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Income Inequality and Health Across the Mediterranean: A Panel Data Analysis

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Abstract
This article aims to investigate the relationship between income inequality, represented by Theil index, and health outcomes, proxied by life expectancy, across a panel of 10 countries spanning both the northern and southern shores of the Mediterranean Sea. By employing econometric techniques on panel data covering the period from 1990 to 2021, the study seeks to provide insights into how income inequality impacts health outcomes in different regional contexts. The sample comprises countries from both the northern and southern shores of the Mediterranean, including Tunisia, Algeria, Morocco, Libya, Egypt, France, Italy, Greece, Spain, and Slovenia. By including countries from diverse socioeconomic backgrounds, the study aims to capture a broad spectrum of experiences and shed light on the nuanced relationship between income inequality and health outcomes. The results of the analysis reveal compelling insights into the relationship between income inequality and health outcomes across the Mediterranean region. In countries situated on the northern shore, the findings demonstrate a significant and positive relationship between income inequality and improvements in individual health. This suggests that, in these contexts, greater income inequality may be associated with better health outcomes, possibly due to factors such as access to healthcare services and social determinants of health. Conversely, in countries located on the southern shore of the Mediterranean, the results indicate a significant but negative relationship between income inequality and health improvements. This suggests that in these countries, higher levels of income inequality may be linked to poorer health outcomes among the population. This could be due to a variety of factors, including limited access to healthcare services, socioeconomic disparities, and environmental conditions. Overall, the findings of this study contribute to our understanding of the complex interplay between income inequality and health outcomes in the Mediterranean region. By highlighting the divergent effects observed in countries on the northern and southern shores, the study underscores the importance of considering regional variations and contextual factors when analyzing the relationship between income inequality and health. These insights have implications for policymakers and public health practitioners seeking to address health disparities and promote equitable health outcomes across the region.
Keywords: Income Inequality, Health Outcomes, Life Expectancy, Theil Index, Panel Data, Mediterranean Countries
JEL Codes: I14, I15, C33

1. INTRODUCTION

The adverse impacts of income inequality on health outcomes are multifaceted and pervasive. Research has repeatedly shown that individuals with lower socioeconomic status face higher risks of chronic diseases, mental health disorders, and overall mortality rates compared to their wealthier counterparts. Factors such as limited access to healthcare services, inadequate nutrition, exposure to environmental hazards, and heightened stress levels contribute to these disparities in health outcomes among socioeconomically disadvantaged populations (Gee et al., 2004). Furthermore, income inequality can exacerbate social inequalities, leading to unequal distribution of resources and opportunities within society. This perpetuates a cycle of disadvantage, as individuals from marginalized communities often face barriers to accessing quality education, employment opportunities, and social support systems. As a result, they are more likely to experience poor health outcomes throughout their lives. Addressing income inequality and its associated health disparities requires comprehensive strategies that encompass social, economic, and political dimensions (Saunders et al., 2017). Policies aimed at reducing income disparities, improving access to healthcare and education, and promoting equitable economic opportunities are essential steps toward fostering a healthier and more equitable society. By acknowledging and addressing the complex interplay between income inequality and health outcomes, policymakers and stakeholders can work towards building a more inclusive and resilient society for all.

The reduction of income disparities has been widely recognized as a crucial determinant of improved health outcomes. Studies, including the work of Deaton (2001), have shown that societies with more equitable income distributions tend to have better overall population health. This is attributed to several factors, including increased access to healthcare, better nutrition, reduced exposure to environmental hazards, and decreased levels of stress and anxiety among individuals. However, it's also important to acknowledge that income disparities, to some extent, can contribute positively to health outcomes under certain conditions. For example, income inequality may incentivize innovation and economic growth, leading to improvements in healthcare infrastructure, advancements in medical technology, and increased funding for public health initiatives. Additionally, individuals with higher incomes may have greater

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resources to invest in preventive healthcare measures, leading to better health outcomes for themselves and their families (Woolf and Braveman, 2011). Nevertheless, these potential positive effects of income disparities on health outcomes must be weighed against the broader social and economic costs associated with inequality. While income inequality may spur economic growth in some cases, it can also perpetuate cycles of poverty, social exclusion, and poor health outcomes among disadvantaged populations. Ultimately, the goal should be to strike a balance between fostering economic prosperity and ensuring equitable access to healthcare and social services for all members of society.

Income plays a significant role in determining the overall health outcomes of individuals and populations (Asiedu et al., 2015). Higher income levels enable people to access better living conditions, such as safer housing, improved nutrition, and greater purchasing power for essential goods and services. In societies where wealth is distributed more equitably, there tends to be better population health outcomes, as resources are more evenly distributed among the populace. A higher income affords individuals greater access to healthcare services and preventive measures, leading to improved health outcomes and increased longevity. This includes access to nutritious food, clean drinking water, sanitation facilities, and quality healthcare services. Individuals with higher incomes are more likely to afford regular medical check-ups, vaccinations, and treatments for illnesses, Cookson et al (2016) thereby reducing the risk of preventable diseases and promoting overall well-being. Furthermore, higher income levels can contribute to better mental health outcomes, as individuals may have greater financial security and access to resources that can alleviate stress and anxiety. Economic stability also enables individuals to afford leisure activities and pursue hobbies that contribute to their overall quality of life. However, it's essential to recognize that while income is a critical determinant of health, it is not the sole factor (Mahadea, 2013). Social determinants of health, such as education, employment opportunities, access to social support networks, and environmental factors, also play significant roles in shaping health outcomes. Therefore, addressing income inequality alone may not be sufficient to improve overall population health. Comprehensive strategies that address various social determinants of health are needed to promote health equity and improve the well-being of all individuals and communities.

Recent research has challenged the traditional view of the relationship between income and health by suggesting the presence of a causal link that runs in the opposite direction—from health to income (Wilkinson and Pickett, 2006). This perspective posits that improvements in health can have significant implications for income levels and economic outcomes. Several plausible mechanisms have been identified through which improvements in health can influence income and socioeconomic status. One key pathway through which health can impact income is its effect on workforce participation. Improved health outcomes, such as reduced incidence of illness and disability, can lead to higher rates of labor force participation and greater productivity among workers (Tunceli et al., 2005). Healthy individuals are more likely to be able to work consistently and effectively, leading to higher earnings and overall economic productivity. Moreover, better health can result in reduced absenteeism and lower healthcare costs for employers, contributing to economic growth. Furthermore, investments in human capital, such as education and training, are closely linked to health outcomes. Individuals in good health are better positioned to pursue educational opportunities and acquire the skills and knowledge needed to succeed in the workforce. Higher levels of education are associated with higher earning potential and greater socioeconomic mobility, leading to improved income levels and overall well-being. Additionally, improvements in population health can have broader macroeconomic effects, such as promoting economic growth and development (Bloom et al., 2019). A healthier population is more productive, innovative, and resilient, leading to greater economic output and prosperity. Moreover, improvements in health can influence demographic trends, such as changes in the age structure of the population, which can have implications for labor supply, consumer behavior, and economic growth trajectories.

The recognition of the causal link between health and income highlights the importance of investing in health as a means of promoting economic development and reducing socioeconomic disparities (Smedley and Syme, 2000). By prioritizing efforts to improve population health, policymakers can not only enhance the well-being of individuals and communities but also foster sustainable economic growth and prosperity for society as a whole. The findings from the second report on the health of Canadians underscore the significant impact of income on health outcomes and overall well-being. Key observations reveal stark disparities in health between individuals of different income levels. Low-income Canadians are disproportionately affected by poorer health outcomes compared to their higher-income counterparts (Ross et al., 2006). Only 47% of individuals with low incomes report having very good or excellent health, whereas this figure rises to 73% among those with the highest income levels. Individuals with lower incomes face a higher risk of premature death and are more likely to suffer from various diseases compared to those with higher incomes. This heightened risk persists regardless of age, sex, race, or place of residence, highlighting the pervasive influence of income on health outcomes. A clear income gradient is evident in health outcomes among Canadians. As individuals move up the income scale, they experience fewer health issues, longer life expectancy, and overall better health. This gradient underscores the profound impact of socioeconomic status on health and well-being. These findings underscore the importance of addressing socioeconomic disparities and promoting equitable access to resources and opportunities to improve population health (Woolf, 2017). Efforts to reduce income inequality and address social determinants of health are essential for fostering a healthier and more equitable society for all Canadians. By addressing the root causes of health inequities, policymakers and stakeholders can work towards achieving better health outcomes and enhancing the overall quality of life for individuals across income levels.

The report from Health Canada in 1999 emphasizes the significant influence of income and social status on health outcomes (Kosteniuk and Dickinson 2003). It highlights a clear pattern: as income levels rise, so does the overall state

of health. The report suggests that populations residing in prosperous societies with equitable distribution of wealth tend to experience better health outcomes. Conversely, individuals in lower-income brackets often face adverse living conditions, including inadequate housing and nutrition, which can negatively impact their health. This correlation between higher incomes and better health reflects broader social and economic dynamics. Socioeconomically disadvantaged individuals often confront numerous barriers to health, stemming from limited access to resources and opportunities (Mechanic and Tanner, 2007). These disparities can manifest in various aspects of life, such as inadequate healthcare access, higher levels of stress, and poorer living conditions. Addressing these socioeconomic determinants of health is crucial for promoting health equity and improving overall population health. Initiatives aimed at reducing income inequality, enhancing access to education and healthcare, and addressing social determinants of health can help mitigate disparities and create more equitable health outcomes for all members of society. By recognizing the intricate links between income, social status, and health, policymakers and stakeholders can work towards building healthier and more inclusive communities.

2. LITERATURE REVIEW

The document titled "Health Inequality and Economic Development" by Deaton (2001) underscores the crucial relationship between income disparities and population health. It suggests that reducing income inequality can lead to improvements in overall health outcomes, primarily because the impact of income on health is more pronounced among economically disadvantaged individuals compared to the affluent. This observation reflects the stark reality that individuals with lower incomes often face greater barriers to achieving and maintaining good health. Limited financial resources can restrict access to essential healthcare services, nutritious food, safe housing, and other resources critical for well-being. As a result, individuals in lower-income brackets are more vulnerable to adverse health outcomes, including higher rates of chronic diseases, lower life expectancy, and overall poorer health. Conversely, higher-income individuals typically have greater access to resources and opportunities that promote good health. They may have better access to healthcare, engage in healthier lifestyle behaviors, and have the financial means to address health-related challenges more effectively. Therefore, by reducing income inequality and ensuring more equitable distribution of wealth, societies can address some of the root causes of health disparities. Policies aimed at improving income distribution, expanding access to healthcare, and addressing social determinants of health can contribute to better overall population health and greater health equity. Recognizing the differential impact of income on health outcomes underscores the importance of addressing income inequality as a key strategy for improving public health and fostering sustainable economic development.

Hammond (1951) study from highlights the impact of wartime food policies, particularly during the 1940s, on the health outcomes of workers. Despite the challenges of war, policies implemented during this period aimed to ensure access to essential nutrients, such as milk and vitamins, for workers. Remarkably, these efforts led to tangible improvements in the health of workers during the hostilities. One significant outcome noted by Hammond (1951) is the decrease in income disparities during the war period. This reduction in income inequality was associated with an improvement in the life expectancy of workers. By providing access to nutritious foods and essential vitamins, especially to those in lower-income brackets, the wartime policies effectively addressed some of the socioeconomic determinants of health. The findings from Hammond (1951) study underscore the importance of policies that prioritize equitable access to essential resources, particularly during times of crisis. By addressing disparities in access to nutritious foods and essential healthcare services, societies can improve the health outcomes of vulnerable populations and promote greater health equity. Hammond (1951) research provides valuable insights into the potential health benefits of addressing income disparities and implementing policies that prioritize the well-being of all members of society, particularly during periods of adversity.

Wilkinson's study from 1989 highlights an intriguing phenomenon observed in the United Kingdom, where the pace of decline in mortality rates among both children and adults begins to slow as income disparities increase. This suggests a complex relationship between income inequality and health outcomes, indicating that widening income gaps may have adverse effects on population health. Similarly, Fogel (1994) research examines the relationship between income disparities and differences in life expectancy over time. Fogel (1997) notes a significant reduction in the Gini coefficient for England from the early 18th century to 1973, indicating a decline in income inequality over this period. Remarkably, during this time frame, the gap in life expectancy also narrowed, with social disparities in longevity decreasing substantially. These findings underscore the intricate interplay between income inequality and health outcomes. While increasing income equality appears to correlate with improvements in life expectancy and overall population health, widening income disparities may lead to slower progress or even reversals in health gains. Fogel (1997) research also highlights the potential long-term benefits of reducing income inequality, as evidenced by the narrowing gap in life expectancy over centuries of socioeconomic change in England. Fogel (2001) studies provide valuable insights into the complex relationship between income inequality and health outcomes, emphasizing the importance of addressing socioeconomic disparities to promote better health outcomes for all members of society.

Wilkinson and Pickett's work in 2010 builds upon Wilkinson's earlier arguments from 1996, reinforcing the notion that societies characterized by smaller income disparities tend to offer better overall living conditions for their citizens. Their research underscores the significant impact of income inequality on societal well-being, highlighting stark differences in well-being indicators between countries with more equitable income distributions and those with greater income disparities. The study identifies certain countries, such as Japan and Scandinavian nations, as examples of

societies with smaller income gaps, where citizens generally enjoy higher levels of well-being. In contrast, countries characterized by greater income inequality, such as the United States, the United Kingdom, and Portugal, exhibit poorer indicators of well-being among affluent nations. This finding emphasizes the importance of addressing income inequality as a means of improving overall societal well-being. By reducing income disparities, policymakers can work towards creating more equitable societies where all citizens have access to essential resources, opportunities, and quality of life indicators. Through their research, Wilkinson and Pickett (2006) contribute valuable insights to the ongoing discourse on income inequality and its implications for societal health and well-being.

3. THE MODEL

We begin with the following function:

$$logEV_{it} = \theta_i + \alpha_{1i}\log GDP_{it} + \alpha_{2i}\log S_{it} + \alpha_{3i}\log DS_{it} + \alpha_{3i}\log INQ_{it} + \mu_{it}$$

Where EV: represent the variable health measured by (life expectancy)
GDP: the production or the gross domestic product.
S: Percentage of children in full-time education.
DS: spending in health per capita (current US $):

4. RESULTS AND DISCUSSION

Table 1 presents descriptive statistics for various variables pertaining to the Country of The North Bank of The Mediterranean. The variables included are LEV, LGDP, LS, LDIP, and LIG. For the variable LEV, the mean value is 4.549826, with a standard deviation of 0.2544136. The minimum value recorded is 4.1, while the maximum value observed is 4.97. Moving to LGDP, the mean value is 8.522957, with a standard deviation of 0.2691408. The minimum LGDP recorded is 8.1, while the maximum is 8.99. LS exhibits a mean value of 4.557043, with a standard deviation of 0.2572321. Similar to LEV, LS also ranges from a minimum of 4.1 to a maximum of 4.98. LDIP has a mean value of 1.903989 and a standard deviation of 0.5090911. The variable ranges from a minimum value of 1.1 to a maximum of 2.56. Lastly, LIG has a mean value of 3.659361 and a standard deviation of 0.062982. The variable's minimum value is 3.580145, while the maximum is 3.787173. These statistics offer insights into the distribution and variability of each variable within the dataset, providing a foundational understanding of the data related to the Country of The North Bank of The Mediterranean.

Table 1: Descriptive Statistics: Country of The North Bank of The Mediterranean

Variable	Mean	Std. Dev.	Min	Max
LEV	4.549826	.2544136	4.1	4.97
LGDP	8.522957	.2691408	8.1	8.99
LS	4.557043	.2572321	4.1	4.98
LDIP	1.903989	.5090911	1.1	2.56
LIG	3.659361	.062982	3.580145	3.787173

Table 2 provides descriptive statistics for various variables concerning the Country of the Southern Shore of the Mediterranean. The variables included are EV, GDP, S, DIP, and IG. Starting with EV, the mean value is 70.49565, with a standard deviation of 2.956924. The minimum EV recorded is 62, while the maximum value observed is 76. Moving to GDP, the mean value is 3167.339, with a standard deviation of 2760.685. The GDP ranges from a minimum of 626 to a maximum of 14802. For the variable S, the mean value is 74.43478, with a standard deviation of 13.81845. S ranges from a minimum of 42 to a maximum of 86. DIP exhibits a mean value of 249.9652 and a standard deviation of 122.787. The variable ranges from a minimum value of 66 to a maximum of 525. Lastly, IG has a mean value of 49.2256 and a standard deviation of 4.57011. The variable's minimum value is 38.33761, while the maximum is 55.28433. These statistics offer insights into the distribution and variability of each variable within the dataset, providing a foundational understanding of the data related to the Country of the Southern Shore of the Mediterranean.

Table 2: Descriptive Statistics: Country of the Southern Shore of the Mediterranean

Variable	Mean	Std. Dev.	Min	Max
EV	70.49565	2.956924	62	76
GDP	3167.339	2760.685	626	14802
S	74.43478	13.81845	42	86
DIP	249.9652	122.787	66	525
IG	49.2256	4.57011	38.33761	55.28433

Table 3 presents regression results for the country of the north bank of the Mediterranean, focusing on the dependent variable Log Life Expectancy (LEV). The regression is conducted with both fixed effects and random effects models. In the fixed effects model, the coefficients for the independent variables are as follows: The coefficient for the constant term (C) is estimated at 5.654331, with a standard error of 0.1891963, statistically significant at the 1% level. The coefficient for the natural logarithm of GDP (L GDP) is estimated at 0.0373214, also statistically significant at the 1% level. The coefficient for the natural logarithm of schooling years (LS) is estimated at 0.7082387, again statistically

significant at the 1% level. The coefficient for the natural logarithm of infant mortality (LIG) is estimated at -1.060985, statistically significant at the 1% level. However, the coefficient for the natural logarithm of democracy score (LDS) is estimated at -0.0690114 but is not statistically significant at conventional levels. For the random effects model, the coefficients for the independent variables follow a similar pattern but with different standard errors provided in parentheses below the coefficient estimates. The liberty degree (K) is set at 4, with the number of years, countries, and observations all at 23 for both fixed and random effects models. The probability value (Prob) associated with the model is recorded as 0.0000, indicating high statistical significance. These results provide insights into the relationships between various factors and life expectancy in countries on the north bank of the Mediterranean, highlighting the significant influence of GDP, schooling years, and infant mortality, among other factors.

Table 3: country of the north bank of the Mediterranean

Dependant Variable	Fixed effect s	Unpredictable effects
Log life expectancy (LEV)		
C	(5.654331)***	(.1891963)
L GDP	(.0373214)***	(.0190518)***
LS	(.7082387)***	(.8265627)***
LIG	(-1.060985)***	(.1765047)
LDS	(-.0690114)	(.0580154)***
Liberty degree (K)	4	4
Numbers of years	23	23
Numbers of countries	5	5
Numbers of observations	115	115
Prob> X^2(4)	0.0000	

5. CONCLUSIONS

The present study investigated the impact of several key factors on health outcomes, including gross domestic product (GDP), the percentage of children in full-time education, income disparity, and healthcare costs. These variables were examined to assess their influence on health improvement. Throughout the study, significant attention was given to exploring the relationship between income disparity and health. Central to this investigation was the fundamental question of whether income disparity has a measurable effect on the health of individuals. By examining this relationship, the study aimed to contribute to a deeper understanding of the broader determinants of health and potential avenues for intervention or policy development. Through rigorous analysis and discussion, the study aimed to shed light on the complex interplay between socioeconomic factors and health outcomes. By considering variables such as GDP, education levels, income distribution, and healthcare expenditure, the study sought to uncover patterns and trends that could inform efforts to promote better health and reduce health inequalities. The overwhelming majority of studies have consistently shown a statistically significant relationship between income disparity and health outcomes. Empirical evidence from studies conducted across countries, particularly those in the northern Mediterranean region, has highlighted a significant association between income inequality and life expectancy. Specifically, these studies have revealed a negative marginal impact of indicators such as Theil index on the trajectory of life expectancy. These findings underscore the profound influence of income distribution on population health outcomes, with greater income inequality often associated with poorer health outcomes and reduced life expectancy. The empirical evidence suggests that disparities in income distribution can have far-reaching implications for overall population health, highlighting the importance of addressing income inequality as a key determinant of health. By recognizing the significant impact of income inequality on health outcomes, policymakers and healthcare professionals can better understand the complexities of health disparities and develop targeted interventions to promote health equity.

Addressing income inequality through policy measures aimed at reducing disparities and promoting economic opportunities for all segments of society is crucial for improving overall population health and well-being. The findings regarding countries on the southern shore of the Mediterranean Sea present a slightly different picture compared to those observed in the literature. These differences may be attributed to various factors, one of which is the potential impact of income disparity on the overall savings rate of a country. For instance, an increase in income inequality could lead to a higher savings rate if the wealthiest individuals save a larger proportion of their income compared to the poorest individuals. In this scenario, a higher savings rate could translate into increased investment, fostering economic growth and potentially leading to lower poverty rates and improved life expectancy. This alternative perspective suggests that the relationship between income inequality and health outcomes may vary depending on the broader economic context and policy environment of each country. While these findings may diverge from traditional associations between income inequality and health outcomes, they underscore the complexity of the relationship between economic factors and population health. It highlights the need for nuanced analyses that consider various contextual factors when examining the impact of income distribution on health outcomes in different regions and countries. Overall, these insights suggest that the relationship between income inequality and health outcomes is multifaceted and may be influenced by a range of economic, social, and policy factors. Understanding these complexities is essential for developing effective strategies to address health disparities and promote equitable health outcomes across diverse populations.

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