PUBLISHED BY
VOPROSY
EKONOMIKI
N. P.

Russian Journal of Economics 7 (2021) 326–353
DOI 10.32609/j.ruje.7.76219
Publication date: 30 December 2021

Russian
Journal of
Economics

www.rujec.org

Total expenditure elasticity of healthcare spending in Russia

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Abstract

In this study we estimate the income elasticity of spending on different healthcare services and medication in Russia, taking into account the non-linear relationship between income level and expenditure. We employ the RLMS-HSE data, 2006–2017, to estimate the elasticities at household level. Our findings show these elasticities have not changed over the years. Additionally, we show that low-income and high-income households demonstrate different levels of elasticities, which is consistent with the fact that healthcare is less affordable for the poor. The study confirms that healthcare and medication are close to luxury level for low-income households and drugs are almost income inelastic for rich households. The results could help to reveal which services are the least affordable for the population.

Keywords: income elasticity, RLMS HSE, health spending, household expenditure, health.
JEL classification: D31, I12, I14.

1. Introduction

It is apparent that falling ill is closely associated with the problem of healthcare-incurred expenses. The amount of money needed for treatment depends on many factors such as severity of the disease, the uniqueness of the remedies, and so on. At the same time, spending on health is constrained by an individual's wealth, and that is in line with theoretical models (Grossman, 1972a, 1972b, 2000; Hall and Jones, 2007) and empirical studies (Getzen, 2000; Parker and Wong, 1997; Rous and Hotchkiss, 2003; Zare et al., 2013). Taking these into account, it could be a nice national health policy practice to guarantee that people should be able to

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purchase all necessary health services regardless of their income constraints. One of the indicators of such policy success is the value of income elasticity of health spending. For example, it could indicate which items are luxury ones and which are affordable for some people.

In accordance with the above logic of reasoning, there are many studies on the income elasticity of health spending at varying levels of analysis for high-income countries (Getzen, 2000; Manning et al., 1987; Moscone and Tosetti, 2010; Newhouse and Phelps, 1976). However, the number of studies on developing and former Soviet Union countries is limited. Post-Soviet countries could prove an interesting case because they inherited extensive healthcare infrastructure and universal health coverage which guaranteed easy access to healthcare (Balabanova et al., 2012; Popovich et al., 2011; Rechel et al., 2014). However, because most post-Soviet countries did not invest sufficient amounts of money in their respective public health systems, their patients could be required to make substantial out-of-pocket payments (Rechel et al., 2014; Reshetnikov et al., 2019). For example, in Russia out-of-pocket spending is growing and is substantially higher than in Western Europe (Jakovljevic et al., 2017; Jakovljevic, 2015; Starodubov and Ulumbekova, 2015). To the best of our knowledge, there is a gap in studies discussing how personal spending on health services can change in response to changes in personal income in post-Soviet countries, particularly in Russia. To eliminate this gap, in this study, we estimate the income elasticities of spending on healthcare services and medication using Russian households' data.

The results of this study make several contributions to the literature about health spending. Firstly, our study contributes to the literature by a brief discussion of income elasticities' estimates in some countries with universal health insurance and a large network of public healthcare institutions. Secondly, we calculate the proportion that spending on specific care has in total household expenditure among persons who have taken this type of care in Russia. Usual estimates of health spending structure published by the official statistical bodies or surveys show that spending on medication has the highest proportion: see, for example, Rosstat (2021a). This is because these studies overlook the fact that persons rarely visit hospitals and seldom get outpatient care and most health spending is associated with minor disorders like the common cold, fever, or headache which are treated using medication. Thirdly, there is a lack of studies comparing income elasticities of different healthcare spending. The authors usually estimate the income elasticity of total health spending or specific expenditure which could cover specialist care or inpatient care (Parker and Wong, 1997; Getzen, 2000; Rous and Hotchkiss, 2003; Zare et al., 2013; Lépine, 2015). We estimate income elasticities of spending on healthcare and medication and take into consideration a non-linear relationship between income level and health spending; thus we consider basic kinds of spending on health and compare the results across different income groups and over time, addressing whether healthcare is a luxury or a necessary benefit in Russia.

This paper has the following structure. The second section describes prior research on this topic. The third section briefly discusses the public health system in Russia and the nature of the out-of-pocket spending. The fourth section explains the data and methods used in this study. The fifth section and the Appendices show the empirical

models' estimates. The sixth section outlines the discussion of the obtained results. The final section contains conclusions.

2. Literature review

The theoretical framework of studies justifying the relationship between income level and demand for healthcare relies on insights from the Grossman model (Grossman, 1972a, 1972b, 2000) and its subsequent developments. These models imply that individuals have incentives to increase investments in health because they want to maximize the utility level. On the basis of the original Grossman model, the model of Dardanoni and Wagstaff (1987) stresses that wealthier individuals tend to invest more in health than the poor. It implies a positive correlation between personal wealth and spending on health.

While subsequent empirical studies about the relationship between income and health spending rely on the Grossman model, they mostly stress the income elasticity phenomenon which is not explained by this model. There is a wide range of empirical papers about income elasticity of health expenditure at the cross-country level (Baltagi and Moscone, 2010; Di Matteo, 2003; Farag et al., 2012; Gerdtham et al., 1992; Newhouse, 1977; Newhouse and Phelps, 1976), the regional level (Di Matteo, 2003), and the individual level (Manning et al., 1987; Rous and Hotchkiss, 2003; Lépine, 2015), but the theoretical framework, that stresses the income elasticity issues, within the scope of health economics for such empirical models, has been limited for a long time. Hall and Jones (2007) solved this problem and developed a theoretical model explaining the effect of income per capita growth on health spending on the basis of the Grossman model and (Ehrlich and Chuma, 1990). They demonstrate that when people get richer, they become saturated in non-healthy consumption. These people begin to prefer to spend their income on purchasing additional years of life. This implies that when people get richer, they should spend more on health.

The theories imply a positive relationship between income and health spending and, moreover, that health spending must grow as people earn more. Empirical studies testing the association between personal wealth or income and health spending show mixed results. Getzen (2000) reviews studies on this topic covering the case of the United States (for micro-level and regional data) or high-income countries (for cross-country studies) and shows that health is either a luxury good at the national level and it is a necessity good at the regional level, but it is mostly income inelastic at the micro level. Getzen's (2000) study stresses that most of the variation in spending at the individual level is explained by differences in health status rather than income and the presence of health insurance makes health a good, the demand for which is income inelastic. At the same time, among less insured individuals, a positive association of healthcare services spending with income is observed: the corresponding elasticity can even exceed one for spending on dentistry, plastic surgery, counseling, eyeglasses, topicals, and other types of care. A similar result has been shown using RAND Health Insurance Experiment data when authors randomly assigned fee-for-service insurance plans with different cost sharing levels (Manning et al., 1987). The findings of the study show a tiny income elasticity and the authors conclude that income growth has a very small effect on health spending increase

(Manning et al., 1987). Note that the share of out-of-pocket expenditure in current health expenditure in the US is just 11% (2018) and it is 15% (2018) in Canada. This could indicate that the majority of health spending in these countries is covered by different insurance plans rather than household spending which justifies why the income could be unimportant in predicting demand for healthcare. In contrast to previous studies, Tsai (2018) examines the causal effect of income change on health spending among the elderly population in the US and finds that an income elasticity is above one. The author employs the case wherein the flawed formula for the indexation of the social security leads to an accidental increase of the income in one group of retired individuals, and it is kept unchanged for another group of people. This natural experiment concerning income increase among certain individuals was used to estimate the causal effect of income change on health spending.

When the microdata about health expenditures became available for lower- and middle-income countries, some studies estimated the income elasticity of health spending and showed that health can be a luxury or a necessary good at the individual level which contradicts the findings from similar studies for high-income countries (Getzen, 2000). In lower- and middle-income countries the public health system cannot cover most of the health spending and these countries demonstrate a high rate of out-of-pocket expenditure. In turn, household income often is an important determinant of the demand for healthcare in this group of economies. For example, the public health system in Brazil covers 75% of the population and individuals have a free access to public healthcare institutions at the time of delivery because the cost of treatment is covered by universal health coverage. At the same time, Brazil has a high share of out-of-pocket payments because they have spent a substantial part of their income on medication or related health services (Massuda et al., 2018) which was 28% in 2018. Da Silva et al. (2015), discussing the case of children in Brazil, shows that spending on medicines and healthcare has positive income elasticity. Next, Iran has a unified health coverage with different public health insurance plans covering both spending on medication and treatment. At the same time, nearly 55% of health expenditure in Iran is out-of-pocket expenditure. While Iranians have different public health insurance policies covering both treatment and the consumption of medicines (Nemati et al., 2020), nevertheless, patients make official and unofficial payments as a form of "gratitude" or for a better quality of service (Mirabedini et al., 2017). Zare et al. (2013) estimate positive income elasticity of health spending in Iran which could be close to one for certain groups in the population and varying types of care.

Studies covering lower and middle-income countries show that income elasticities can vary in line with income differentials; they could depend on an insurance plan, and results are mixed. For example, in Iran, health spending is less elastic at lower income levels and more elastic at higher income levels (Zare et al., 2013) which contradicts the findings for OECD countries (Di Matteo, 2003). Okunade et al. (2010) discuss the case of Thailand and examine the effect of long-term income on health expenditure. They note that households rely on their permanent rather than transitory income in making decisions about spending. The results show that in households with greater income the income elasticity of health spending is lower. Middle-income households demonstrate higher

income elasticities than those of low-income households or rich ones. Zhao and Zhong (2015) show that health spending at the upper end of income distribution is mostly driven by need factors, that is by health problems. At the same time, health expenditure at the lower end of income distribution is mostly driven by socio-economic status like income, education, and insurance plans.

In countries with a poor public healthcare system the estimated income elasticities could be high (Table 1). For example, Nepal had one of the poorest public health systems with a small network of hospitals and clinics. The out-of-pocket spending takes 55% (2018) of current health expenditure. The income elasticity estimate in this country is 1.1 (Rous and Hotchkiss, 2003). Note that the public health system in Nepal is underfunded and could not offer universal health insurance in that period, but individuals have access to primary and tertiary facilities (Rai et al., 2001; WHO, 2007). A similar situation is observed in Senegal where 56% of current health expenditure was out-of-pocket spending in the year 2018. Senegal has the income elasticity of health spending equal to 0.77 (Lépine, 2015).

However, in middle-income countries and transition economies where the proportion of out-of-pocket payments is also high and the public health system is underfunded, the income elasticities are low. In Russia, the income elasticity of spending on medication is no less than 0.2 or even zero (Burggraf et al., 2016; Sari and Langenbrunner, 2001; Street et al., 1999; Zasimova, 2016). To our knowledge, there is only one study trying to explain total health spending in Russia and it found ithat the income elasticity equals 0.15 (Abegunde and Stanciole, 2008). The case of the former socialist economies shows that the income elasticity of health spending can be small where there is a need to make small co-payments, but it increases with the increase of co-payments. This increase is large in Bulgaria and Hungary, and it is small in Poland and Lithuania (Danyliv et al., 2014). Table 1 indicates that income elasticity estimates can be higher among poor public health systems and these elasticities can be lower among public health systems with better funding.

The case of Mexico discussed in Parker and Wong (1997) is a good illustration of how the existence of different public schemes, that is differences in public health systems, can create different income elasticity coefficients. Mexico had half of the current health expenditure taken by out-of-pocket payments. The authors stress that nearly a third of households' health expenditure and spending is on non-prescription medicine and around a half is spent on primary care. Their estimated income elasticities for the uninsured persons are above one for the lower-income level households and close to one for the upper-income group. At the same time, the income elasticity is zero for the insured lower-income individuals, meaning that health insurance can protect the poor population from catastrophic health spending, making health expenditure inelastic on income. Note that high income households often can afford private health insurance plans which could keep their income elasticity of health spending rather high even when the household members are insured.

Our acquaintance with the literature allowed us to conclude that the previous authors usually investigated the variation of total health spending or certain types of spending, but rarely discussed and compared income elasticities of spending, and rarely discussed cases of post-Soviet public health systems.

Table 1
The income elasticity coefficients in middle- and low-income countries.

Study	Sample	Country	Years	Income elasticity: Dependent variable and the estimated elasticity coefficient
Da Silva et al., 2015	Children	Brazil	2004	Expenditure on medicines[a]: 0.1618 Medical care expenditure: 0.0702 Expenditure on laboratory tests and x-rays: −0.0164 Private health insurance expenditure (monthly premiums): 0.0187
Zhao and Zhong, 2015	Population	China	2009	Total health spending: from 0.317 at the first quantile to 0.262 at the third quartile
Dubey, 2021	Population	India	2014, 2017–2018	Total health expenditure: from 0.460 to 0.561 for urban population; from 0.213 to 0.325 for rural population
Zare et al., 2013	Population	Iran	1984–2008	Total health expenditure: from 0.436 to 0.930 GPs expenditure: from 0.095 to 0.247 Specialist expenditure: from 0.92 to 0.219 Inpatient expenditure: from 0.198 to 0.815
Sari and Langenbrunner, 2001	Population	Kazakhstan	1996	Spending on pharmaceuticals: 0.18
Parker and Wong, 1997	Population	Mexico	1989	Dependent variable is total health spending; the income elasticity coefficient is not statistically significant for the lower income insured population 1.20 for the upper income insured population 1.60 for the lower income uninsured population 0.96 for the upper income insured population
Rous and Hotchkiss, 2003	Population	Nepal	1995–1996	Total health spending: 1.10
Danyliv et al., 2014	Population	Poland Hungary Bulgaria Romania Lithuania Ukraine	2010	Willingness and ability to pay for a physician visit: Poland: from 0.8% [min fee][b] to 9.7% [max fee] Hungary: from 3.7% [min fee] to 60.6% [max fee] Bulgaria: from 6.1% [min fee] to 76.5% [max fee] Romania: from 3.7% [min fee] to 39.4% [max fee] Lithuania: from 2.1% [min fee] to 36.9% [max fee] Ukraine: from 5.2% [min fee] to 45.9% [max fee]

(continued on next page)

Table 1 *(continued)*

Study	Sample	Country	Years	Income elasticity: Dependent variable and the estimated elasticity coefficient
Abegunde and Stanciole, 2008	Population	Russia	1997–2004	Total healthcare expenditure: 0.15
Street et al., 1999	Population in Tula, Pskov, Penza, and pooled	Russia	1996	Spending on pharmaceuticals: no statistically significant effect
Zasimova and Kossova,	Population	Russia	2014	Spending on pharmaceuticals: no statistically significant effect
Burggraf et al., 2016	Population	Russia	1996–2008	Expenditure on prescribed medicines: 0.155-0.169 (fixed effect models)
Lépine, 2015	Rural population	Senegal	2009	Total health spending: 0.77
Okunade et al., 2010	Population	Thailand	1994, 1996, 1998, 2000	Total health spending: from –0.01 (first quintile) to 0.91 (fourth quintile)
Da Silva et al., 2015	Children	Brazil	2004	Expenditure on medicines[c]: 0.1618 Medical care expenditure: 0.0702 Expenditure on laboratory tests and x-rays: −0.0164 Private health insurance expenditure (monthly premiums): 0.0187
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Okunade et al., 2010	Population	Thailand	1994, 1996, 1998, 2000	Total health spending: from −0.01 (first quintile) to 0.91 (fourth quintile)

[a)] This is the name of the dependent variable and its corresponding estimated income elasticity coefficient.
[b)] See Danyliv et al. (2014) for fee description and other details.
[c)] This is name of the dependent variable and its corresponding estimated income elasticity coefficient.
Source: Compiled by the authors.

3. Institutional context

The Russian public health system has been underfunded for a long time (Reshetnikov et al., 2019). Russia has been spending on average 5% of its GDP on healthcare during the last several years (Macrotrends, 2021) and this ratio is lower than that of OECD countries: these states spend nearly 10% of their GDP on health. On the basis of Semashko model of healthcare, the current national public health system is funded from the state budget and mandatory health insurance. The latter is a primary source of the Russian public health system and it provides a free of charge treatment at the point of delivery following the Constitution of Russia which states that every citizen has a right to free healthcare.

The mandatory health insurance program covers spending on treatment within the agreed package of health services, but it does not reimburse spending on medication in case of outpatient care, although there are some exceptions. In addition, it can cover dentistry, but the quality of this service is low and patients often have to pay for better materials when they take a service at public clinics and because of this most people prefer paid dental services.

In addition, there is a supplementary voluntary health insurance (VHI) that can be purchased directly or it can be reached through an employer. Likewise, the mandatory health insurance, VHI could reimburse treatment or dentistry in private and public clinics, but the range of these clinics is higher and patients have a better choice of healthcare institutions. Moreover, the VHI can cover more services than that of the mandatory plan, and the quality of these services can be better. However, a minority of Russians have VHI and most VHI-holders live in Moscow and Saint-Petersburg. Note, nearly 5.4% of doctoral visits are VHI-related and approximately 4.5–8% of Russian population have VHI contracts (Aistov et al., 2021; Rosstat, 2021b).

Thus, the state guarantees a free treatment of most conditions excluding medications and dressing materials for outpatient treatment (with some exceptions) and the real coverage of spending on dentistry is small. However, since not all services and materials are covered by mandatory insurance and only a small minority in Russia has VHI contracts, access to healthcare can be low and it is very difficult to access necessary care for free. Hence Russians can spend a part of their income on healthcare. For example, about 38% of individual health expenditure in 2018 were out-of-pocket payments which have grown over the last 20 years from 30% in 2000 to 40% in 2016 (Popovich et al., 2011; WHO, 2021). Moreover, the proportion of out-of-pocket payments in Russia is higher than OECD countries (Avxentyev, 2017) with comparable GDP per capita and public health systems (Starodubov and Ulumbekova, 2015).

Shishkin et al. (2014) show that the proportion of patients who have paid for a visit to a doctor increased from 4% in 1994 to 14.7% in 2012 and the share of individuals who paid for physical examination increased from 8.8% in 1994, reached a peak of 27.4% in 2006 and then gradually declined by 2012. They demonstrate that 17% of patients paid for inpatient care in 2011 and 23.9% of patients paid for outpatient care in 2012. The household expenditure survey by Rosstat shows that 68% of household out-of-pocket spending covers medication and medical items; in addition, 29% of spending goes to cover outpatient care and only 5% for inpatient care. Note that this survey does not distinguish between

outpatient and dental care, hence, such a high percentage of spending on outpatient care can be because dental care is included.

Out-of-pocket payments for inpatient or outpatient care in Russia may have an official or unofficial form. The main form is payment through an official channel (to a cashier) to obtain a better quality of care or to get a service immediately when waiting time is high or to get something that is not offered for free in a state clinic, It can be also paid for treatment in a private institution. Unofficial payments are made to express gratitude or for the same purposes as the official payments. Shishkin et al. (2014) revealed that payments for inpatient and outpatient care have been declining over the last 20 years, but at the same time spending on medication and dental care has been increasing. While medication can be a necessary benefit, payments for outpatient or inpatient care to ensure better quality, or by way of expressing "gratitude," are voluntary and this type of service could be a luxury benefit. In addition, spending on dentistry could be voluntary because expenditure on it cannot be reimbursed by mandatory health insurance in most cases; another reason is the high prices charged for this service, thus, this form of care can be close to the luxury level.

4. Empirical model

In order to estimate the income elasiticties of different health spending in Russia, we started from an empirical model with two latent variables for a respondent i in period t. The first one, $\ln y^*_{it}$, is the desire and the ability to pay for a treatment and (or) medication and the second, h^*_{it}, describes the respondent's health. If he decides that he has no health problems and feels well, he does not go to a doctor for treatment and (or) does not spend money on medication. We use the following model for these latent variables,

$$\begin{aligned}
&\ln y^*_{it} = \alpha_{1t} \ln e_{it} + \delta_{1t} \ln^2 e_{it} + x'_{it}\beta_1 + \mu_{1t} + \varepsilon_{1it},\\
&h^*_{it} = \alpha_{2t} \ln e_{it} + \delta_{2t} \ln^2 e_{it} + x'_{it}\beta_2 + z'_{it}\beta_3 + \mu_{2t} + \varepsilon_{2it},\\
&y_{it} = \begin{cases} y^*_{it},\ h_{it} = 1 \ \text{ if } h^*_{it} > 0 \\ 0,\ h_{it} = 0 \ \text{ if } h^*_{it} \le 0, \end{cases} \\
&\begin{pmatrix} \varepsilon_{1it} \\ \varepsilon_{2it} \end{pmatrix} : iiN\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma^2 & \sigma_{12} \\ \sigma_{12} & 1 \end{pmatrix} \right),\\
&i = 1, 2, ..., n;\ \ t = 1, 2, ..., T,
\end{aligned} \tag{1}$$

where variable h_{it} equals 1 if the respondent reported that he had health problems or feels unwell, 0 if otherwise; his observed expenditures for treatment and (or) medicines is y_{it}; by e_{it} we denote the respondent's total expenditures, it serves as a proxy for income; x_{it} and z_{it} are column vectors of explanatory and control variables (the prime symbol denotes transpose); βs are column vectors of parameters; μ_{1t} and μ_{2t} are time fixed effects; α and δ are slope heterogeneities for the main variable of interest; εs are unobserved shocks that vary among respondents and by years.

Quadratic dependence of treatment and (or) medicines expenditure on the logarithm of total expenditure, $\ln e_{it}$, in model (1) provides linear approximation of the elasticity of interest as a function of the total expenditure. This elasticity can be estimated from the model as the marginal effect,

$$\left(\frac{\partial E(\ln y_{it} | h_{it} = 1)}{\partial \ln e_{jt}}\right), \tag{2}$$

where E denotes expected value.

5. Data and variables

We use the RLMS-HSE[1] data from 2006 to 2017 because some questions that we use in this study do not exist in the RLSM-HSE questionnaire outside this period.[2] The number of observations in our empirical models is limited to respondents aged 17 and above.

Appendix A Table A1 describes the meaning of variables used to estimate the parameters of model (1). In regressions, each variable with ordered values (see Table A1) was implemented in the form of a set of the corresponding binaries. Healthcare expenditures available in the RLMS-HSE data are listed in Table 2. We converted all monetary variables in roubles of 2003 using the RLMS-HSE constructed variable data sets for nominal and real expenses. Constructed variables were also used to create one of the main variables of interest, $\ln e_{it}$.

We use total household expenditure as a proxy for the total household income. This is in accordance with the recommendation of Deaton (1992) who notes that self-reported household income is volatile and can be unreliable in some countries. Because of this, he recommends using total household expenditure as a consistent estimate of income.

The descriptive statistics for the main variables of interest and for other (control) variables used in the empirical models are presented in Appendix B Table B1. This table shows the mean values and standard errors of means of all variables used in our empirical estimates. The mean values of VHI and other variables arranged below in Table B1 are almost the same among respondents with spending on different types of healthcare with a few exceptions in this pattern. Inpatient or outpatient care are preferable in households among the low proportion of respondents who prefer self-treatment. Spending on inpatient care and medication is more common among elderly respondents. Employed individuals use dental services, inpatient, and outpatient care with higher frequency than other individuals in the sample. Expenditure on outpatient care is rare in rural settlements. Some problem is apparently observed among respon-

[1] "The Russia longitudinal monitoring survey — HSE" (RLMS-HSE), conducted by HSE University and Demoscope, LLC together with Carolina Population Center, University of North Carolina at Chapel Hill and the Institute of Sociology, Russian Academy of Sciences (RLMS-HSE web sites: http://www.cpc.unc.edu/projects/rlms-hse, https://www.hse.ru/en/rlms/)

[2] The question about "supplementary voluntary medical insurance, with some form of service from an insurance firm, polyclinic, hospital, or medical center" was asked in 2000–2017. The question, about "consumption of alcoholic beverages, including beer, at least sometimes" has only featured in the RLMS-HSE survey since 2006. In regression models, we use control variables constructed from the aforementioned questions so our estimates were made for the years 2006 to 2017.

Table 2
Description of the dependent variables for the regressions and the descriptive statistics: spending on healthcare.

Spending	Description
Treatment and medication	All healthcare expenses that are listed below in this table
Types of care:	
Dental	Money spent on dental treatment, dentures, false teeth, not including medicine
Inpatient	Money spent on treatment or examination in inpatient hospitals, military hospitals, or clinics, not including medicine
Outpatient	Money spent on treatment or examination in polyclinics, not including medicine
Medication	Money spent on medicines, including vitamins and other drugs

Source: Compiled by the authors.

dents from the RLMS-HSE sample in receiving dental and inpatient services in Western Siberia.

Table B1 also shows that spending on treatment and medication per household member with health problems or illness, y_{it}, constitutes about 11% of total household expenditure per capita, e_{it}. If a household is faced with dental or inpatient care, this proportion rises to almost 17%. Outpatient services and medication are less expensive and the corresponding proportions are 6.7% and 6.1% respectively. On the basis of the aforementioned anomalies, we can expect that spending on medicines is less elastic on total expenditure than other healthcare spending. We check this statement below using the empirical estimates of (2).

As preliminary data acquaintance, Fig. 1 shows the share of spending on different healthcare services or medication (per household member with health problems or illness) in total household expenditure (per capita). When a person pays for inpatient care or dental treatment this spending could take on average nearly 15% of per capita expenditures. In addition, the share of spending on dental and hospital care in total household expenditure per capita does not differ significantly from one another and do not have decreasing or increasing dynamics over the years. At the same time, spending on medication or outpatient care consumes a small proportion of household expenditure. The shares of spending on polyclinics and medicines do not differ significantly from one another but the share on medication has positive dynamics (Fig. 1).

Fig. 2 shows dynamics of spending on healthcare items as a percentage of household expenditures in the lowest and the highest decile groups of households distinguished in accordance with their expenditure per capita. Spending on inpatient and outpatient care, and on dental services consumes nearly the same proportion in total household spending in the lowest and highest decile group. In addition, these proportions stay the same over time for both income decile groups. At the same time, there are differences in the proportion of spending on medication in total household expenditure between the lowest and highest decile groups. The percentage of spending on medication is below 5% in the high-income group and it is nearly 15% in the lowest income group. In addition, we observe a tendency for the proportion of spending on medication to grow over time among the lowest income group.

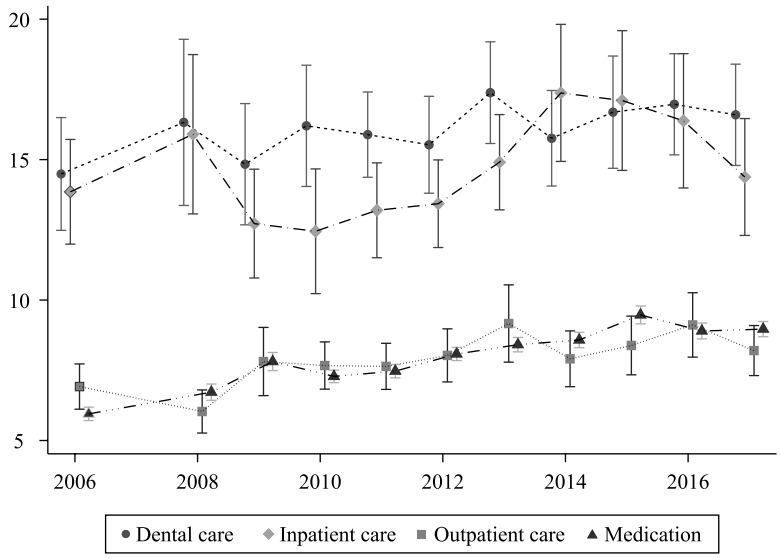

Fig. 1. Spending on different kinds of healthcare in Russia, 2006–2017 (%).

Note: Spending on healthcare per household member with health problems or illness as a percentage of household expenditure per capita in the last 30 days by years (with 95% confidence intervals).
Source: Authors' calculations.

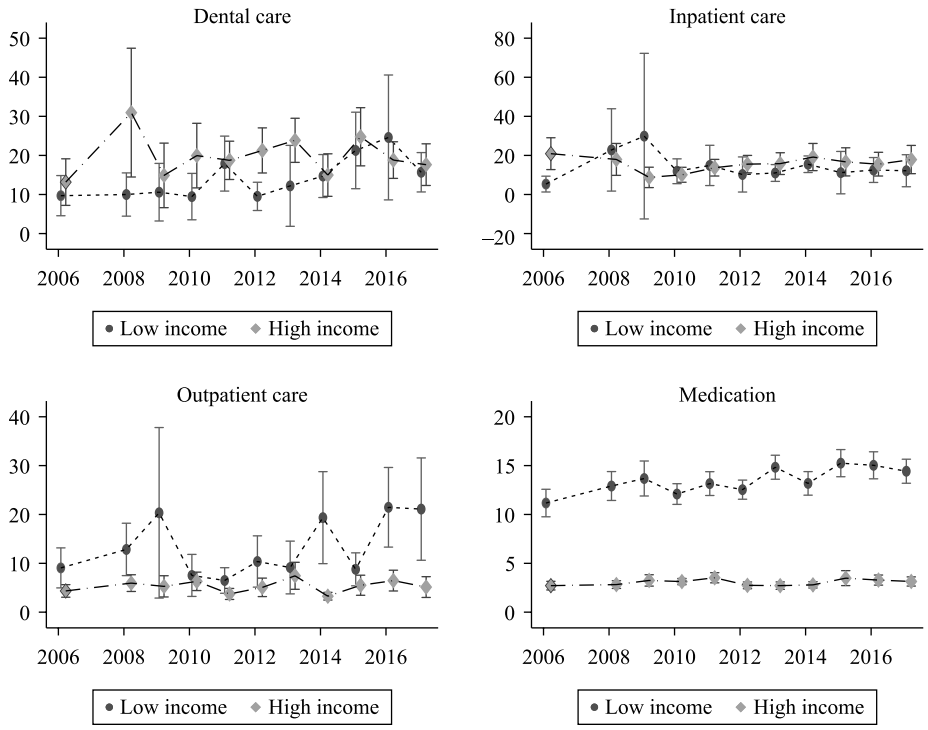

Fig. 2. Spending on different kinds of healthcare among low and high income households in Russia, 2006–2017 (%).

Note: Spending on healthcare items per household member with health problems or illness as a percentage of household expenditure per capita in the last 30 days by years in the lowest and highest decile groups of households, separated in accordance with their expenditure per capita (with 95% confidence intervals).
Source: Compiled by the authors.

6. Results and discussion

Parameters of the model (1) are estimated using the maximum likelihood method and the estimated models are in Appendix C Table C1. The behavioral patterns of the households could be similar within their communities because the households observe the same supply of healthcare services, medication, prices, and other characteristics within the neighborhood where they live. This is the reason in our study why we report cluster-robust standard errors clustered at the level of a settlement.

Table C1 gives us the possibility to estimate income elasticity of total health spending in 2006–2017 (Fig. 3). From Fig. 3 we see that health is a necessary good because all elasticity coefficients are between zero and one levels. Our estimates (see Fig. 3) do not identify an upwards or downwards shift in the income elasticity coefficients because their confidence intervals overlay one another.

Our model gives us a possibility to estimate income elasticity at different income levels. Fig. 4 shows the results of this estimation and demonstrates that the income elasticity of total health spending is close to 1 among the low-income group, and close to 0.4 among the high-income group. The differences between the estimated elasticities for 2006 and 2017, as well as among the average elasticity coefficients for the period 2006—2017, are not statistically significant because their 95% confidence intervals overlap one another.

Thus, these results find the positive income elasticity of health spending at the individual level in Russia to be consistent with findings from other studies concerning developing countries: Iran (Zare et al., 2013), China (Zhao and Zhong, 2015), Brazil (Da Silva et al., 2015), Thailand (Okunade et al., 2010), Senegal (Lépine, 2015), Nepal (Rous and Hotchkiss, 2003), and India (Dubey, 2021).

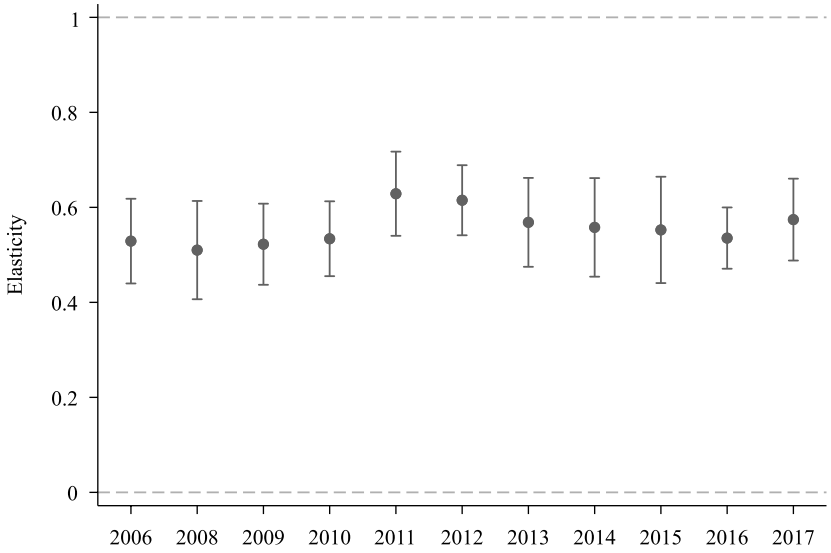

Fig. 3. Income elasticities of spending on treatment and medication in Russia, 2006–2017 (with 95% confidence intervals).

Source: Authors' calculations.

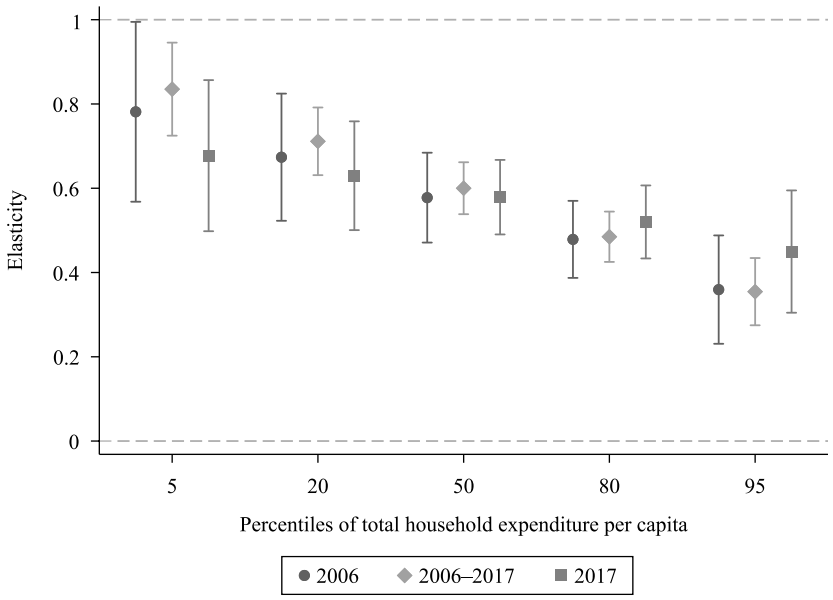

Fig. 4. Income elasticities of spending on treatment and medicines in Russia by income groups, mean values of (2) in 2006, 2006–2017, and 2017 (with 95% confidence intervals).

Source: Authors' calculations.

However, our estimations differ from the similar study about healthcare spending in Russia where the income elasticity of total expenditure on health is 0.15 (Abegunde and Stanciole, 2008). Such a difference exists because we rely on the U-shape relationship between health spending and household income while Abegunde and Stanciole (2008) imply the linear relationship. In addition, our results are different from the case of the US (Getzen, 2000) where the author in the review of other studies identifies that health spending is income inelastic at the individual level for most healthcare services. Such a difference among results could exist because of another public health system in the US and the fact that a large part of the US population secures loans to cover treatment cost. This, in particular, follows on from the report of the Consumer Financial Protection Bureau (CFPB, 2014) which says that "medical debts comprise 52% of the collections' trade lines that appear on consumer credit reports."

Our paper stresses that income elasticities of health spending are close to 1 or above this level among the low-income group of population and these elasticities are close to zero levels for high-income individuals. This implies that when the income of poor individuals decreases by 1%, they should reduce their demand for health services by almost 1%, or greater than 1%. This result is consistent with studies (Parker and Wong, 1997; Zare et al., 2013) indicating that the relationship between income and health spending varies with different income levels. It would appear that in Russia, as well as in some other (developing) countries, poor citizens have trouble affording high quality health services. The dangerous effect of this is that low-income individuals facing catastrophic spending on health could be forced to cut their consumption of other goods and services to pay for treatment.

There are many households in the RLMS-HSE sample which spend their income on medication, including vitamins and other medicines, but they do not depend on treatment or examination in inpatient or outpatient care institutions, or in dental care organizations. Taking advantage of this, we estimated the income elasticity of spending on medication over time and by income percentile. The model parameters' estimates are in Appendix C Table C2 and the corresponding elasticities are shown in Fig. 5 and 6. The mean value of these elasticities is about 0.3 (Fig. 5), meaning that medication is rather inelastic as a necessary good. There are no clear upward or downward shifts among the income elasticities of spending on medication in 2006–2017 (Fig. 5).

Fig. 6 shows the income elasticity of spending on medication in groups of respondents with different income. It shows that when the household expenditure per capita increases by 1%, spending on medication increases by nearly 0.6% among low-income group of population and it increases by about 0.2% and less among those in the high-income group. These estimates show no statistically significant difference in the income elasticity coefficients of spending on medication in 2006 and 2017 because their 95% confidence intervals overlay one another.

Both Fig. 4 and Fig. 6 show that the income elasticity of spending on medication is smaller than that of total health spending. At the same time, the variation of the income elasticity coefficients of spending on medication across income groups is bigger than that of expenditure on health in total (see Fig. 4). Moreover, based on Fig. 6 (taking into account confidence intervals), we can state that in 2017, medications were an absolutely income inelastic good for 95% total expenditure percentile.

Note, the main personal health spending item in Russia is medication because mandatory health insurance does not reimburse expenditure on medicines in most cases (Popovich et al., 2011; Rechel et al., 2014). Our find-

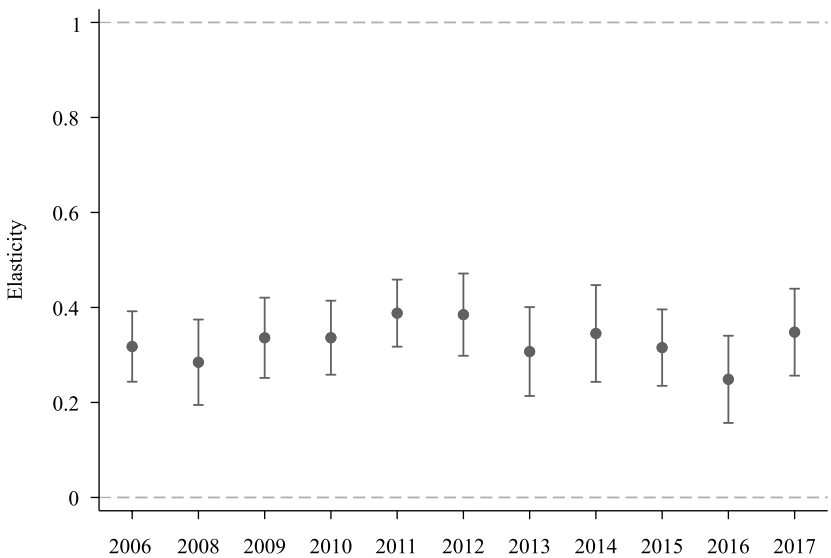

Fig. 5. Income elasticities of spending on medication in Russia, 2006–2017 (with 95% confidence intervals).

Source: Authors' calculations.

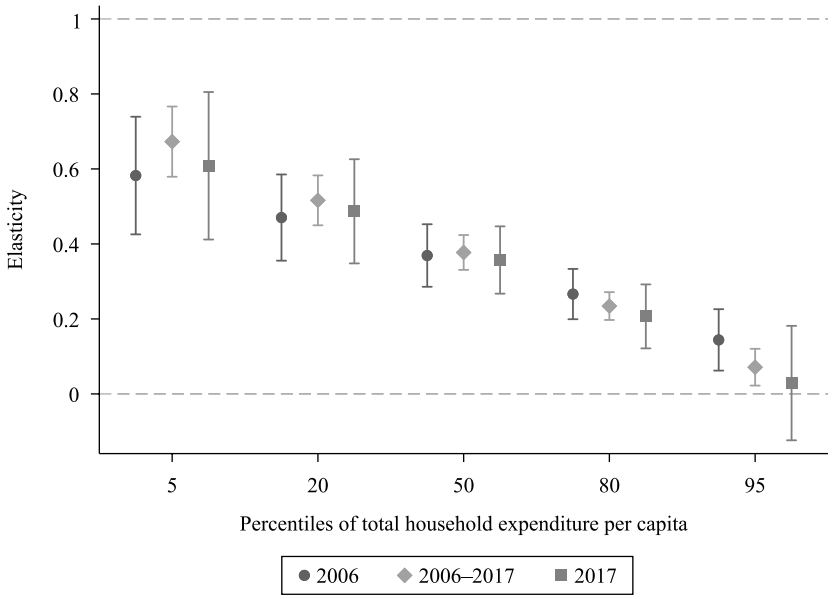

Fig. 6. Income elasticities of spending on medication in Russia by income groups in 2006, 2006–2017, and 2017 (with 95% confidence intervals).

Source: Authors' calculations.

ings (on the RLMS-HSE data) show that poor households could spend nearly 15% of their income on medication when a household member has health problems which is comparable to prior research in Russia (Street et al., 1999). At the same time, rich households spend less than 5% on it. This concurs with the estimated income elasticity of spending on medication which is close to 1 for the lowest income percentiles and close to 0 for rich households. Note that our income elasticity estimates differ from less detailed estimates (Street et al., 1999; Zasimova and Kossova, 2016) demonstrating that spending on medication is income inelastic in Russia. They rely on the question about personal spending on medication regardless of whether the person has any health problems or disorders. In addition, our results are slightly different from Burggraf et al. (2016) who found that demand for medication has small income elasticity. Our findings differ from the previous (mentioned above) studies because we allow elasticity to vary across households with different incomes assuming a U-shape relationship between household income and spending on medication rather than linear dependence in other studies. The use of a model specification that better suits the available data allowed us to refine the estimates of previous authors. Our findings also could be different because other authors employ the dataset for 1996–2008 while we use the latest years (2006–2017) and a larger set of control variables. They use both fixed effects two-step Heckman model (which produces 0.15–0.17 income elasticity) and the same model with random effects (0.24 income elasticity) and use participation equation to predict non-zero outcomes in medication spending variable while we predict the existence of health problems or feeling unwell in the last 30 days. They predict non-zero outcomes because their dependent variable has many zero outcomes, probably because prior to

2005 retired persons and some other groups had exemptions (*lgoti*) for purchasing medication. However, in 2005 these exemptions were cancelled and now we do not observe an excess number of zeros in our dependent variable. Thus, different models and periods with another institutional structure could show differences in income elasticity estimates.

7. Conclusions

We estimated income elasticities of spending on healthcare and medication at household level in Russia. Our findings show that while some health services and medication could be classified as luxury goods for the lowest-income group of population, these expenditures are almost absolutely inelastic on income for the rich part of the population.

One of the reasons for high elastic services may be that the mandatory health insurance does not include reimbursement of spending on medications that are complementary to some treatment and could be expensive for some groups.

Usually, income elasticities in health spending are high in countries with high out-of-pocket payments for the corresponding items. In Russia, the proportion of out-of-pocket payments in current health expenditure has risen from 30.2% in 2000 to 36.6% in 2019 (OECD, 2021); it is rather high compared with high-income countries and it is comparable with BRICS countries (Jakovljevic et al., 2020). We think that the income elasticity of health spending could be reduced if out-of-pocket payments became lower. For example, it could be reasonable to develop certain medicine insurance programs and subsidies, at least for low-income groups in order to promote public health.

Our study is based on self-reported expenditure. This allows us to take into account unofficial out-of-pocket payments for healthcare that may not be included in the official statistics. At the same time, there is no information about loans for treatment whenever unexpected large spending on healthcare is incurred. So future research on the financing of such out-of-pocket payments could be warranted.

Acknowledgements

This research was supported by a Russian Science Foundation grant, project №20-18-00307, “Health of Nation: A Multidimensional Analysis of Health, Health Inequality and Health-Related Quality of Life.”

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Appendix A

Table A1
Variable description

Variable	Comment
ln y_{it}	Log of (1 + household expenditure on healthcare services and/or medicines (depending on the model specification) per household member who has suffered from health problems or has been unwell in the last 30 days)
ln e_{it}	Log of (1 + household expenditure per capita in the last 30 days). 1 if respondent has voluntary health insurance, 0 otherwise
VHI	1 if respondent has voluntary health insurance, 0 otherwise
HH size	Number of respondents in the household
Number of children < 7 years in HH	Number of children under 7 years old in the household (0, 1, 2, 3, 4–6)

(continued on next page)

Table A1 *(continued)*

Variable	Comment
Self-treatment, proportion in HH	Number of self-treated respondents in household, divided by HH size
Doctor in HH, job	1 if there is a working doctor in the household, 0 otherwise
Doctor in HH, education	1 if there is a person with a medical degree in the household, 0 otherwise
Chronic disease	1 if the respondent has a chronic heart, liver, kidney, stomach, or spinal disease; 0 otherwise
Diabetes	1 if a physician has ever said that the respondent had diabetes or an increased sugar level in the blood, 0 otherwise
High blood pressure	1 if a physician has ever said that the respondent had high arterial blood pressure, 0 otherwise
Stroke	1 if a physician has ever said that the respondent had a stroke-blood hemorrhage in the brain, 0 otherwise
Heart attack	1 if the respondent has ever been diagnosed with myocardial infarction, 0 otherwise
Age	Age of the respondent (years)
Education	Levels: 1 — secondary school, 2 — vocational training school, 3 — technical college, 4 — university
Working	1 if the respondent has a job, 0 otherwise
Married	1 if the respondent is married, 0 otherwise
Male	1 if male, 0 if female
Rural	1 if the respondent lives in a rural settlement, 0 otherwise
Region	Regions: 1 — Moscow and Saint Petersburg; 2 — Northern and North-Western, excluding Saint Petersburg; 3 — Central and Central Black-Earth (Chernozem), excluding Moscow; 4 — Volga-Vyatski and Volga Basin; 5 — North Caucasian; 6 — Ural; 7 — Western Siberian; 8 — Eastern Siberian, Far Eastern. Data from the Crimea are not available in the RLMS-HSE.
Occupation	Not working and occupation coding (ISCO-08): 0 — Not working, 1 — Managers, 2 — Professionals, 3 — Technicians and associate professionals, 4 — Clerical support workers, 5 — Service and sales workers, 6 — Skilled agricultural, forestry and fish, 7 — Craft and related trades workers, 8 — Plant and machine operators, and assemblers, 9 — Elementary occupations
Physical exercise	1 — does not engage in physical activity (none), 2 — light physical exercise for relaxation fewer than three times a week (light exercise), 3 — medium and intensive physical exercise fewer than three times a week (moderate exercise), 4 — intensive physical exercise at least three times a week for 15 minutes or more (intensive exercise), 5 — daily exercise not less than 30 minutes a day (daily)
BMI	Body mass index (kg/m^2)
Smoker	1 if respondent smokes, 0 otherwise
Alcohol consumption	0 — not drinking (teetotal), 1 — once in the last 30 days, 2 — 2–3 times in the last 30 days, 3 — once a week, 4 — 2–3 times a week, 5 — 4–6 times a week, 6 — every day (daily)
Life satisfaction	1 — not at all satisfied, 2 — less than satisfied, 3 — both yes and no, 4 — rather satisfied, 5 — fully satisfied

Source: Compiled by the authors.

Appendix B

Table B1
Mean values and its standard errors (in parentheses). Samples are restricted to respondents with health problems or illness and non-missing values of all variables over the columns.

Variable	Treatment and medication		Dental care		Inpatient care		Outpatient care		Medication	
	Mean	St. error	Mean	St. error	Mean	St. error	Mean	St. error	Mean	St. error
y_{it}	623.510	(14.560)	1280.840	(66.250)	1370.480	(139.430)	492.410	(21.950)	347.520	(3.150)
e_{it}	5724.220	(58.830)	7559.490	(262.070)	8175.260	(259.770)	7301.950	(204.650)	5700.680	(59.790)
VHI	0.032	(0.001)	0.038	(0.003)	0.047	(0.005)	0.050	(0.004)	0.032	(0.001)
HH size	3.164	(0.010)	3.632	(0.032)	3.381	(0.037)	3.319	(0.032)	3.158	(0.010)
Number of children <7 years in HH	0.216	(0.003)	0.258	(0.010)	0.248	(0.012)	0.230	(0.011)	0.217	(0.003)
Self-treatment, proportion in HH	0.465	(0.002)	0.400	(0.006)	0.333	(0.007)	0.346	(0.006)	0.468	(0.002)
Doctor in HH, job	0.055	(0.001)	0.058	(0.004)	0.051	(0.005)	0.052	(0.005)	0.055	(0.001)
Doctor in HH, education	0.128	(0.002)	0.147	(0.006)	0.128	(0.008)	0.131	(0.007)	0.128	(0.002)
Chronic disease	0.662	(0.003)	0.618	(0.009)	0.673	(0.011)	0.687	(0.009)	0.663	(0.003)
Diabetes	0.127	(0.002)	0.116	(0.006)	0.153	(0.008)	0.137	(0.007)	0.128	(0.002)
High blood pressure	0.611	(0.003)	0.535	(0.009)	0.583	(0.011)	0.568	(0.010)	0.613	(0.003)
Stroke	0.056	(0.001)	0.043	(0.004)	0.054	(0.005)	0.053	(0.005)	0.056	(0.001)
Heart attack	0.056	(0.001)	0.038	(0.003)	0.059	(0.005)	0.066	(0.005)	0.056	(0.001)
Age	54.950	(0.110)	50.890	(0.330)	52.970	(0.420)	51.700	(0.380)	55.080	(0.120)
Education	2.649	(0.007)	2.831	(0.020)	2.767	(0.026)	2.816	(0.023)	2.647	(0.007)
Working	0.355	(0.003)	0.456	(0.009)	0.411	(0.011)	0.426	(0.010)	0.353	(0.003)
Married	0.591	(0.003)	0.621	(0.009)	0.648	(0.011)	0.635	(0.010)	0.591	(0.003)
Male	0.348	(0.003)	0.357	(0.009)	0.363	(0.011)	0.369	(0.010)	0.347	(0.003)
Rural	0.285	(0.003)	0.222	(0.008)	0.233	(0.010)	0.199	(0.008)	0.286	(0.003)
Moscow, St. Petersburg	0.125	(0.002)	0.141	(0.006)	0.132	(0.008)	0.118	(0.007)	0.126	(0.002)
Northern, North Western	0.059	(0.001)	0.054	(0.004)	0.061	(0.005)	0.066	(0.005)	0.058	(0.001)
Central, Central BlackEarth	0.178	(0.002)	0.143	(0.006)	0.158	(0.008)	0.153	(0.007)	0.178	(0.002)
Volga-Vaytski, Volga Basin	0.185	(0.002)	0.181	(0.007)	0.185	(0.009)	0.192	(0.008)	0.187	(0.002)
North Caucasian	0.133	(0.002)	0.176	(0.007)	0.165	(0.008)	0.122	(0.007)	0.132	(0.002)
Ural	0.132	(0.002)	0.161	(0.007)	0.128	(0.008)	0.138	(0.007)	0.132	(0.002)

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Table B1 *(continued)*

Variable	Treatment and medication		Dental care		Inpatient care		Outpatient care		Medication	
	Mean	St. error	Mean	St. error	Mean	St. error	Mean	St. error	Mean	St. error
Western Siberian	0.103	(0.002)	0.073	(0.005)	0.081	(0.006)	0.124	(0.007)	0.103	(0.002)
Eastern Siberian, Far Eastern	0.085	(0.002)	0.073	(0.005)	0.091	(0.007)	0.086	(0.006)	0.084	(0.002)
Managers	0.024	(0.001)	0.038	(0.003)	0.04	(0.004)	0.035	(0.004)	0.024	(0.001)
Professionals	0.072	(0.002)	0.099	(0.005)	0.101	(0.007)	0.105	(0.006)	0.071	(0.002)
Technicians and associate professionals	0.061	(0.001)	0.087	(0.005)	0.072	(0.006)	0.080	(0.005)	0.061	(0.001)
Clerical support workers	0.018	(0.001)	0.024	(0.003)	0.021	(0.003)	0.012	(0.002)	0.018	(0.001)
Service and sales workers	0.061	(0.001)	0.073	(0.005)	0.059	(0.005)	0.069	(0.005)	0.061	(0.001)
Skilled agricultural, forestry and fishery workers	0.001	(0.000)	0.002	(0.001)	0.002	(0.001)	0.001	(0.001)	0.001	(0.000)
Craft and related trades workers	0.045	(0.001)	0.056	(0.004)	0.047	(0.005)	0.049	(0.004)	0.045	(0.001)
Plant and machine operators, and assemblers	0.044	(0.001)	0.052	(0.004)	0.046	(0.005)	0.052	(0.004)	0.044	(0.001)
Elementary occupations	0.028	(0.001)	0.024	(0.003)	0.023	(0.003)	0.021	(0.003)	0.028	(0.001)
Physical exercise	1.536	(0.007)	1.681	(0.023)	1.592	(0.027)	1.663	(0.025)	1.535	(0.007)
BMI	27.450	(0.040)	27.000	(0.100)	27.270	(0.130)	27.130	(0.110)	27.470	(0.040)
Smoker	0.251	(0.003)	0.250	(0.008)	0.229	(0.010)	0.273	(0.009)	0.251	(0.003)
Alcohol consumption	1.244	(0.009)	1.448	(0.027)	1.276	(0.033)	1.340	(0.029)	1.241	(0.009)
Life satisfaction	2.991	(0.007)	3.122	(0.020)	2.993	(0.025)	3.032	(0.023)	2.990	(0.007)
Observations	27 255		3030		1949		2437		26 593	

Source: Authors' calculations.

Appendix C

Table C1
Model (1) parameters estimates.

Variable	Log of (1 + Treatment and medication per h. probl.)		Health problem or illness	
	Beta	St. error	Beta	St. error
Year = 2006	Ref.		Ref.	
Year = 2008	2.122	(2.766)	0.0753	(2.222)
Year = 2009	0.426	(2.465)	4.9520*	(2.904)
Year = 2010	−2.453	(2.746)	1.0710	(2.299)
Year = 2011	−1.951	(2.557)	1.5740	(2.092)
Year = 2012	−4.715	(3.091)	−0.0425	(2.035)
Year = 2013	−0.286	(3.615)	−4.3430**	(2.179)
Year = 2014	−0.378	(3.989)	0.6690	(2.360)
Year = 2015	1.250	(2.955)	3.5200*	(1.912)
Year = 2016	−1.556	(3.188)	0.0386	(2.551)
Year = 2017	2.140	(3.051)	−2.5050	(2.191)
Log of (1 + Expenditures per capita)	1.788***	(0.447)	0.7750**	(0.353)
Year = 2006 × Log of (1 + Expenditures per capita)	Ref.		Ref.	
Year = 2008 × Log of (1 + Expenditures per capita)	−0.4940	(0.660)	0.0438	(0.542)
Year = 2009 × Log of (1 + Expenditures per capita)	−0.0426	(0.590)	−1.1420	(0.702)
Year = 2010 × Log of (1 + Expenditures per capita)	0.6540	(0.653)	−0.2050	(0.558)
Year = 2011 × Log of (1 + Expenditures per capita)	0.4690	(0.604)	−0.3910	(0.499)
Year = 2012 × Log of (1 + Expenditures per capita)	1.1630	(0.739)	0.0076	(0.486)
Year = 2013 × Log of (1 + Expenditures per capita)	0.1380	(0.859)	0.9800*	(0.515)
Year = 2014 × Log of (1 + Expenditures per capita)	0.1770	(0.936)	−0.1650	(0.562)
Year = 2015 × Log of (1 + Expenditures per capita)	−0.2010	(0.693)	−0.8290*	(0.454)
Year = 2016 × Log of (1 + Expenditures per capita)	0.4980	(0.761)	−0.0351	(0.608)
Year = 2017 × Log of (1 + Expenditures per capita)	−0.4410	(0.715)	0.5630	(0.523)
[Log of (1 + Expenditures per capita)]^2	−0.0759***	(0.0261)	−0.0351	(0.0219)
Year = 2006 × [Log of (1 + Expenditures per capita)]^2	Ref.		Ref.	
Year = 2008 × [Log of (1 + Expenditures per capita)]^2	0.0286	(0.0390)	−0.00719	(0.0331)
Year = 2009 × [Log of (1 + Expenditures per capita)]^2	0.00217	(0.0351)	0.06370	(0.0424)
Year = 2010 × [Log of (1 + Expenditures per capita)]^2	−0.0391	(0.0387)	0.00846	(0.0340)
Year = 2011 × [Log of (1 + Expenditures per capita)]^2	−0.0223	(0.0354)	0.02250	(0.0300)
Year = 2012 × [Log of (1 + Expenditures per capita)]^2	−0.0649	(0.0439)	−0.00195	(0.0291)
Year = 2013 × [Log of (1 + Expenditures per capita)]^2	−0.00591	(0.0505)	−0.05780*	(0.0305)
Year = 2014 × [Log of (1 + Expenditures per capita)]^2	−0.00895	(0.0543)	0.00757	(0.0334)
Year = 2015 × [Log of (1 + Expenditures per capita)]^2	0.0135	(0.0407)	0.04490*	(0.0272)
Year = 2016 × [Log of (1 + Expenditures per capita)]^2	−0.0296	(0.0451)	0.00178	(0.0362)
Year = 2017 × [Log of (1 + Expenditures per capita)]^2	0.0293	(0.0413)	−0.03220	(0.0311)
VHI	0.0045	(0.0448)	0.06950*	(0.0360)
HH size	−0.1410***	(0.0286)	−0.16600***	(0.0282)
(HH size)^2	0.0116***	(0.00292)	0.01160***	(0.00309)
Number of children < 7 years in HH: 0	Ref.		Ref.	
Number of children < 7 years in HH: 1	−0.0787***	(0.0269)	0.1290***	(0.0225)
Number of children < 7 years in HH: 2	−0.1260**	(0.0633)	0.1230**	(0.0501)
Number of children < 7 years in HH: 3	−0.2340*	(0.1320)	0.1990**	(0.0996)
Number of children < 7 years in HH: 4–6	−0.2630	(0.1880)	−0.1990	(0.2190)
Self-treatment, prop. in HH	−1.0860***	(0.0930)	−0.5900***	(0.1110)
(Self-treatment, prop. in HH)^2	0.2890***	(0.0940)	3.3590***	(0.1400)
Doctor in HH, job	0.0467	(0.0478)	−0.0639*	(0.0353)
Doctor in HH, education	0.0475	(0.0320)	−0.0571**	(0.0258)
Chronic disease	0.1890***	(0.0194)	0.5770***	(0.0212)
Diabetes	0.1520***	(0.0249)	0.4000***	(0.0372)
High blood pressure	0.0865***	(0.0215)	0.4340***	(0.0209)
Stroke	0.2540***	(0.0361)	0.3340***	(0.0679)
Heart attack	0.1170***	(0.0301)	0.1530***	(0.0462)

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Table C1 *(continued)*

Variable	Log of (1 + Treatment and medication per h. probl.)		Health problem or illness	
	Beta	St. error	Beta	St. error
Age	−0.00812***	(0.00298)	−0.0142***	(0.00347)
Age^2/100	0. 0154***	(0.00295)	0.0260***	(0.00335)
Secondary school	Ref.		Ref.	
Vocational training school	0.0184	(0.0263)	−0.0391	(0.0317)
Technical college	0.0575**	(0.0278)	−0.0145	(0.0252)
University	0.1780***	(0.0293)	−0.0633*	(0.0325)
Working	−0.0872***	(0.0168)	−0.4150***	(0.131)
Married	0.0493***	(0.0180)	0.0358**	(0.0177)
Male	−0.0691***	(0.0162)	−0.4430***	(0.0256)
Rural	−0.0760*	(0.0458)	−0.0671**	(0.0311)
Moscow, St. Petersburg	Ref.		Ref.	
Northern, North Western	−0.1460	(0.1530)	0.00077	(0.105)
Central, Central Black-Earth	−0.0855	(0.0677)	−0.0790**	(0.0371)
Volga-Vaytski, Volga Basin	−0.1110	(0.0759)	−0.0592**	(0.0286)
North Caucasian	0.0210	(0.0792)	−0.0497	(0.0444)
Ural	−0.2570***	(0.0650)	−0.0205	(0.0416)
Western Siberian	−0.2540***	(0.0593)	0.0132	(0.0461)
Eastern Siberian, Far Eastern	−0.1900	(0.140)	−0.0886***	(0.0245)
Not working			Ref.	
Managers			0.251*	(0.136)
Professionals			0.289**	(0.138)
Technicians and associate professionals			0.229*	(0.130)
Clerical support workers			0.184	(0.134)
Service and sales workers			0.189	(0.132)
Skilled agricultural, forestry and fishery workers			0.554**	(0.222)
Craft and related trades workers			0.253*	(0.132)
Plant and machine operators, and assemblers			0.207	(0.132)
Elementary occupations			0.264*	(0.135)
Physical exercise: none			Ref.	
Physical exercise: light exercise			0.1070***	(0.0297)
Physical exercise: moderate exercise			0.0955***	(0.0297)
Physical exercise: intensive exercise			0.1250**	(0.0573)
Physical exercise: daily			0.0666**	(0.0331)
BMI			−0.0198	(0.0144)
BMI^2/100			0. 0372	(0.0256)
Smoker			−0.00174	(0.0152)
Alcohol consumption: not drinking			Ref.	
Alcohol consumption: once last month			0.0295	(0.0280)
Alcohol consumption: 2–3 times last month			−0.0076	(0.0252)
Alcohol consumption: weekly			−0.0844***	(0.0260)
Alcohol consumption: 2–3 times a week			−0.0460	(0.0332)
Alcohol consumption: 4–6 times a week			−0.0569	(0.0669)
Alcohol consumption: daily			−0.1490***	(0.0555)
Life satisfaction: not at all satisfied			Ref.	
Life satisfaction: less than satisfied			−0.0546**	(0.0276)
Life satisfaction: both yes and no			−0.1090***	(0.0275)
Life satisfaction: rather satisfied			−0.2620***	(0.0286)
Life satisfaction: fully satisfied			−0.2570***	(0.0384)
Constant	−4.0030**	(1.918)	−3.3870**	(1.4470)
Observations	46 340			
Clusters	161			
χ^2	17 042.8***			
P	0.261***			

Note: "Log of (1 + Treatment and medicines per household member with health problems or illness)" is dependent variable in main equation. "Health problem or unwell" is dependent variable in choice equation. Clustered standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
Source: Authors' calculations.

Table C2
Model (1) parameters estimates on a sample of those households that spent only on medicines.

Variable	Log of (1 + Medication per health problem)		Health problem or illness	
	Beta	St. error	Beta	St. error
Year = 2006	Ref.		Ref.	
Year = 2008	3.274	(2.178)	1.014	(2.403)
Year = 2009	−1.720	(2.371)	5.870*	(3.116)
Year = 2010	−1.301	(2.591)	2.192	(2.604)
Year = 2011	−1.187	(2.791)	2.878	(2.228)
Year = 2012	−4.780**	(2.198)	1.202	(2.528)
Year = 2013	−1.278	(2.539)	−3.986*	(2.344)
Year = 2014	−5.396	(3.636)	2.103	(2.388)
Year = 2015	1.424	(1.888)	4.796**	(2.059)
Year = 2016	−3.032	(3.375)	1.928	(2.726)
Year = 2017	−2.287	(2.604)	−1.374	(2.647)
Log of (1 + Expenditures per capita)	1.649***	(0.309)	0.874**	(0.427)
Year = 2006 × Log of (1 + Expenditures per capita)	Ref.		Ref.	
Year = 2008 × Log of (1 + Expenditures per capita)	−0.745	(0.509)	−0.206	(0.590)
Year = 2009 × Log of (1 + Expenditures per capita)	0.472	(0.559)	−1.383*	(0.757)
Year = 2010 × Log of (1 + Expenditures per capita)	0.392	(0.624)	−0.491	(0.632)
Year = 2011 × Log of (1 + Expenditures per capita)	0.326	(0.664)	−0.704	(0.542)
Year = 2012 × Log of (1 + Expenditures per capita)	1.233**	(0.509)	−0.291	(0.622)
Year = 2013 × Log of (1 + Expenditures per capita)	0.457	(0.584)	0.904	(0.563)
Year = 2014 × Log of (1 + Expenditures per capita)	1.424*	(0.860)	−0.504	(0.570)
Year = 2015 × Log of (1 + Expenditures per capita)	−0.200	(0.430)	−1.128**	(0.501)
Year = 2016 × Log of (1 + Expenditures per capita)	0.952	(0.820)	−0.477	(0.655)
Year = 2017 × Log of (1 + Expenditures per capita)	0.674	(0.609)	0.280	(0.637)
[Log of (1 + Expenditures per capita)]^2	−0.0807***	(0.0178)	−0.0485*	(0.0266)
Year = 2006 × [Log of (1 + Expenditures per capita)]^2	Ref.		Ref.	
Year = 2008 × [Log of (1 + Expenditures per capita)]^2	0.0432	(0.0295)	0.0106	(0.0361)
Year = 2009 × [Log of (1 + Expenditures per capita)]^2	−0.0275	(0.0328)	0.0800*	(0.0459)
Year = 2010 × [Log of (1 + Expenditures per capita)]^2	−0.0226	(0.0375)	0.0275	(0.0384)
Year = 2011 × [Log of (1 + Expenditures per capita)]^2	−0.0155	(0.0394)	0.0414	(0.0330)
Year = 2012 × [Log of (1 + Expenditures per capita)]^2	−0.0707**	(0.0295)	0.0164	(0.0382)
Year = 2013 × [Log of (1 + Expenditures per capita)]^2	−0.0283	(0.0335)	−0.0531	(0.0340)
Year = 2014 × [Log of (1 + Expenditures per capita)]^2	−0.0847*	(0.0506)	0.0282	(0.0341)
Year = 2015 × [Log of (1 + Expenditures per capita)]^2	0.0120	(0.0244)	0.0630**	(0.0308)
Year = 2016 × [Log of (1 + Expenditures per capita)]^2	−0.0619	(0.0498)	0.0279	(0.0394)
Year = 2017 × [Log of (1 + Expenditures per capita)]^2	−0.0390	(0.0354)	−0.0141	(0.0382)
VHI	0.0380	(0.0563)	0.0855***	(0.0281)
HH size	−0.1910***	(0.0243)	−0.1910***	(0.0261)
(HH size)^2	0.0136***	(0.0026)	0.0127***	(0.0026)
Number of children < 7 years in HH: 0	Ref.		Ref.	
Number of children < 7 years in HH: 1	0.0028	(0.0263)	0.1690***	(0.0272)
Number of children < 7 years in HH: 2	−0.0254	(0.0596)	0.1890***	(0.0505)
Number of children < 7 years in HH: 3	0.1160	(0.1340)	0.3880***	(0.1020)
Number of children < 7 years in HH: 4–6	−0.3180	(0.2470)	−0.2460	(0.2430)
Self-treatment, prop. in HH	−0.9140***	(0.1180)	−0.5280***	(0.1160)
(Self-treatment, prop. in HH)^2	0.3410***	(0.1090)	3.4630***	(0.1380)
Doctor in HH, job	0.0738	(0.0463)	−0.0562	(0.0367)
Doctor in HH, education	0.0810***	(0.0308)	−0.0703***	(0.0268)
Chronic disease	0.1950***	(0.0194)	0.5620***	(0.0229)
Diabetes	0.1530***	(0.0247)	0.3940***	(0.0385)
High blood pressure	0.1280***	(0.0213)	0.4420***	(0.0212)
Stroke	0.3010***	(0.0429)	0.3480***	(0.0747)
Heart attack	0.1270***	(0.0337)	0.1490***	(0.0528)
Age	−0.0078**	(0.0030)	−0.0134***	(0.00396)
Age^2/100	0.0162***	(0.0030)	0.0260***	(0.00383)

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Table C2 *(continued)*

Variable	Log of (1 + Medication per health problem)		Health problem or illness	
	Beta	St. error	Beta	St. error
Secondary school	Ref.		Ref.	
Vocational training school	0.0143	(0.0273)	−0.0402	(0.0342)
Technical college	0.0496**	(0.0251)	−0.0216	(0.0272)
University	0.1060***	(0.0277)	−0.1080***	(0.0345)
Working	−0.0721***	(0.0190)	−0.4880***	(0.1800)
Married	0.0198	(0.0186)	0.0137	(0.0193)
Male	−0.0793***	(0.0149)	−0.4510***	(0.0259)
Rural	−0.00465	(0.0415)	−0.0251	(0.0333)
Moscow, St. Petersburg	Ref.		Ref.	
Northern, Northwestern	−0.1450	(0.0981)	0.00412	(0.1260)
Central, Central Black-Earth	−0.0494	(0.0738)	−0.0953**	(0.0476)
Volga-Vaytski, Volga Basin	−0.1490**	(0.0639)	−0.1110***	(0.0360)
North Caucasian	−0.0415	(0.0829)	−0.1340**	(0.0560)
Ural	−0.2640***	(0.0779)	−0.0613	(0.0531)
Western Siberian	−0.2240***	(0.0564)	−0.0334	(0.0515)
Eastern Siberian, Far Eastern	−0.1890	(0.1160)	−0.1040***	(0.0355)
Not working			Ref.	
Managers			0.2870	(0.1830)
Professionals			0.3320*	(0.1880)
Technicians and associate professionals			0.2890	(0.1780)
Clerical support workers			0.2530	(0.1870)
Service and sales workers			0.2490	(0.1810)
Skilled agricultural, forestry and fishery workers			0.6380**	(0.2790)
Craft and related trades workers			0.3300*	(0.1810)
Plant and machine operators, and assemblers			0.2660	(0.1820)
Elementary occupations			0.3310*	(0.1860)
Physical exercise: none			Ref.	
Physical exercise: light exercise			0.0932***	(0.0336)
Physical exercise: moderate exercise			0.0892**	(0.0384)
Physical exercise: intensive exercise			0.100	(0.0639)
Physical exercise: daily			0.0567	(0.0349)
BMI			−0.0190	(0.0154)
$BMI^2/100$			0.0393	(0.0274)
Smoker			0.0210	(0.0177)
Alcohol consumption: Not drinking			Ref.	
Alcohol consumption: once last month			0.0203	(0.0287)
Alcohol consumption: 2-3 times last month			−0.0184	(0.0257)
Alcohol consumption: weekly			−0.1050***	(0.0279)
Alcohol consumption: 2-3 times a week			−0.0666*	(0.0353)
Alcohol consumption: 4-6 times a week			−0.1010	(0.0725)
Alcohol consumption: daily			−0.1410**	(0.0623)
Life satisfaction: not at all satisfied			Ref.	
Life satisfaction: less than satisfied			−0.0638**	(0.0291)
Life satisfaction: both yes and no			−0.1100***	(0.0311)
Life satisfaction: rather satisfied			−0.2470***	(0.0327)
Life satisfaction: fully satisfied			−0.2820***	(0.0455)
Constant	−2.9280**	(1.331)	−3.4990**	(1.7000)
Observations	39 846			
Clusters	161			
χ^2	11 270.7***			
P	0.289***			

Note: "Log of (1 + Medicines per household member with health problems or illness)" is dependent variable in main equation. "Health problem or illness" is dependent variable in choice equation. Clustered standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
Source: Authors' calculations.