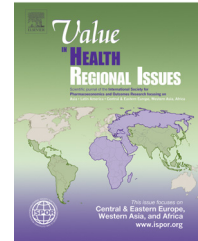




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Economic Burden of Cardiovascular Diseases in the Russian Federation

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ABSTRACT

Objectives: In the Russian Federation, cardiovascular disease (CVD) is the primary cause of death and premature death; however, to date, there have been no systematic cost-of-illness studies to assess the economic impact of CVD. **Methods:** The economic burden of CVD was estimated from statistic data on morbidity, mortality, and health care resource use. Health care costs were estimated on the basis of expenditure on primary, outpatient, emergency, and inpatient care, as well as medications. Non-health care costs included economic losses due to morbidity and premature death in the working age. **Results:** CVD was estimated to cost Russia RUR 836.1 billion (€24,517.8 million) in 2006 and RUR 1076 billion (€24,400.4 million) in 2009. Of the total costs of CVD, 14.5% in 2006 and 21.3% in 2009 were due to health care, with 85.5% and 78.7%, respectively, due to non-health care costs. **Conclusions:** CVD is a leading public health problem. We first

assessed the economic burden of CVD in Russia. Our results can be used for planning investments in prevention programs and measures for improving care for patients with CVD. Regular monitoring of the economic burden of CVD in the future at the federal, regional, and municipal levels will allow assessment of the dynamics of economic burden, as well as the effectiveness of investments in the economy in primary and secondary prevention. Because data are relatively unavailable, there are important limitations to this study, which highlight the need for more accurate CVD-specific information.

Keywords: cardiovascular disease, coronary heart disease, cerebrovascular diseases, cost-of-illness study, economic burden, Russia.

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Introduction

In the Russian Federation, cardiovascular disease (CVD) is the primary cause of death and premature death [1]. There has been, however, no systematic cost-of-illness study to assess its economic impact. The World Bank calculated health care expenditures in two regions of Russia and extrapolated these data to the entire country [2]. These regions, however, were not representative of the entire country because the calculations included only health care costs. Another attempt to calculate the economic burden of CVDs in Russia was made by the World Health Organization. It calculated the economic burden for 2005 and predicted a prognosis of burden for 2015 and 2030 of the most prevalent noncommunicable diseases from a macroeconomic perspective based on death rate [3].

The objectives of this study were to estimate the economic costs of CVD in Russia, including health care costs and productivity loss, and to estimate the proportion of total CVD cost attributable to coronary heart disease (CHD) and cerebrovascular diseases as was estimated in the study of Leal et al. [4] in the European Union (EU).

Methods

Methodological Background

Cost-of-illness analyses involved the identification, measurement, and valuing of resources related to CVD in Russia in the period 2006 to 2009. The calculation included health care costs and costs outside the health care sector (productivity losses associated with premature death or morbidity and disability pensions). All expenditures were measured for the period 2006 to 2009 in the prices of the appropriate year. Additional file 1 includes the sources of information used for calculations.

The national currency rubles was converted to euros (€) by using a weighted exchange rate for the period 2006 to 2009. Epidemiological and health care utilization data were acquired from the Ministry of Health of the Russian Federation and the market research company COMCON from the published literature. Analysis was based on the *International Statistical Classification of Diseases, 10th Revision (ICD-10)* categories: CVD (ICD-10 category I00–I99), hypertensive diseases (ICD-10 category I10–I15), CHD (ICD-10 category I20–I25), and cerebrovascular disease

Conflicts of interest: The authors have indicated that they have no conflicts of interest with regard to the content of this article.

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(ICD-10 category I60–I69). All sources of information used for the calculations are listed in the Additional information file.

Health Care Expenditure

The following categories of CVD health care services were included in the calculations: primary and outpatient care, accident and emergency (A&E) care, hospital inpatient care, cardiosurgery and percutaneous coronary interventions (PCIs), and medications. Cardiosurgery and PCI expenditures were calculated separately from hospital inpatient care because they are financed through different sources in Russia. Hospital inpatient care is paid by the health insurance system, while cardiosurgery and PCIs are paid by direct payment from the federal budget in the framework of the federal program on high technology and costly medical care or by the patient. Other types of activities related to the CVD were not included because of the difficulties in locating information. Data for A&E care and hospital inpatient care were received from the Ministry of Health of the Russian Federation; data on primary and outpatient care were obtained from several information sources; and data on medications were received from annual pharmacoepidemiology surveys through the COMCON company and other literature data.

Health Service Utilization

Primary and outpatient care

Primary care activities consisted of CVD-related visits to general practitioners (GPs), as well as GP visits to patients' homes. There is a specific statistical form for all medical organizations that includes data on the number of patients who visited this organization for outpatient care during the year according to the ICD-10 categories. This statistical form is centrally received in the Ministry of Health and processed as a single form for the entire country. We received a single form for the entire country for 2006 to 2009. The number of visits for each outpatient was calculated on the basis of these statistical forms and data from previous studies examining the mean number of visits of patients with CVD during the year.

Hospital inpatient care

Inpatient care was estimated on the basis of the number of CVD-related days in the hospital. There is also a specific statistical form for all inpatient medical organizations that includes data on the number of hospitalizations and number of hospital days in this organization during the year according to the ICD-10 categories. This statistical form is also centrally received in the Ministry of Health and processed as a single form for the entire country. We received the statistical single form for inpatient care in Russia for 2006 to 2009 and selected data on ICD-10 categories of interest.

A&E care

A&E care consisted of all CVD-related hospital emergency visits. A 2009 special statistical form for all inpatient medical organizations included information regarding the number of hospital emergency visits according to the ICD-10 categories. We selected data on ICD-10 categories in 2009 and extrapolated these values for 2006 to 2008.

Cardiosurgery and PCI

The main cardiosurgery institution in Russia, the Bakoulev Center for Cardiovascular Surgery, centrally collects information from all medical organizations involved in such interventions in Russia and annually publishes a statistical yearbook. We selected data regarding the number of PCI, coronary artery bypass grafting, and some other cardiosurgeries performed in Russia in 2006 to 2009.

Health care unit costs

Unit costs of an inpatient day, outpatient visit, and emergency visit were obtained from the Ministry of Health. The official Web site annually publishes information on the mean costs of inpatient days, outpatient visits, and emergency visits in different specialties and total expenditures in the framework of the program of the governmental guarantees of the medical care.

The costs of cardiosurgery and PCI paid directly by the federal budget are published annually on the Web site of the Ministry of Health in the description of the Federal Program on High Technology and Costly Medical Care.

Expenditure on medication

There are no national sources of information regarding national expenditures on medications in Russia. We used data from several pharmacoepidemiology surveys made in Russia in 2006 to 2009 and extrapolated these data for the entire country. The main source was the databases of annual surveys conducted by the COMCON company; other studies were used to identify patients with CVD regularly taking medication for long periods as well as some other data. Costs of medications were calculated on the basis of mean prices during the studding years, including value added tax (VAT).

Non-Health Service Costs

Non-health service costs included productivity losses associated with premature death and morbidity and disability pensions. Because little information was found on informal care costs and out-of-pocket expenses across the country, these costs were not included in the calculations.

Estimation of productivity costs due to premature death during working age

Productivity costs due to premature death during working age included the gross domestic product (GDP) per employed person related to CVD attributable to mortality.

The productivity loss from CVD-mortality was estimated by calculating the following:

1. number of CVD-related deaths during working age (retirement age is 60 years for men and 55 years for women);
2. number of remaining work years at the time of death (to estimate the likely GDP that an individual who died would have otherwise produced);
3. annual GDP per employed person; and
4. economic activity and unemployment rates.

Future GDP was not indexed in the main analysis, as the usual discount rate of 3% to 3.5% is not reasonable for Russia. The inflation rate was 9% in 2006, 11.9% in 2007, 13.3% in 2008, and 8.8% in 2009. The effects of indexation on productivity costs using rates of 10% and 15% were studied through sensitivity analysis.

Estimation of productivity costs due to cardiovascular morbidity
Morbidity costs were defined as those associated with CVD-attributable absence from work, estimated by multiplying the number of certified days off work due to CVD by GDP produced in one working day.

The number of CVD-related working days lost was obtained from a special statistical form for all medical organizations that included data on the number of disability days during the year according to the ICD-10 categories. This statistical form is also centrally received at the Ministry of Health and processed as a single form for the entire country. We received a single form for working days lost in Russia for 2006 to 2009 and selected data on ICD-10 categories related to CVD.

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