RURAL RESIDENCE AND HOUSEHOLD HEALTH EXPENDITURE IN UKRAINE

by

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Abstract

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This work examines if there is a link between residency (urban/rural) and household out-of-pocket expenditure in Ukraine. It investigates main predictors of high health spending and discusses how they differ in rural and urban households. Based on LiTS III data for Ukraine we ran simple linear regressions for a full sample as well as rural and urban subsamples. It is shown that keeping all other characteristics of household constant Ukraine families from rural settlements on average spend on healthcare 49% more than urban. Households with "bad" health status spend twice more on health comparing to households with "good" health. Health expenditures significantly increase with a size of a family only in the rural subsample. 10% increase in income of urban families is associated with a 4% increase in health spending while a similar effect for rural families is insignificant. An education level of a household head is associated with higher healthcare expenditures, but only for rural families.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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LIST OF ABBREVIATIONS

EBRD – European Bank for Reconstruction and Development

LiTS III – Life in Transition Survey III, household survey in transition countries in 2016 conducted by European Bank for Reconstruction and Development

PSU – primary sampling unit

UAH – Ukrainian hryvnia, the national currency of Ukraine

WB – World Bank

WHO – World Health Organization

Chapter 1

INTRODUCTION

Good mental and physical health of the population is an important determinant of economic growth, human development and poverty reduction in any country. WHO commission suggests that "each 10% improvement in life expectancy is associated with an increase in economic growth of about 0.3% to 0.4% per year, other growth factors being equal".

Nowadays population aging, increase in suffering from obesity and cardiovascular diseases, widening of the sophisticated treatment usage induce the healthcare costs rise. It may result in a substantial increase in household expenditures when facing health shocks. Such burden for households can lead to further impoverishment or even catastrophic health expenses.

The household share of direct healthcare expenditures called out-of-pocket payments (OOP) is a significant part of household spending in poor and developing countries. In particular, in Ukraine about a half of expenses on healthcare are financed privately. Moreover, 94% of these payments are paid out of pocket.

To a large extent such a high level of OOP is due to the poorly functioning system of public health care financing and management. After 25 years of health care degradation, Ukraine has finally started a health care reform. Among other goals, the reform is aimed at reducing the burden of health financing for the population by supporting particular groups of people that can be identified by socio-economic, demographic characteristics. For the success of the reform, it is very important to develop deeper knowledge of household healthcare

expenditures when designing and improving healthcare financing policy for any country, especially for the one with limited resources.

In my master thesis I check to what extent the place of residency (rural/urban location) has a substantial effect on household healthcare OOP expenditures in Ukraine and pinpoint individual household characteristics (such as education, age of the household head, as well as the size and structure of a family), which best describes household health spending. On the one hand, Ukrainian rural residents tend to have lower income, which limits their abilities to spend on health from their own pocket. On the other hand, they may have a worse access to the public health care infrastructure, which may force them to pay their own money for services that urban residence get for free in public facilities. Hence, in case there is a link between place of living and household health spending it can have both positive or negative sign.

In this study it was found that:

- families from rural settlements spend on average by 49% more than urban ones
- households with "bad" health status spend twice more on health comparing to households with "good" health
- size of the family matters in predicting household healthcare expenditure only for rural households while family income matters only for urban
- using of public medical system by a member of family is linked to increase in health spending. The effect is larger for urban households
- education level of household head is positively associated with health spending, but only for rural families

I hope that the findings of this study will be useful to design a national healthcare financing policy.

In Chapter 2 we go through the literature on family healthcare expenditures to choose the set of determinants of household health spending for this research. In Chapter 3 we describe methodology for this paper. In Chapter 4 we explain how we prepared the data and provide descriptive statistics. In Chapter 5 we show empirical results, selection bias tests, robustness tests and discuss them. In Chapter 6 there is a conclusion of this study.

Chapter 2

LITERATURE REVIEW

There is a considerable body of literature on the determinants of household health spending. They substantially vary for developed and developing countries (Xu et al., 2011). While many of which do not focus on rural/urban difference, they are informative in terms of the list of other factors and some aspects of estimation to be taken into account.

2.1. Supportive studies

The household's structure is reported to be of importance in many studies. For example, You and Kobayashi (2011) using an individual level survey show that people in China usually spend more on healthcare with age, in case of living in a household with a head having higher education, higher income and some chronic disease. However, the most important finding from our point of view is that those who resided in rural settlements has higher health expenditure.

Foster (2005) lists income, age and health insurance as the key factors that impact health spending. This study reveals that healthcare spending and its components do not follow the "hump" shape lifecycle that is present for the annual income and total expenditures. Kumara and Samaratunge (2016) based on the evidence from household surveys in Sri Lanka claim that households with more than one elderly member, children under 5, educated head of the family, members with chronic diseases are more likely to experience higher costs on health services. They also show that households with higher income are less sensitive to the health spending burden. Looking from the supply side, the availability of closer hospitals, bed numbers and dentists decrease OOP expenditures. On the other

hand, the higher number of doctors in public health sector leads to the government-doctor-induced cost. In particular, Fan et al. (2000) uses a consumer survey for the USA and finds that out-of-pocket expenditures are associated with financial constraints, family size and composition. This study points to the importance of controlling for both demand and supply side factors. Such household characteristics as a literate household head and a spouse, at least one obstetric delivery in the last three years, unsafe water, unhygienic toilet and household's belonging to some particular province were significant factors predicting OOP expenditures in Pakistan (Malik and Syed, 2012). The study based on Pakistan Household Integrated Economic Survey showed that such predictors as male head, house made with bricks, children, no elderly and head, who has a white-collar job, were negatively associated with out-of-pocket expenditures. But the highest significant factor was nonfood expenditures.

There are some studies focusing more on gender differences, which also include residence indicators as a control. Using the individual level of OOP health payments in Bangladesh Mahumud et al. (2017) suggests that age, female gender, marital status, household's wealth, as well as rural residence should reduce household health expenditures. Nevertheless, unemployment and the absence of financial support from the government were negatively associated with OOP expenses. The authors claim that differences in mortality and reproductive biology make a noticeable difference in healthcare usage among males and females. The other important fact is that males are more likely to be employed. They more often have working insurance that covers possible expenses on health shocks.

A more specific study by Hotchkiss et al. (1997) found that rural population in Nepal spent on healthcare more than urban controlling for income. During the Rainy period of the year health shocks of rural inhabitants worsen. Authors also try to explain an unexpected outcome in the way that people in rural areas don't

rely on public health facilities. They use private health sector, because public services have poor quality in the rural place. Rural people are much more sensitive to diseases and are likely to become more disabling due to delaying the medical help from modern practitioners because of inaccessibility.

Rous and Hotchkiss (2002), who use the Nepal Living Standards Survey, also examine predictors of OOP payments. In this paper, the authors emphasize the problem of endogeneity of health status and the choice of a provider. Using a multiple-equation model, authors found that some common unobserved factors associated with healthcare expenditures, illness and the choice of a provider were statistically significant. It could be the reason for the bias in different similar studies if not controlled. Authors claim that income directly influences health expenditures and indirectly - likelihood of illness, choosing the provider. It is also noticed that urban people spend less, but they usually exploit more expensive health services. This contradiction was explained by the fact that rural sample often underreport their diseases and sometimes use any type of healthcare provider.

2.2. Main study

Finally, Molla et al. (2017) in their research based on Bangladesh household income and expenditure survey 2010 showed that such factors as household income, presence of chronic disease, number of family members, health shocks and prevalence of male members were significant in predicting household expenditures in Bangladesh and had a positive sign, i.e. increase expenditures. Chronic diseases and health shocks turned out to be the most valuable factors. The most interesting in their finding is that rural households spend less on OOP healthcare payments than respondents in urban areas controlling for all factors

listed above. Authors explain it by the fact that expensive modern medical services and practitioners are usually available mostly in urban areas.

Chapter 3

METHODOLOGY

In the empirical analysis we follow Molla et al. (2017). Our aim was choosing a simple analytical method that fits the data by minimizing the sum of squared errors. The goal was to estimate the difference of health expenditures between rural and urban families controlling on other household characteristics. It was also point of interest to see how main determinants of health spending differ depending on the place of living. So, we decided to use linear regression as an analytical method for the research. In fact, we also tried to use models with interactions of the rural indicator with the following variables: current health condition dummies, the size of a family, and getting treatment in public medical system, being rural and age of household head. All of them turned out to be insignificant which is likely to be driven by insufficient sample size.

3.1. Model description

Following the Molla et al. (2017) theory it is assumed that health expenditures are decided at the level of household. Thus, the main explanatory variables in this kind of analysis are household income and household composition. In particular, we control for the family size and presence of household members (young children, elderlies, etc.) that on average are more likely to require medical attention. The second block of independent variables includes key household head characteristics, i.e. age, education and gender because he/she is assumed to be the main decision maker. We also control for health heterogeneity by including self-assessed health status and indicator for recent medical needs. Our main variable of interest is a rural dummy.

The dependent variable (healthcare expenditure) and income are measured in UAH and log-transformed also as well as in the model by Molla et al. (2017) "to satisfy the OLS assumptions, and to reduce the influence of outliers."

We would like to mention with some modifications to Molla at el. (2017). We use the current health self-assessment instead of chronic illness indicators. In addition, we control for the presence of health shocks and regional variation.

Finally, the specification is the following:

$$\begin{aligned}\ln exp_i = \beta_0 + \beta_1 \cdot \ln household\ income_i + \beta_2 \cdot family\ size_i + \beta_3 \\ \cdot health\ assessment_i + \beta_4 \cdot rural\ residence_i + \beta_5 \\ \cdot age\ of\ head_i + \beta_6 \cdot gender\ of\ head_i + \beta_7 \\ \cdot education\ of\ head_i + \beta_8 \\ \cdot receiving\ treatment\ in\ health\ system\ by\ a\ member_i \\ + \beta_9 \cdot number\ of\ aged\ under\ 5_i + \beta_{10} \\ \cdot number\ of\ aged\ above\ 60_i + \beta_{11} \cdot female\ proportion_i \\ + dummies\ for\ regions + \varepsilon_i\end{aligned}$$

In the equation above: β_0 – intercept; i – household; ε_i – error term.

The estimations are performed using STATA 13.0. A p-value of 0.05 was taken as the statistically significance level.

3.2. Variables

Our dependent variable is *out-of-pocket health spending*: the share of household payments that goes directly to the provider. We consider that monthly OOP health payments equal to monthly household healthcare expenditures. This assumption is fair in this case as World Bank reported that 94% of private spending is OOP in Ukraine.

Size of the family is defined as a number of members of the family who has been living in the household for the past 6 month. Similarly, members aged under 5, members aged above 60 are measured as a number of people. Age of household head is counted in years. Following the existing literature we control for a "female proportion", calculated as a share of female members in the family.

The following variables were introduced in the regression specification as dummies: "medium health", "bad health", rural residence, gender of the household head, education of the household head, receiving medical treatment in public health system by any member over the last year. Self-assessment of current health as "good" and the lowest level of education (primary or secondary level) of household head were adopted as base. There are also dummies for each of macro regions: West, North, East, South and Center. Observations from Kyiv were taken as a base group.

The variable *treated* is equal to one (zero otherwise) if over the past 12 months any member of a household received medical treatment in the public health system.

Observing the level of education of household head we constructed four educational categories. The first category includes only respondents with secondary education or less; the second group – respondents who completed post-secondary non-tertiary education; the third – respondents who completed tertiary education, but not received a university diploma; the forth – Bachelor's

degree or more. Detailed information on education of head of household and his parents is presented in Section 4.3.

To assess interregional differences in health expenditures we grouped regions into 5 economic zones following an approach by the State Statistics Service of Ukraine (2013). These zones are Kyiv (as a base), West (Volyn, Zakarpattia, Rivne, Lviv, Ivano-Frankivks, Ternopil, Chmelnytsk, Chernivtsi), North (Zhytomyr, Kyiv region without Kyiv city, Sumy, Chernihiv), South (Mykolaiv, Kherson, Odessa), East (Dnipropetrovsk, Zaporizhia, Kharkiv), and Center (Vinnytsia, Kirovograd, Poltava, Cherkassy).

Chapter 4

DATA

4.1. Data description

This study is based on the Life in Transition Survey III, organized and conducted in 2016 by the European Bank for Reconstruction and Development (EBRD) in collaboration with the World Bank (WB). The survey has information on 51 000 household in 34 countries (mainly "transition countries"). The raw data set contains 1507 observations for Ukrainian households. The data was collected at 75 Primary Sampling Units (PSU) – settlements from 21 Ukrainian regions (there are no data for Luhansk, Donetsk, Chernivtsi regions and Autonomous Republic of Crimea). 31 out of 75 PSU were rural and the rest 44 – urban. Each PSU has on average 20 observations.

4.2. Sample construction

Data set before cleaning included 1507 observations. Only 2 variables from those we are interested in had more than 10 missing values. One of explanatory variable - *Income* had 512 missing values and 49 zeroes. The dependent variable - *Health expenditure* had 199 missing values and 74 zeroes. So, the problem of missing data is serious.

First, we focus on our dependent variable. To determine the extent to which omitting missing observations may bias our estimates, we exploit Heckman selection model. The model estimation is discussed later in the section 5.3. Based on the results we decided to drop 199 observations with missing health expenditure.

Next, we tried to deal with a problem of missing incomes by using total expenditures of family (it was calculated as a sum of all household expenditures) as a proxy. Unfortunately, total expenditures in our dataset have even more missing values. So, eventually we decided to use income variable in this research. After some analysis, discussed in section 5.2 below, observations with missing and zero income are also dropped. It reduces our dataset by extra 443 observations (118 out of 561 of missing or zero incomes were already dropped when we excluded observations with missing health expenditures).

Finally, households with top 1% annual income were excluded as outliers (6 obs.). So, the dataset after cleaning includes 859 observations.

4.3. Descriptive statistics

The final sample includes 859 observations. The annual healthcare expenditures of household is a dependent variable. It is measured in UAH. The independent variables are annual income, self-assessment of current health, family size, place of living (rural/urban residency), age, gender and education of household head, receiving a treatment in medical facilities by any family member, number of family members aged under 5, the number of family members aged 60 and above, and regional dummies.

Variables and their descriptive statistics are shown in the Table 1 below. The mean of yearly household health expenditures is 1 819 UAH while median was 1 000 UAH. The average annual household income is 49 085 UAH and median is equal to 48 000 UAH. 43% of households have rural place of living and 56% of families have at least one member, who received medical treatment in a public facility over the last year. The average family consists of 2.35 persons, with 59% of females members. There are 74 out of 859 households, which have children

aged under 5 and 364 households, which have members aged 60 or above. As for heads of households: most of them are males with the mean age of 53 years. Among those 30% completed secondary education or even less, 62% have completed some post-secondary education and only 8% have Bachelor's degree or more.

Table 1. Descriptive statistics

Variable	Mean	SD	Min	Max
Log of yearly total household healthcare expenditures	6.58	1.82	0	10.92
Log of yearly total household income	10.63	0.63	7.78	11.88
Self health assessment	2.86	0.70	2	4
Dummy on rural residence	0.43	0.50	0	1
Family size	2.26	1.06	1	6
If any member received medical treatment in health system during last year	0.56	0.50	0	1
Number of aged under 5 in family	0.09	0.31	0	3
Number of 60 and above aged members in the family	0.58	0.74	0	3
Proportion of females	0.59	0.27	0	1
Dummy on gender of household head	0.53	0.50	0	1
Age of household head	52.86	15.71	18	90

Concerning the relationship between the residence and health expenditures we observe that urban households on average spend less on health (Table 2). Specifically, without taking in account other factors, rural families on average spend on healthcare 2383 UAH annually, while urban households spend on average 1386 UAH.

Table 2. Comparative statistics of rural and urban subsamples

Variable	Mean for rural subsample	Mean for urban subsample
Yearly total household healthcare expenditures, UAH	2383.3	1386.7
Yearly total household income, UAH	45387.8	51922.4
Family size	2.3	2.2
If any member received medical treatment in health system during last year	51%	59%
Number of aged under 5 in family	0.1	0.1
Number of 60 and above aged members in the family	0.6	0.5
Proportion of females in the family	60%	59%
Dummy for male household head	52%	54%
Age of household head	53.6	52.3

To some extent this difference in health spending may be explained by other factors. Consistent with the literature, heads of households living in urban areas are more optimistic when assessing their current health conditions. 33% of them assess their health as "good" and "very good", 50% as "medium", 17% as "bad" or "very bad" (Figure 1). Rural respondents answered in the following way: 32% - "good" and "very good", 47% - "medium", 21% - "bad" and "very bad" (Figure 2).

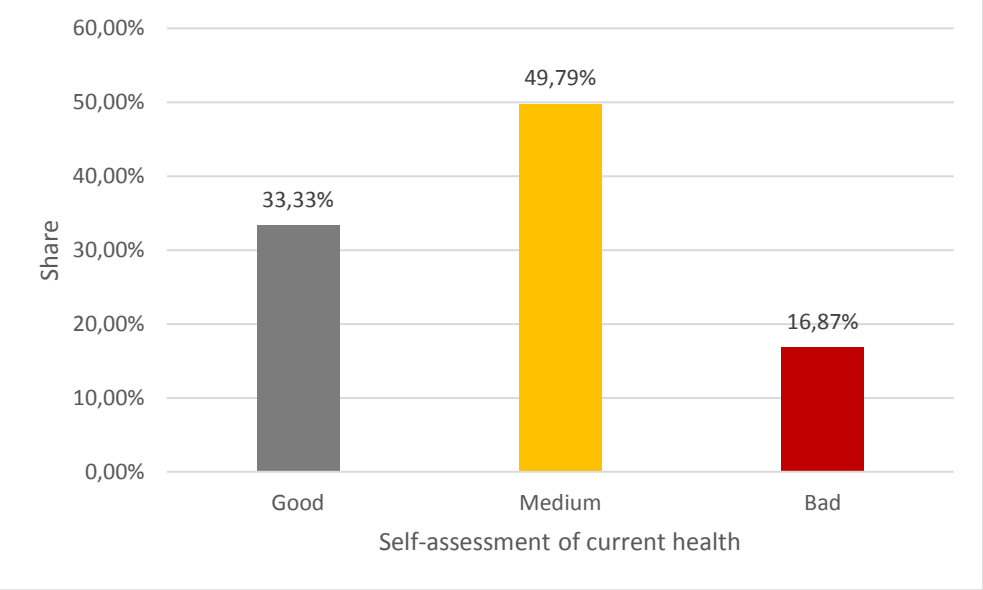

Figure 1. Self-assessment of health by family head (urban subsample)

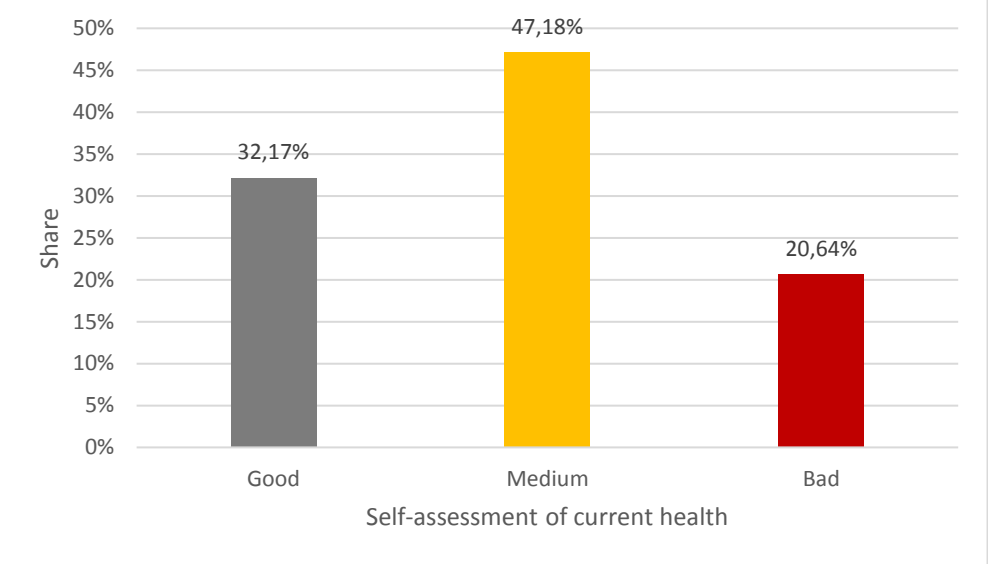

Figure 2. Self-assessment of health by family head (rural subsample)

Overall, urban heads of families have also higher levels of education (Figure 3, Figure 4). 23% of urban family heads have primary or secondary education as the highest level of education they completed, 38% - post-secondary non-tertiary education, 29% - tertiary, 10% - have Bachelor's degrees or more. Among rural

heads 40% completed only primary or secondary education, 39% - post-secondary non-tertiary education, 17% - tertiary, 6% - have Bachelor's degrees or more. Less educated people may have difficulties approaching a doctor at the early stage and thus, are forced to pay more.

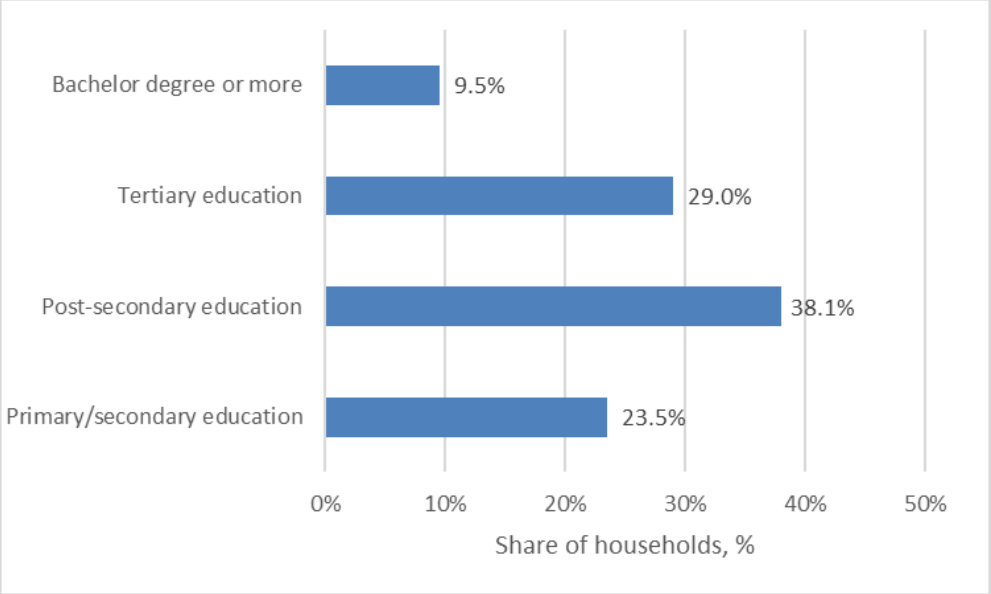

Figure 3. Education level of household head (urban subsample)

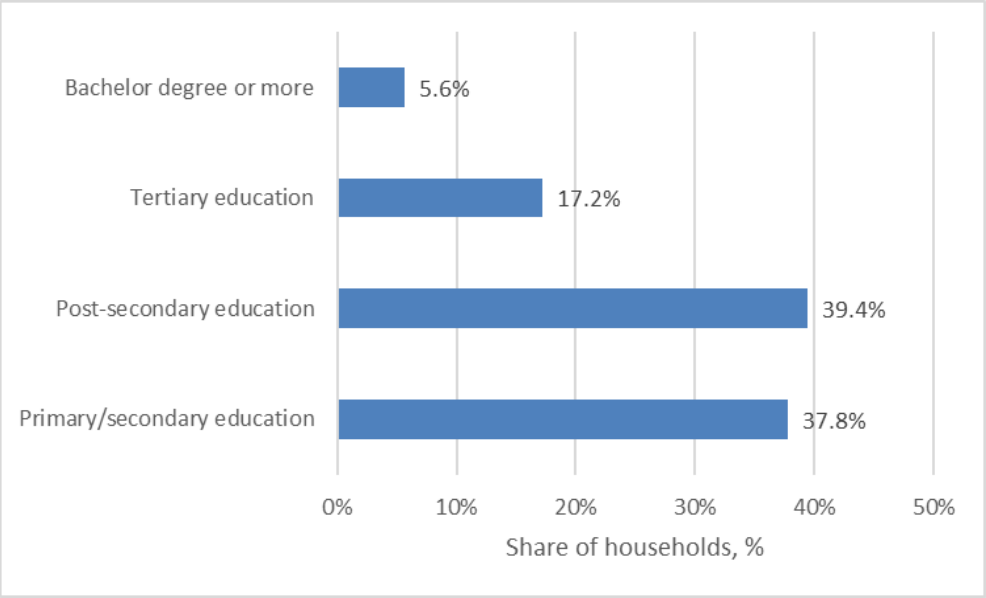

Figure 4. Education level of household head (rural subsample)

Chapter 5

RESULTS

5.1. Empirical results

We estimated the regression for the Full sample (859 observations) with a dummy for rural residence and two separate regressions with the same determinants for rural (373 observations) and urban (486 observations) subsamples. The results are presented in the Table 3.

The output from multiple regression for the full sample indicates that households from rural settlements on average spend on healthcare 49% more than urban families, and it is highly statistically significant at $p<0.01$.

Health is perceived as a necessity. Holding all other variables constant in the model on average 10% increase in income leads to 3% increase in household healthcare expenditure (p-value = 0.051.). From the results of regressions on subsamples, we can conclude that income is a strong determinant of health spending only for urban households ($p<0.05$), but not for rural ($p>0.1$). 10% increase in income for urban families gives approximately 4% increase of urban household health expenditures.

Table 3. Estimation results

	Full sample		Urban subsample		Rural subsample	
	β	se	β	se	β	se
Log(income)	0.287*	0.147	0.438**	0.21	0.15	0.204
Medium health	0.578***	0.145	0.531***	0.185	0.650***	0.243
Bad health	0.954***	0.203	0.769**	0.3	1.183***	0.287
Rural residence	0.488***	0.132				
Size of family	0.177**	0.075	0.058	0.104	0.315***	0.11
Receiving treatment in health system	0.719***	0.125	0.858***	0.182	0.540***	0.189
Members aged under 5	0.052	0.195	0.263	0.328	-0.124	0.246
Members aged above 60	0.121	0.101	0.174	0.153	0.064	0.135
Proportion of females	0.446	0.289	0.363	0.367	0.436	0.447
Male head	-0.048	0.136	-0.106	0.195	-0.055	0.192
Age of a head	0.007	0.006	0.002	0.008	0.017*	0.009
Post-secondary educ.	0.279*	0.154	0.384	0.252	0.289	0.199
Incomplete tert. educ.	0.366**	0.178	0.363	0.257	0.452*	0.272
Tertiary educ.	0.486**	0.227	0.413	0.298	0.866**	0.429
Sample size	859		486		373	
Adjusted R^2	0.14		0.114		0.146	

Notes: additional controls for this regression are dummies for regions; base level of health status of family is "good" health; base level of household head education is secondary educ.; * if p-value < 0.1, ** if p-value < 0.05, *** p < 0.01.

Both urban and rural families spend more if their current health conditions are not "good". Urban families that assess their current health as "medium" and "bad" spend 53% and 77% more on health than households in "good" health conditions. For the rural families this effect is even larger: households with "medium" and "bad" health spend 65% and 118% more than families with optimistic assessment.

The size of the family matters in predicting household healthcare expenditure only for rural households (it is highly statistically significant at $p<0.01$). Each additional member for the rural family increases health spending by 32% holding all other variables in the model constant. The same coefficient is insignificant for urban households, most likely due to a little variation in family size among urban residents.

Receiving a medical treatment by at least one member of family during the last year significantly increases household health expenditure by 86% for urban families and 54% for rural. A larger effect for households with urban place of living may be due to higher costs of modern sophisticated methods of treatments and diagnostics that are much more available to urban citizens.

The level of education of household head is another important predictor of health spending, but only for rural families. Households with the head, who received some tertiary education, have 45% higher health expenditures than those with completed only primary or secondary school (at $p<0.1$). Rural families with heads holding a Bachelor's degree or above have approximately 87% higher health spending (at significance level $p<0.05$). This result may reflect a much larger exposure to the information about health and treatment in urban location.

5.2. Selection bias test due to missing income

Given that a substantial share of respondents in the original sample did not report their income it is possible that the results may be biased if non-reporting has some pattern. To address this potential problem we created a dummy "mis_income" that equals to 1 if income is missing or equals to zero. Otherwise (income>0), this dummy equals to zero. Then, missing values for income and zero incomes were replaced by a positive value 1. We should use the value 1 (not zero) because we use income in log form in our regression. This dummy is introduced in the main model. It is found to be insignificant: (p-value = 0.26, see Table 4). Hence, the distribution of the subsample of observations with missing or zero incomes (561 observations) does not significantly differ from distribution of the rest of observations. It means that our decision to drop observations with missing and zero incomes does not create a large selection bias.

Table 4. Selection bias test due to missing income

	Full sample		Urban subsample		Rural subsample	
	β	se	β	se	β	se
log(income)	0.136	0.125	0.282	0.179	0.06	0.179
Medium health	0.449***	0.124	0.370**	0.152	0.549**	0.213
Bad health	0.951***	0.175	0.850***	0.25	1.145***	0.261
Rural residence	0.177	0.116				
Size of family	0.330***	0.061	0.218**	0.087	0.446***	0.08
Receiving treatment in health system	0.683***	0.109	0.880***	0.142	0.431**	0.173
Members aged under 5	0.072	0.17	0.3	0.232	-0.128	0.251
Members aged above 60	0.116	0.092	0.188	0.126	0.0386	0.142
Proportion of females	0.428*	0.253	0.499	0.331	0.228	0.393
Male head	-0.144	0.12	-0.096	0.16	-0.278	0.182
Age of a head	0.010**	0.005	0.001	0.006	0.020**	0.008
Post-secondary educ.	0.179	0.133	0.195	0.205	0.296*	0.175
Incomplete tert. educ.	0.312**	0.152	0.362*	0.204	0.382	0.238
Tertiary educ.	0.36	0.223	0.364	0.258	0.363	0.467
Missing income	1.531	1.359	3.352*	1.953	0.369	1.921
Sample size	1298		733		565	
Adjusted R^2	0.138		0.129		0.16	

Notes: additional controls for this regression are dummies for regions; base level of health status of family is "good" health; base level of household head education is secondary educ.; * if p-value < 0.1, ** if p-value < 0.05, *** p < 0.01.

5.3. Heckman test due to missing health expenditure

The raw data set included 199 observations with missing dependent variable (household healthcare expenditure). To check if these observations may cause a significant bias we exploit Heckman selection model. The identification is based on three additional variables that were included to the selection equation: "trust to people" - variable that measure (scale from 1 to 5) general trust to other people and variables that measures trust to authorities - "trust to President", "trust to government". The latter two were found insignificant in selection equation even at $p<0.1$. The former proposed selection variable "trust to people" was observed to be statistically significant at $p<0.05$. In general, results of the Heckman selection model let us conclude that the selection bias is minor.

5.4. Robustness test for household income

We decided to exercise robustness checks to verify structural validity of core regressors.

The first test was performed for the variable "income". We re-estimated the main model by replacing variable "income" with variables "trip" and "food". Variable "trip" is a dummy and equals to 1 when primary respondent claimed that, in general, household could afford (if wishes) "each year, one-week holiday out of home, including stay in second home/country house or at friends/relatives". Variable "food" is also a dummy. It equals to 1 if respondents answered they could afford (if wishes) "consumption of meat, chicken, or fish (or vegetarian equivalent) each second day". The results of this test presented in the Table 5.

Table 5. Estimation results. Robustness test for income

	Full sample		Urban subsample		Rural subsample	
	β	se	β	se	β	se
Trip	0.344**	0.158	0.306	0.196	0.413	0.263
Food	-0.066	0.172	-0.014	0.238	-0.117	0.262
Medium health	0.563***	0.144	0.500***	0.185	0.660***	0.243
Bad health	0.960***	0.202	0.750**	0.298	1.213***	0.291
Rural residence	0.422***	0.129				
Size of family	0.248***	0.066	0.179**	0.085	0.340***	0.103
Receiving treatment in health system	0.708***	0.125	0.860***	0.184	0.550***	0.194
Members aged under 5	0.037	0.196	0.144	0.304	-0.062	0.259
Members aged above 60	0.122	0.102	0.157	0.155	0.086	0.137
Proportion of females	0.369	0.283	0.237	0.366	0.392	0.43
Male head	-0.033	0.136	-0.068	0.189	-0.068	0.197
Age of a head	0.008	0.006	0.002	0.008	0.018*	0.009
Post-secondary educ.	0.263*	0.158	0.32	0.253	0.268	0.2
Incomplete tert. educ.	0.382**	0.179	0.35	0.261	0.454*	0.271
Tertiary educ.	0.515**	0.226	0.418	0.303	0.867**	0.43
Sample size	859		486		373	
Adjusted R^2	0.14		0.106		0.15	

Notes: additional controls for this regression are dummies for regions; base level of health status of family is "good" health; base level of household head education is secondary educ.; * if p-value < 0.1, ** if p-value < 0.05, *** p < 0.01.

"Food" is found out to be insignificant. Variable "trip" is statistically significant at $p<0.05$ in full sample but not significant in both subsamples separately. None of estimates of other controls changes their sign in comparison with the main model (with log(income)). All coefficients deviate in value by at most 5%. This can be interpreted as one of the evidences of the model validity.

5.5. Robustness test for education of household head

The second test was done for another important explanatory variable – education level of the household head. We grouped education of father and mother of household head in the same 4 categories as we did previously for education of the family head. In particular, belonging to the 1st category means that the highest level of education of a person is primary or secondary school. The highest, 4th category, contains only those who has Bachelor's degree or more. So, replacing level of education of household head on education of his father and mother we got the results presented in the Table 6. The regression output shows us that education of father is not statistically significant even at $p<0.1$ level. All level of mother's education found out to be statistically significant but only for rural settlements (similar to the individual's education). Overall, other estimates do not change more than by 5% after replacing variables and running the main model. Hence, this is one more evidence of model validity.

Table 6. Estimation results. Robustness test for education of household head

	Full sample		Urban subsample		Rural subsample	
	β	se	β	se	β	se
log(income)	0.329**	0.148	0.445**	0.204	0.21	0.205
Medium health	0.583***	0.144	0.563***	0.183	0.591**	0.243
Bad health	0.926***	0.2	0.785***	0.291	1.096***	0.286
Rural residence	0.490***	0.132				
Size of family	0.155**	0.076	0.042	0.101	0.289***	0.112
Receiving treatment in health system	0.748***	0.124	0.919***	0.184	0.582***	0.189
Members aged under 5	0.071	0.203	0.204	0.327	-0.072	0.277
Members aged above 60	0.12	0.103	0.152	0.155	0.095	0.136
Proportion of females	0.518*	0.285	0.356	0.36	0.597	0.454
Male head	-0.008	0.135	-0.08	0.194	0.035	0.189
Age of a head	0.009	0.006	0.004	0.008	0.019*	0.009
Post-secondary father educ.	-0.36	0.229	-0.103	0.276	-0.67	0.416
Incomplete tert. father educ.	-0.443	0.274	-0.386	0.321	-0.305	0.538
Tertiary father educ.	-0.207	0.282	-0.136	0.25	0.251	0.543
Post-secondary mother educ.	0.680***	0.236	0.546**	0.272	0.983**	0.433
Incomplete tert. mother educ.	0.574**	0.268	0.373	0.352	0.760*	0.412
Tertiary mother educ.	0.051	0.31	-0.225	0.342	1.067**	0.516
Sample size	859		486		373	
Adjusted R^2	0.145		0.118		0.15	

Notes: additional controls for this regression are dummies for regions; base level of health status of family is "good" health; base level of household head parents education is secondary educ.; * if p-value < 0.1, ** if p-value < 0.05, *** p < 0.01.

5.6. Blinder-Oaxaca decomposition

For deeper investigation of health expenditure difference between rural and urban households we decided to apply the Blinder-Oaxaca decomposition for linear regression model. We have mean of log health expenditure that equals to 6.84 for rural families and to 6.37 for urban. That's why the gap of spending on healthcare is 0.47.

The decomposition output – the gap of household health expenditure divided into 3 parts. The first part measures the difference that is due to group variation in the predictors (the "endowments effect"). It is not statistically significant even at p=0.10. The second part reflects the contribution of differences in the coefficients. It is highly statistically significant at p=0.01 and makes up almost all the gap of health spending. The third part – the interaction term that quantifies the simultaneous effect of differences in endowments and coefficients. It is not statistically significant even at p=0.10 level.

Hence, the gap in health expenditures is not due to household characteristics that we used as predictors. Instead, it is, for example, more costly to have bad health in rural settlements.

Chapter 6

CONCLUSIONS

The results of this study show that urban and rural households in Ukraine have a significant difference in their health expenditures. In particular, rural families on average spend almost 50% more than urban. This gap is not explained by the variation in fundamentals – the "endowment effect" is not significant. Instead, it is the difference in the effects of (returns to) the variables that matters.

The first finding is related to income. Consistent with the literature, income has a positive effect – richer people spend more on health However, when each subsample is analyzed separately the effect is found to be significant only for urban residents. Overall, income differential cannot explain health spending difference. Moreover, rural residents, although less affluent (they have 14% lower income relative to urban households) spent more on health.

We also found that the size of the family matters in predicting household healthcare expenditure only for rural households. These two results (about income and family size) may suggest that rural residents have substantial excess costs (for example, due to the type of facilities used or high transportation cost).

Among the most important result is the effect of self-evaluated health status. Households with a "bad" health spend twice more on health comparing to households with a "good" health. The effect is much more pronounced in the rural subsample. It is more costly to get sick in rural settings.

Education level of the household head is positively associated with health spending, but only for rural families. Given no such effect for urban households we suggest that the link between education and health expenditures reflects the

excess to information about proper health and health care behavior. It seems that urban residents have a much larger exposure to the information about health and health care. Thus, both educated and non-education persons equally understand the importance of health. In contrast, in rural settings household heads with lower education tend to undervalue the importance of spending money for healthcare. Government should introduce an information campaign in rural settlements to overcome this difference.

These findings may be useful for Ministry of Health of Ukraine when designing coverage and/or subsidy for vulnerable families. The study lists main household characteristics that are associated with financial burden related to health shocks by the family. They are family size, family members aged under 60 and above 5, poor health status, and rural residency.

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APPENDIX A

Table 7. Heckman selection model estimates

	β	se	P>z
log(income)	0.176	0.085	0.038
Medium health	0.383	0.096	0.000
Bad health	0.823	0.133	0.000
Rural residence	0.345	0.084	0.000
Size of family	0.067	0.049	0.171
Receiving treatment in health system	0.081	0.091	0.375
Members aged under 5	0.052	0.140	0.710
Members aged above 60	0.102	0.075	0.171
Proportion of females	-0.039	0.180	0.828
Male head	0.004	0.096	0.969
Age of a head	-0.001	0.004	0.872
2nd lvl of education	0.081	0.098	0.406
3rd lvl of education	0.152	0.114	0.181
4th lvl of education	0.217	0.166	0.192

Table 8. Heckman selection equation

	β	se	P>z
Trust - other people	0.008	0.004	0.032
Trust - the Presidency	-0.120	0.075	0.108
Trust - The Parliamemt	0.119	0.075	0.114
log(income)	0.114	0.115	0.322
Medium health	0.086	0.134	0.521
Bad health	0.043	0.190	0.820
Rural residence	0.095	0.119	0.426
Size of family	0.002	0.067	0.978
Receiving treatment in health system	0.647	0.117	0.000
Members aged under 5	0.200	0.223	0.369
Members aged above 60	0.208	0.115	0.070
Proportion of females	0.330	0.248	0.184
Male head	0.122	0.140	0.386
Age of a head	-0.001	0.005	0.782
2nd lvl of education	0.238	0.136	0.081
3rd lvl of education	0.198	0.159	0.212
4th lvl of education	0.065	0.243	0.789
Athrho	-0.559	0.271	0.039
lnsigma	0.099	0.041	0.015
Rho	-0.507	0.201	
Sigma	1.104	0.045	
Lambda	-0.560	0.241	

APPENDIX B

Table 9. Blinder-Oaxaca decomposition estimates

	β	se	P>z
Differential			
Prediction urban	6.377	0.084	0.000
Prediction rural	6.848	0.094	0.000
Difference	-0.471	0.126	0.000
Decomposition			
Endowments	0.067	0.095	0.480
Coefficients	-0.503	0.136	0.000
Interaction	-0.035	0.109	0.747