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The Impact of Income Inequality on the Population Health: Evidence From 138 Countries

Siyuan Liu
(Universiti Putra Malaysia, Malaysia)

Abstract: This study examines the impact of income inequality on population health using data from 138 countries from 2010 to 2019. Employing the Generalized Method of Moments estimation, the findings reveal that income inequality negatively affects population health, with widening income inequality leading to a decline in population health. To explore the potential heterogeneity, the full sample is divided into three subsamples based on income levels. The results indicate that the impact of income inequality on population health varies across different income groups. In middle-income countries, income inequality significantly harms population health, whereas in low-income and high-income countries, the effect is not statistically significant. This finding suggests that middle-income countries should pay more attention to income distribution issues to reduce health inequality and improve population health.

Key words: income inequality, population health, generalized method of moments, income level
JEL code: I24, I10

1. Introduction

Population health, as an essential element of human capital, has far-reaching impacts on all aspects of society, especially in terms of enhancing labor productivity (Nahar et al., 2015), increasing incomes (Weil, 2014) and promoting economic growth (Narayan et al., 2010; Weil, 2007). The 2030 Agenda for Sustainable Development includes “Good Health and Well-being” as one of its goals, highlighting health as a key factor in measuring social progress.

A range of factors influence health status, with the impact of income inequality on health being of particular relevance (Bor et al., 2017; Hedén & Lyttkens, 2015). Income distribution is linked to economic growth, influencing the dynamics of growth in a country or region, and it is critical for economic progress and social stability. The breakout of COVID-19 at the beginning of the 2020s sparked an unprecedented economic and social catastrophe, which emphasized the severity and repercussions of the existing inequalities and resulted in a further growth in inequality. Currently, income inequality has become one of the major manifestations of social inequality and can affect living standards and healthcare resources, ultimately affecting overall health.

Graafland & Lous (2018) stated that severe income inequality affects the standard of living of residents in several ways. Generally, people with higher income levels have a higher standard of living; conversely, people with lower incomes may have limited income and thus lack access to adequate food, lack adequate nutrition, and live in

Siyuan Liu, Ph.D. Student, Universiti Putra Malaysia. E-mail: siyuanliu57@gmail.com.

relatively poorer conditions. Income inequality can widen the income gap between high-income and low-income groups, further lowering the standard of living of low-income groups, which in turn affects their health. In addition, the widening income gap may lead to an unequal distribution of healthcare resources, with higher-income groups having more healthcare resources and services and lower-income groups facing an insufficient supply of public healthcare facilities, negatively affecting their health status (Bhandari et al., 2015; Guo et al., 2022).

Indeed, studies by Karlsson et al. (2010), Rözer & Volker (2016), Ali et al. (2021), Cai et al. (2021) and others have shown that income inequality can have some impact on health. However, due to differences in research objects and research methods, scholars have not reached a unified conclusion on the question of whether the impact of income inequality on health is negative or positive. And the current study seems to ignore the fact that the impact of income inequality on health may vary depending on the income level of each country or region. Therefore, this study first extends the study population by utilizing unbalanced panel data from 138 countries for analysis to make the findings more generalizable. In addition, this study will conduct a heterogeneity analysis to divide the full sample into three sub-samples of high-income countries, middle-income countries, and low-income countries based on their income levels, and to explore the effects of income inequality on population health in each of the sub-samples, in order to deepen the knowledge of the relationship between income inequality and population health.

2. Literature Review

Scholars have been investigating the connection between income and health since the late 1970s. The absolute income hypothesis, the relative income hypothesis, and the income inequality hypothesis are the three basic theories that underpin research in this area. The absolute income hypothesis emphasizes the relationship between an individual's absolute income and health. The hypothesis assumes that by increasing the absolute income of individuals, the overall health of the population will improve. Unlike absolute income, the relative income hypothesis examines the impact of relative income levels on health in society as a whole in terms of the impact of income inequality on individual psychological, socio-political and other levels. An individual's level of health is not only related to his absolute level of personal income, but there is also a considerable correlation with relative income. Then, the income inequality hypothesis argues that income inequality has an impact on healthy human capital, in addition to income itself. This is mainly due to the fact that inequality causes a certain amount of psychological stress and negativity and reduces social trust, which can have a negative impact on health (Kragten & Rözer, 2017).

Based on the above theories, scholars have also empirically verified the impact of income inequality on health, but the conclusions obtained are not the same. Some scholars argue that income inequality has a detrimental effect on population health. Karlsson et al. (2010) examined the relationship between absolute personal income, income inequality, and health levels across 21 countries using cross-sectional data. Their findings revealed a positive association between absolute personal income and individual health levels, while income inequality was found to be negatively related to individual health levels. In a study by Hajebi & Razmi (2014), the relationship between health status and income inequality was investigated, employing life expectancy as a measure of health and the Gini coefficient as a measure of income inequality. The results demonstrated a significant negative relationship between income inequality and health status. Similarly, Ali et al. (2021) examined the relationship between income inequality and life expectancy in Pakistan. Their analysis, based on ARDL model regression and Granger causality tests, indicated that income inequality reduces life expectancy. In addition, several scholars have shown that the impact of income inequality on health varies slightly across groups. Rözer &

Volker (2016) explored the impact of income inequality on health in different age groups. They found that the negative impact of income inequality on health was more pronounced in younger age groups compared to middle-aged and older age groups. Cai et al. (2021) found that the negative impact of income inequality on health was more pronounced in the low-income group than in the middle-aged and older age groups, by looking at 1,710 apple farmers from China.

In summary, the existing literature suggests that income inequality has an impact on health, but we still need to further verify whether this impact is negative or positive. And whether this effect varies across countries with different incomes.

3. Methodology and Data

3.1 Model Specification and Methodology

The study considers population health as the dependent variable and employs life expectancy at birth (LE) as a measure of population health. The primary explanatory variable is income inequality, quantified using the Gini coefficient (Gini). According to Biggs et al. (2010), Hajebi & Razmi (2014), Hedén & Lyttkens (2015), and Odusanya & Akinlo (2021), the general regression model is shown in Equation (1):

$$LE = f(Gini, RGDP, Edu, HE, Aging) \tag{1}$$

LE denotes life expectancy at birth, Gini denotes Gini coefficient, RGDP denotes gross domestic product per capita, Edu denotes education level, HE denotes health expenditure, and Aging denotes population aging coefficient.

In order to examine the relationship between income inequality and population health, panel data from 138 countries spanning the period from 2010 to 2019 were collected for this study. Due to the possible correlation between the explanatory variables and the error terms, static estimation can generate endogeneity and lead to biased estimation results. As suggested by Ding et al. (2023), generalized method of moments (GMM) was chosen as the estimation method in this study. The econometric model was designed as follows：

$$Ln\ (LE_{it}) = \sigma_0 + \sigma_1 Ln(LE_{i,t-1}) + \sigma_2 Gini_{it} + \varphi Y_{it} + \varepsilon_{it} \tag{2}$$

LE denotes the life expectancy at birth. Gini denotes Gini coefficient. Y stands for the control variables. ε_{it} denotes the random error term; country and time are indicated by i and t, respectively. σ_0, σ_1, σ_2, and φ denote the coefficients of the corresponding variables.

3.2 Data

This study collected data from 138 countries for the years 2010 through 2019 (10 years). The dependent variable in this study is life expectancy at birth (LE), which is used to assess population health. The Gini coefficient (Gini) is the major independent variable in this study. It measures income inequality. The control variables in this study are: Gross Domestic Product per capita (RGDP), which indicate the level of economic development. Educational Level (Edu), which refers to the enrolment in tertiary education. Health Expenditure (HE), which refers to the current healthcare expenditure as a percentage of GDP. Population Aging Coefficient (Aging), which refers to the proportion of the population aged 65 and over in the total population. data for Gini are from the World Inequality Database; all other data are from the World Bank.

4. Result Discussion

4.1 Basic Results and Robustness Checks

Table 1 shows the results of the baseline regression and robustness tests. Column I shows the basic regression results. The p-values of the Sargan Test and AR (2) are also greater than 0.05, indicating that the results of the GMM obtained in Column I are reliable. The estimated coefficients of Gini in Column I are significantly negative at a 1% level of significance, which indicates that there is a negative correlation between the income inequality and population health.

Columns II and III show the results of robustness checks. First, income inequality can also be reflected by the income of the top 10% income share (IS) of earners (Flores, 2021), this study will use the IS instead of Gini to measure income inequality. Column II shows the results. The coefficients of IS are all negatively significant at the 1% level of significance, which suggests that income inequality is negatively associated with life expectancy. Subsequently, we replace LE with infant mortality rate (IMR) to measure population health. IMR is a significant indicator of mortality levels within a specific area, it is the number of infants dying before reaching one year of age, per 1,000 live births in a given year. It can also be used to measure population health (Ibrahim A. Odusanya & Bukunmi Agboola, 2017; Odusanya & Akinlo, 2021). The results are shown in Column III. The coefficient of Gini is statistically significant and positive, indicating that income inequality is positively associated with infant mortality. The results of the two robustness tests are consistent with those obtained from the basic regression, proving the reliability of the benchmark regression, i.e., that widening income inequality is detrimental to population health.

Table 1 Basic Regression and Robustness Checks

Variables	Basic Regression	Robustness checks	
	I	II	III
L. LE	0.9188***	0.9183***	
	(0.0065)	(0.0046)	
L.IMR			0.9436***
			(0.0006)
Gini	-0.0161**		0.0308***
	(0.0074)		(0.0017)
IS		-0.0135***	
		(0.0036)	
RGDP	0.0138***	0.0139***	-0.0081***
	(0.0012)	(0.0008)	(0.0004)
Edu	0.0072***	0.0041	0.1383***
	(0.0026)	(0.0155)	(0.0042)
HE	-0.0268	0.0059***	-0.0030***
	(0.0218)	(0.0018)	(0.0005)
Aging	-0.0595***	-0.0539***	0.0219***
	(0.0099)	(0.0077)	(0.0029)
Constant	0.3554***	0.3523***	-0.0156***
	(0.0295)	(0.0200)	(0.0009)
Observations	952	952	952
Sargan Test	0.2795	0.4744	0.3473
AR (2)	0.5977	0.5728	0.5455

Notes: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

4.2 Heterogeneity Analysis

The dynamics of income inequality differ significantly across countries with varying income levels, as does population health. Therefore, does the effect of income inequality on population health also differ across nations with different income levels? To address this question, this study will conduct a heterogeneity analysis. Utilizing data from the World Bank, the full sample will be categorized into high-income, middle-income, and low-income countries based on income level, and empirical analyses will be conducted for each subgroup. The objective is to determine whether notable disparities exist in the impact of income inequality on population health across these groups, thereby fostering a more comprehensive understanding of this relationship.

Table 2 shows the estimation results for sub-samples. Column I is for high-income countries, column II for middle-income countries, and column III for low-income countries. The results show that the impact of income inequality on population health varies across countries with different income levels. Only in middle-income countries does income inequality have a significant negative impact on population health. The effect of income inequality on population health is not significant in either high- or low-income countries. In high-income countries, this may be attributed to their higher per capita income, more advanced economies, and superior healthcare systems, which mitigate the impact of income inequality on health outcomes. As noted by Blázquez-Fernández et al. (2018), income inequality does not diminish health in developed regions. In low-income countries, factors such as limited and lower-quality healthcare, inadequate sanitation, and a higher prevalence of infectious diseases may play a more direct role in influencing population health (Dupas & Miguel, 2017).

Table 2 Estimation Results for Sub-samples

Variables	High-income	Middle-income	Low-income
	I	II	III
L.LE	0.4872***	0.8798***	0.9838***
	(0.0375)	(0.0235)	(0.0371)
Gini	-0.0099	-0.0343**	0.1292
	(0.0196)	(0.0166)	(0.0788)
RGDP	0.0072***	0.0054	0.3603***
	(0.0025)	(0.0037)	(0.0377)
HE	0.1764***	0.0534	0.1025
	(0.0583)	(0.0363)	(0.0779)
Aging	0.2179***	0.0171	-1.3626
	(0.0251)	(0.0410)	(1.1321)
EDU	0.0052	0.0076**	-0.2298***
	(0.0059)	(0.0038)	(0.0511)
N	354	493	105

Notes: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

5. Conclusion

The main findings are as follows. This study uses the GMM estimation found that income inequality has a negative impact on health. In addition, GDP per capita, level of human capital and aging also have a significant impact on health. Further heterogeneity analyses show that the negative impact of income inequality on

population health is particularly significant in middle-income countries, while it is not significant in high-income and low-income countries. Studies by Acheampong & Opoku (2024) and McFarland et al. (2023) have also shown that a more equitable distribution of income promotes better health. Accordingly, the Government needs to formulate a fairer and more scientific income distribution policy to improve income inequality as much as possible, to promote a more equitable distribution of income, and to improve overall health from the perspective of improving income inequality.

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