 1047-53.

Wines, M. 2000. "An Ailing Russia Lives a Tough Life That's Getting Shorter." *The New York (NY) Times,* December 3.

World Bank. World Development Indicators.

——. 1993. *World Development Report 1993 Investing in Health.* New York: Oxford University Press for the World Bank.

——. 1999. Curbing the Epidemic: Governments and the Economics of Tobacco Control. Development in Practice. Washington, DC: The World Bank.

——. 2003a. "Road Safety," *At a Glance* series published by Health Nutrition Population Unit. September, Washington, DC: The World Bank.

_____. 2003b. *Averting AIDS Crises in Eastern Europe and Central Asia.* A Regional Support Strategy. Washington, DC: The World Bank.

_____. 2003c. Country Assistance Strategy (CAS) for the Russian Federation.

——. 2004a. Health in Europe and Central Asia: Transition Retrospective and Business Plan. Washington DC: The World Bank.

——. 2004b. "Millennium Development Goals for Health in Europe and Central Asia, Relevance and Policy Implications." Working Paper 33, The World Bank, Washington, DC.

——. 2004c. "Road Safety Taskforce Operational Guidance for World Bank Staff," *Transport Notes* TN-1, The World Bank, Washington DC.

——. 2004d. "Implementing the Recommendations of the World Report on Road Traffic Injury Prevention." *Transport Notes* TN-1. The World Bank., Washington, DC.

——. 2005a. CAS Progress Report for Russian Federation. Washington DC: The World Bank

——. 2005b. Global Estimates of Fatal Work Related Diseases and Occupational Accidents. Washington, DC: The World Bank.

——. 2005c. Russian Federation Reducing Poverty through Growth and Social Policy Reform. Washington, DC: The World Bank.

Yach, D. 2004. "Cardiovascular Disease, Cancer, and Diabetes" in Social Injustice and Public Health. Part III: How Social Injustice Affects Health. Oxford Vision 2020: Oxford, England. Available at *http://www.oxfordvision2020.org/view.asp?ID=95.*

Yach, D., and C. Hawkes. 2004. "The WHO Long-Term Strategy for Prevention and Control of Leading Chronic Diseases." Draft Report, The World Health Organization, Geneva.

Yach, D., C. Hawkes, C. L. Gould, and K. J. Hofman. 2004. "The Global Burden of Chronic Diseases, Overcoming Impediments to Prevention and Control." *Journal of the American Medical Association* 291: 2616-22.

Yusuf, S., S. Hawken, S. Ounpuu, T. Dans, A. Avenzum, F. Lanas, M. McQueen, A. Budaj, P. Pais, J. Varigos, L. Lisheng, and other INTERHEART Study Investigators. 2004. "Effect of Potentially Modifiable Risk Factors Associated with Myocardial Infarction in 52 Countries (the INTERHEART Study): Case-Control Study," *Lancet* 364: 937-52.

Zeidner R. 2004. "Fitness On the Job. Special to *Washington (DC) Post,* August 17.

Zhirova, I.A., O. G. Froilova, T. M. Astakhova, and E. Ketting, E. 2004. "Abortion-Related Maternal Mortality in the Russian Federation," *Studies in Family Planning* 35(3).

Zohoori, N. D. Blanchette, and B. Popkin. 2005. "Monitoring Health Conditions in the Russian Federation. The Russian Longitudinal Monitoring Survey 1992-2004." University of North Carolina at Chapel Hill.

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