

ЕКОНОМІЧНІ НАУКИ

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DETERMINANTS OF HEALTH STATUS IN HIGH INCOME COUNTRIES

Summary. The aim of the paper is to determine the key factors influencing health status in high income countries. To reach the goal of the study two stages of analysis were conducted. Firstly, based on the descriptive analysis, the U-shaped relationship with a diminishing negative impact of an increase in gross domestic product per capita/public healthcare expenditures per capita on health status (infant mortality rate) was evidenced, life expectancy as a measurement of the quality and accessibility of healthcare services similarly has a diminishing negative effect. Secondly, the Ordinary Least Squares regression technique was used to find the significance of determinants, according to the estimated results, only life expectancy is a significant factor, the importance of gross domestic product per capita and public healthcare expenditures per capita was not proved in this cross sectoral study for 57 high income countries. Based on the estimated results, in order to attain better health status financial assets should be invested particularly in healthcare sector to increase the quality and accessibility of healthcare services, which would lead to noticeable improvements in health status through lowering infant mortality rates.

Keywords: health status, infant mortality, life expectancy, gross domestic product, public healthcare expenditures.

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ФАКТОРИ ВПЛИВУ НА СТАН ЗДОРОВ'Я У КРАЇНАХ З ВИСОКИМ РІВНЕМ ДОХОДУ

Анотація. Метою статті є визначення ключових факторів, що впливають на стан здоров'я у країнах з високим рівнем доходу. Для досягнення поставленої цілі було здійснено два етапи аналізу: по-перше, на основі кореляційного аналізу взаємозв'язку між валовим внутрішнім продуктом (ВВП) на душу населення/державними витратами на охорону здоров'я (ДВОЗ) на душу населення та станом здоров'я (рівнем дитячої смертності(ДС)) було доведено існування U-подібної залежності ефекту зростання ВВП та ДВОЗ на зменшення рівня ДС, крім того, обернена U-подібна залежність між тривалістю життя, показником якості та доступності послуг з охорони здоров'я, та станом здоров'я була доведена. По-друге, для визначення статистичної значущості впливу факторів на стан здоров'я було використано метод найменших квадратів (МНК). Відповідно до результатів множинного регресійного аналізу, лише очікувана тривалість життя є статистично важливим фактором, значимість ВВП та ДВОЗ не підтвердилась для 57 країн з високим рівнем доходу. На основі отриманих результатів, з метою покращення стану здоров'я населення необхідно направляти фінансові активи у галузь охорони здоров'я для підвищення якості та доступності медичних послуг, що призведе до помітного поліпшення стану здоров'я через зниження рівня дитячої смертності.

Ключові слова: стан здоров'я, дитяча смертність, тривалість життя, валовий внутрішній продукт, витрати на охорону здоров'я.

Introduction. Health is a key factor of sustainable social and economic development as enables to maximize the total output by employing available labour force. It can be reached due to an increase in labour productivity as a result of human capital accumulation through investments in healthcare and education. The issue on public health is crucial for all countries, thus in developed countries there is a production crisis due to aging population and a relatively small labour force has to satisfy the needs of all population, while the share of retired people increases, which puts additional pressure on the youth. Regarding the developing countries, they face the opposite problem, fast growing population requires the proportional

increase in total output, which is hardly attainable due to limited physical and human resources. Thus, an increase in productivity through improvements in health status will eliminate the negative consequences of mentioned issues.

At the same time, in the context of global sustainability, the issues on health are attracting the attention as improvements in health status through a reduction in infant mortality rates (IM) allow us to maximize the potential output employing the same limited resources, which follows the concept of sustainability.

Additionally, besides its vital role in dealing with current global issues, healthcare sector has positive externalities, thus, public health is the es-

sence of sustainable social and economic progress and its determinants should be studied.

Literature review. According to the literature, the key factor that affects health status directly and indirectly is gross domestic product (GDP) per capita and/or income level, as countries with high GDP per capita spend more on healthcare sector, and individuals with high income live in better conditions, have better nutrition and spend more on the healthcare (Pritchett and Summers, 1996).

Hussain, Malik and Hayat (2009) and Kalemli-Ozcan (2002) in their studies confirmed the relationship between economic growth and improvements in health status (infant mortality rate). The relationship between GDP per capita and health status is two-sided in its nature, as an improvement in health status leads to an increase in labour productivity in the long-run (Bloom and Canning, 2000), positively affecting aggregate output and economic development (Oni, 2014; Jack and Lewis, 2009; Cole and Neumayer, 2006; Gupta and Mitra, 2003; Beheshti and Sajoudi, 2008), additionally, healthy workers take less leave days linked to ill health and spend less on sicknesses (Clayton, 2010). Thus, undeveloped countries with a weak healthcare system are trapped in poverty, as health issues reduce the time spent on the paid labour market, decreasing total output and limiting the potential growth (Barro, 1996; Rivera and Currais, 1999; Acemoglu and Johnson, 2006). Moreover, according to the World Health Organization (WHO, 2005), around 50% of economic inequality between developed and developing countries are associated with poor health and shorter life expectancy.

At the same time, according to the previous studies, there is a significant impact of education on health status measured as IM rate (Jamison, Jamison and Hanushek, 2006; Cutler, Deaton and Muney, 2006; Papageorgiou and Stoytcheva, 2008), additionally, a study conducted by Younger (2001) evidenced the impact of education and proved the significance of the effect of diphtheria vaccination rates on IM, while concluding that the number of doctors and the number of hospital beds do not have a significant impact on IM.

Another study on determinants of health status (IM) proved the significant effect of fertility rates,

female participation in the labour force rates, gross national income per capita and female literacy rates on IM and did not evidence the significant impact of government healthcare expenditures on IM (Zakir and Wunnava, 1999).

The relationship between public healthcare expenditures (PHE) and health status is quite interesting as it shows the state's policy towards healthcare issues, besides that, a reduction in PHE and a simultaneous increase in private healthcare expenditures, known as "Health financing transition", lead to unsustainable and inefficient healthcare system, as positive externalities obtained by public financing would be lost, thus the impact of such a transition would be negative on health status (Oxley & MacFarlan, 1995).

Data and methodology. The aim of the study is to find the key determinants of health status among developed high income countries in order to provide the recommendations for governments on economic growth due to health improvements. To reach the aim of the paper secondary data collected from the World Bank database on key variables: Infant mortality rate (IM), gross domestic product per capita (GDP), public healthcare expenditures per capita (PHE) and life expectancy (LE) are used for 57 high income countries (Andorra, Antigua and Barbuda, Argentina, Australia, Austria, Bahamas, Bahrain, Barbados, Belgium, Brunei Darussalam, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Rep. Korea, Kuwait, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Oman, Palau, Panama, Poland, Portugal, Qatar, San Marino, Saudi Arabia, Seychelles, Singapore, Slovak Republic, Slovenia, Spain, St. Kitts and Nevis, Sweden, Switzerland, Trinidad and Tobago, United Arab Emirates, United Kingdom, United States, Uruguay) for 2015 in order to identify the influence of each factor on IM using Ordinary Least Squares regression (OLS) technique.

Descriptive analysis. To study the relationship between key determinants of health status and IM, the correlation plots were constructed.

Thus, the relationship between economic level of development measured as GDP per capita and health

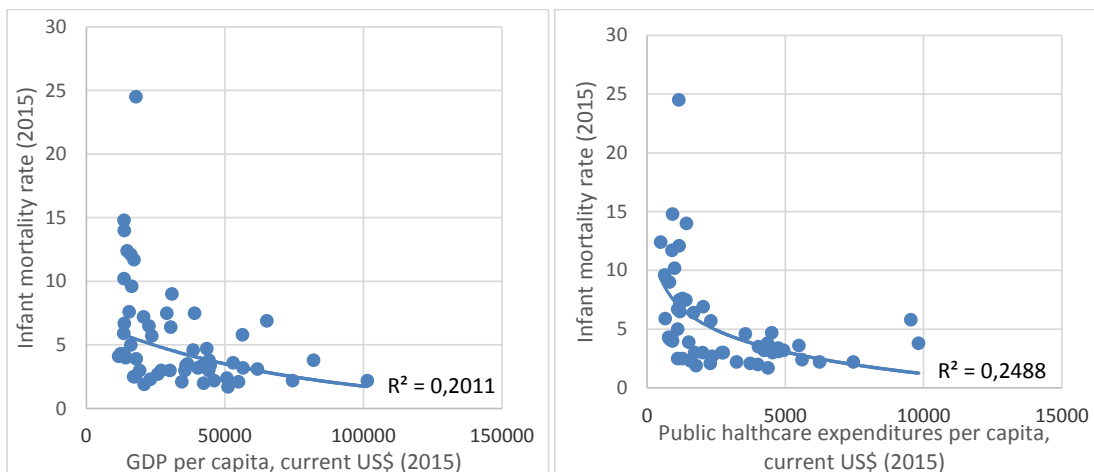


Figure 1. The relationship between gross domestic product per capita (left), healthcare expenditures per capita (right) and infant mortality rate, 2015

status can be seen on the figure 1 (left). The plot illustrates a U-shaped relationship between GDP per capita and IM rate, which indicates the diminishing negative impact of an increase in GDP per capita on health status measured as an infant mortality rate.

As Fuchs (1974) emphasized the importance of having the minimum level of income to spend on healthcare, when that level is reached additional income is not highly correlated with the health status. The same picture can be seen for developed countries (figure 1), there is a huge reduction in IM caused by an increase in GDP per capita from 20,000 to 50,000 US \$, as the average IM rate for countries with around 20,000 US \$ (GDP per capita) is 9 per 1,000 live births, while for countries with around 50,000 US \$ (GDP per capita) the average IM rate is 3 per 1,000 live births, and a slight

reduction of IM can be seen for countries with over 50,000 US \$ (GDP per capita), where the average IM rate is 2.5 per 1,000 live births.

The next factor, which affects the health status is public healthcare expenditures per capita, and is considered as an indicator of healthcare policy. As can be seen on the figure 1 (right) there is a relationship between PHE per capita and IM, additionally, an increase in PHE has a negative diminishing impact on IM, the same pattern of a relationship was noticed for GDP per capita.

Another indicator that influences IM is life expectancy, which is added as a measurement of the quality and accessibility of healthcare services, as the data on quality of healthcare sector is not available, and there is no generally accepted methodology on measuring the last one.

The figure 2 shows the negative effect of an increase in LE on IM, that has a diminishing impact as well, as better health conditions of adults (LE) lead to a reduction of IM rates. Thus, for countries with LE at the level of 75 years, IM rate is around 8 on average, which is high comparing to the countries with LE at around 85 years, where IM is around 2.5 on average.



Figure 2. The relationship between life expectancy and infant mortality rate, 2015

Results and regression analysis. The provided descriptive analysis illustrates the relationship between: GDP per capita and IM, PHE per capita and IM, LE and IM. Consequently, as the aim of the paper is to study and prove the significance of key determinants of health status, the Ordinary Least Squares regression (OLS) technique is used, and the study model is formulated as following:

$$\ln IM_i = \beta_0 + \beta_1 * \ln GDP_i + \beta_2 * \ln PHE_i + \beta_3 * \ln LE_i + \varepsilon_i$$

Where, $\ln IM_i$ – natural logarithm of infant mortality rate for i th country, $\ln GDP_i$ – natural logarithm of gross domestic product per capita for i th country, $\ln PHE_i$ – natural logarithm of public healthcare expenditures per capita for i th country, $\ln LE_i$ – natural logarithm of life expectancy for i th country.

Table 1

Analysis outcomes

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.646726							
R Square	0.418255							
Adjusted R Square	0.385326							
Standard Error	0.474886							
Observations	57							
ANOVA								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	3	8.593342	2.864447	12.70172	2.27E-06			
Residual	53	11.95238	0.225517					
Total	56	20.54572						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	29.97469	8.611648	3.480715	0.001009	12.70191	47.24747	12.70191	47.24747
LnGDP	0.11487	0.235913	0.486915	0.628327	-0.35831	0.588052	-0.35831	0.588052
LnPHE	-0.27777	0.187679	-1.48003	0.144786	-0.65421	0.098667	-0.65421	0.098667
LnLE	-6.308	2.119474	-2.97621	0.00439	-10.5591	-2.05687	-10.5591	-2.05687

Thus, according to the OLS analysis outcomes (Table 1), only LE has a statistically significant impact on IM, while GDP per capita and public healthcare expenditures per capita do not have a significant effect on health status in developed high income countries, which supports the findings of Zakir and Wunnava (1999). The results can be interpreted as: a 1% increase in life expectancy leads to a 6.3 % reduction in infant mortality rates, holding other factors constant. The estimated equation can be expressed as: $\ln IM_i = 29.97 + 0.11 * \ln GDP_i - 0.28 * \ln PHE_i - 6.3 * \ln LE_i$, where the signs are correct according to the underlying theory, except the GDP per capita, which is in contrast to the economic theories and previous results (Hussain, Malik and Hayat, 2009; Kalemli-Ozcan, 2002).

Conclusions. The study was conducted to identify the key determinants of health status measured as infant mortality. Based on the theoretical background and current literature the following factors were included in the model: 1) GDP per capita as a measurement of economic development; 2) public healthcare expenditures per capita as a measurement of a state's policy towards health issues; 3) life expectancy as a measurement of the quality and accessibility of healthcare system.

The study consists of two stages: firstly, the descriptive analysis was applied, as a result the existence of a U-shaped relationship between health status and its determinants was evidenced. Secondly, the OLS regression method was used to estimate the significance of the factors affecting health status, based on the analysis outcomes, only one factor (life expectancy) has a negative significant impact, thus a 1% increase in life expectancy leads to a 6.3% reduction in infant mortality rate; for the rest two factors (GDP per capita and PHE per capita), their significance was not proved for high income countries in 2015.

The findings of the study have practical importance, as the significance of an impact of GDP per capita / PHE per capita was not proved we should not expect a considerable improvement in health status caused by an increase in GDP per capita or PHE per capita, in order to attain better health status financial assets should be invested particularly in healthcare sector to increase the quality and accessibility of healthcare services, which would lead to noticeable improvements.

Limitations. As the time span to see the effect of additional public healthcare expenditures is unknown, the results are limited in their importance, specifically in a cross-sectoral analysis.

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