Relationship between Cardiovascular Disease and Low Income Countries

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ABSTRACT:

Background

Country income level impacts the quality and availability of resources in that particular country. This review aims to identify the relationship between economic status of a country and cardiovascular disease rates.

Methods

This paper searched PubMed for original research using key search terms including heart disease, cardiovascular health and low income, low income community, and low income countries. The results were synthesized from five original research papers conducted in economically different countries, such as the United States, Brazil, and Greece.

Results

Low income households had a significant increase of cardiovascular deaths compared to wealthier households. An upbringing in a low socioeconomic community resulted in lower test scores and low level positions.

Discussion

Lower income neighborhoods lack resources and technology. This prevents them from detecting cardiovascular diseases earlier on. With more money in underserved countries, other social determinants of health will also be improved, such as education, food, and environment.

INTRODUCTION:

Significance of the Problem

Cardiovascular death rates have drastically increased since the COVID 19-pandemic, resulting in excess mortality rates in hospitals [1]. Cannata et. al conducted a study where every participant had a cardiovascular disease and 10.4% of the patients in the COVID 19 group died in the hospital compared to 5.4% of patients in the comparator group [2]. Millions of cases of cardiovascular diseases can be prevented annually [2]. Many of these cases are influenced by disparities in cardiovascular disease (CVD) management, including inequalities associated with socioeconomic status and race [3]. Studies show that low-income countries have more

cardiovascular disease [4].

In middle and low income countries, risk factors for poor health outcomes increase, including factors like poorer diet, worse air quality, and lower education rates [5]. With the limited amount of resources, low income countries lack proper medical attention and technology compared to high income countries, resulting in a major difference in health outcomes [6]. In 2005, a global goal of reducing death rates caused by 2% was implemented, and in 2007, a group of researchers set up interventions to estimate the number of deaths caused by cardiovascular deaths and lack of resources in low income countries [7]. Furthermore, the Prospective Urban Rural Epidemiologic (PURE) study gathers a strong correlation of education levels in countries with different overall income levels, but doesn't specify the impact economically different countries have on cardiovascular disease rates [8].

Objectives

This review aims to highlight the relationship between cardiovascular disease rates and the income level of the countries they are found in. Though cardiovascular disease rates and data of the number of deaths caused by cardiovascular diseases have been recorded, there is no clear evidence of the correlation between income level and cardiovascular disease. The paper will demonstrate how countries of different income levels have different CVD rates as well as the role of resource variation in this relationship.

METHODS:

For this review, original papers from PubMed were used. Key search terms were "heart disease", "cardiovascular health" AND "low income", "low income community", and "low income countries AND disease". Inclusion criteria were original research studies with data related to cardiovascular rates and income level. Studies looking at other diseases were excluded. Additionally, review articles, case studies or case series, and articles not in English were excluded.

RESULTS:

Table 1. Summary of the key findings

Study	**Focus**	**Key Findings**	**Relevance**
Lu et al. (2024) [9]	Trends of heart disease and disability-adjusted life years (DALYs) vary in countries with different income levels.	Underdeveloped regions had more concentrated percentages of higher age standardized DALY rates as well as the burden of	Hypertensive heart disease remains an issue despite the decline in wealth inequality.

		hypertensive heart disease.	
Lotufo et al. (2013) [10]	Trends of cardiovascular death rates in various income level households in Sao Paulo, Brazil.	Deaths were higher in low-middle income areas compared to higher ones. Men had higher death rates compared to women regardless of income level.	The amount of deaths vary depending on household income level.
Hahad et al. (2023) [11]	Risks of cardiovascular disease and mortality rates are related to socioeconomic disadvantages.	Cardiovascular disease patients had lower test scores and household income levels.	Low socioeconomic areas have disadvantages for people that are unable to receive aid and impact education.
Kollia et al. (2016) [12]	Comparing the effects of socioeconomic crisis in Attica, Greece on cardiovascular disease rates.	Low income individuals have a 2.7 times more likely chance of developing cardiovascular disease in 10 years.	Socioeconomic status impacts abilities to detect signs of cardiovascular disease.
Ware et al. (2023). [13]	Comparing the rate of cardiovascular disease rate to country income level.	As a country's income level increases, BMI and cholesterol levels decrease.	Higher income countries have more resources to prevent cardiovascular diseases.

The spatial distribution of the burden of hypertensive heart disease (HHD) is prevalent in countries with moderate socio-demographic index (SDI), accounting for 38.72% of the global burden of HHD in terms of DALYs recorded in 2019 [9]. The countries that were affected the most by HHD are China, India, Indonesia, Brazil, and the United States [9]. In 2019, there was a substantial increase in the HHD burden compared to 1990 by 54.25% [9]. However, during this increase, the rise in HHD cases was evenly spread out across the world [9]. A drop in the difference of heart burden between high income and low income countries occurred during 1990 and 2019, where the ISI (Inequality Slope Index) showed a negative correlation between DALY rates and SDI index [9]. Though during the time the burden of HHD as well as the wealth gap decreased regionally in high income and low income countries, the global inequality in hypertensive heart disease remains a constant issue [9].

While researching in Sao Paulo, Brazil from 1996 to 2010, 197,770 deaths were all due to heart disease [10]. Lower household incomes had more cardiovascular deaths compared to higher income households, as low income households had an average of 65.1% coronary heart diseases while high income households had 62.8% coronary heart diseases [10]. The reduction of the age-adjusted death rates was observed in wealthy and low income areas, where the reduction pace was faster in the high income areas [10].

Patients with cardiovascular disease (CVD) who were interviewed in the study had lower socioeconomic score (SES) as well as low education, household income, and occupation [11]. In the 5 to 10 year follow up, patients with low SES scores were positively associated with all cause mortality [11]. Low socioeconomic score was connected to more than a five fold higher risk of CVD mortality after five years [11].

In a study in Attica, Athens, Greece, patients above 45 years old had an increased 10 year CVD incidence [12]. Additionally, low income individuals have a 2.7 times more likely chance of developing cardiovascular disease in 10 years [12]. Low socioeconomic communities were unable to detect cardiovascular diseases due to the inability to pay for tests and screening [12].

Cardiovascular health (CVH) and glycemia showed patterns regarding country income level, cholesterol, and BMI [13]. Education levels for the participants varied greatly based on which low income or high income country they came from [13].

DISCUSSION:

The objective of the paper is to find the relationship between cardiovascular disease rates and country income levels. The results show trends where lower income households have higher cardiovascular disease rates compared to higher income households. Lower income households entail lower scores, education levels, and occupation standards [11]. As lower income countries may not contain the same amount or quality of resources higher income countries have, people living in those countries may not be equipped with the technology necessary to diagnose cardiovascular diseases. The results were expected as lower income communities won't be able to afford the technology and the resources that are needed to identify diseases. Additionally, in low income countries, access to education may be limited, as well as access to healthy diets. Current literature states that there are more cases of cardiovascular disease in lower income neighborhoods compared to higher income neighborhoods [10]. The data is relevant as initiatives can take place in lower income neighborhoods to reduce the wealth inequality. More resources can be given to underdeveloped countries and policy makers can make arrangements with wealthier countries to receive quality resources and technology. Improving the quality of life in lower income neighborhoods can improve other areas of life, including education and environment. Cardiovascular disease rates can be reduced in low income communities with more resources.

REFERENCES:

1. Woodruff, R. C., Tong, X., Khan, S. S., Shah, N. S., Jackson, S. L., Loustalot, F., & Vaughan, A. S. (2024). Trends in Cardiovascular Disease Mortality Rates and Excess Deaths, 2010-2022. *American journal of preventive medicine*, *66*(4), 582–589. https://doi.org/10.1016/j.amepre.2023.11.009
2. Cannata, A., Watson, S. A., Daniel, A., Giacca, M., Shah, A. M., McDonagh, T. A., Scott, P. A., & Bromage, D. I. (2022). Impact of the COVID-19 pandemic on in-hospital mortality in cardiovascular disease: a meta-analysis. European journal of preventive cardiology, 29(8), 1266–1274. https://doi.org/10.1093/eurjpc/zwab119
3. Talha, K. M., Waqar, E., Johnson, H. M., Shapiro, M. D., Nambi, V., Virani, S. S., Mehta, A., Nasir, K., Hall, M. E., Abramov, D., & Minhas, A. M. K. (2024). Relationship between race, income-level, and Cardiovascular Disease. *Journal of the National Medical Association*, *116*(5), 539–552. https://doi.org/10.1016/j.jnma.2024.07.115
4. Timmis, A., Vardas, P., Townsend, N., Torbica, A., Katus, H., De Smedt, D., Gale, C. P., Maggioni, A. P., Petersen, S. E., Huculeci, R., Kazakiewicz, D., de Benito Rubio, V., Ignatiuk, B., Raisi-Estabragh, Z., Pawlak, A., Karagiannidis, E., Treskes, R., Gaita, D., Beltrame, J. F., McConnachie, A., … Atlas Writing Group, European Society of Cardiology (2022). European Society of Cardiology: cardiovascular disease statistics 2021. *European heart journal*, *43*(8), 716–799. https://doi.org/10.1093/eurheartj/ehab892
5. Yusuf, S., Joseph, P., Rangarajan, S., Islam, S., Mente, A., Hystad, P., Brauer, M., Kutty, V. R., Gupta, R., Wielgosz, A., AlHabib, K. F., Dans, A., Lopez-Jaramillo, P., Avezum, A., Lanas, F., Oguz, A., Kruger, I. M., Diaz, R., Yusoff, K., Mony, P., … Dagenais, G. (2020). Modifiable risk factors, cardiovascular disease, and mortality in 155 722 individuals from 21 high-income, middle-income, and low-income countries (PURE): a prospective cohort study. *Lancet (London, England)*, *395*(10226), 795–808. https://doi.org/10.1016/S0140-6736(19)32008-2
6. Radich, J. P., Briercheck, E., Chiu, D. T., Menon, M. P., Sala Torra, O., Yeung, C. C. S., & Warren, E. H. (2022). Precision Medicine in Low- and Middle-Income Countries. *Annual review of pathology*, *17*, 387–402. https://doi.org/10.1146/annurev-pathol-042320-034052
7. Lim, S. S., Gaziano, T. A., Gakidou, E., Reddy, K. S., Farzadfar, F., Lozano, R., & Rodgers, A. (2007). Prevention of cardiovascular disease in high-risk individuals in low-income and middle-income countries: health effects and costs. *Lancet (London, England)*, *370*(9604), 2054–2062. https://doi.org/10.1016/S0140-6736(07)61699-7
8. Rosengren, A., Smyth, A., Rangarajan, S., Ramasundarahettige, C., Bangdiwala, S. I., AlHabib, K. F., Avezum, A., Bengtsson Boström, K., Chifamba, J., Gulec, S., Gupta, R., Igumbor, E. U., Iqbal, R., Ismail, N., Joseph, P., Kaur, M., Khatib, R., Kruger, I. M., Lamelas, P., Lanas, F., … Yusuf, S. (2019). Socioeconomic status and risk of cardiovascular disease in 20 low-income, middle-income, and high-income countries: the Prospective Urban Rural Epidemiologic (PURE) study. *The Lancet. Global health*, *7*(6), e748–e760. https://doi.org/10.1016/S2214-109X(19)30045-2

9. Lu, M., Li, D., Hu, Y., Zhang, L., Li, Y., Zhang, Z., & Li, C. (2024). Persistence of severe global inequalities in the burden of Hypertension Heart Disease from 1990 to 2019: findings from the global burden of disease study 2019. BMC public health, 24(1), 110. https://doi.org/10.1186/s12889-023-17573-9
10. Lotufo, P. A., Fernandes, T. G., Bando, D. H., Alencar, A. P., & Benseñor, I. M. (2013). Income and heart disease mortality trends in Sao Paulo, Brazil, 1996 to 2010. International Journal of Cardiology, 167(6), 2820–2823. https://doi.org/10.1016/j.ijcard.2012.07.006
11. Hahad, O., Gilan, D. A., Chalabi, J., Al-Kindi, S., Schuster, A. K., Wicke, F., Büttner, M., Tüscher, O., Lackner, K. J., Galle, P. R., Konstantinides, S., Daiber, A., Wild, P. S., & Münzel, T. (2024). Cumulative social disadvantage and cardiovascular disease burden and mortality. European Journal of Preventive Cardiology, 31(1), 40–48. https://doi.org/10.1093/eurjpc/zwad264
12. Kollia, N., Panagiotakos, D. B., Georgousopoulou, E., Chrysohoou, C., Tousoulis, D., Stefanadis, C., Papageorgiou, C., & Pitsavos, C. (2016). Exploring the association between low socioeconomic status and cardiovascular disease risk in healthy Greeks, in the years of financial crisis (2002–2012): The ATTICA study. International Journal of Cardiology, 223, 758–763. https://doi.org/10.1016/j.ijcard.2016.08.294
13. Ware, L., Vermeulen, B., Maposa, I., Flood, D., Brant, L. C. C., Khandelwal, S., Singh, K., Soares, S., Jessen, N., Perman, G., Riaz, B. K., Sachdev, H. S., Allen, N. B., & Labarthe, D. R. (2023). Comparison of Cardiovascular Health Profiles Across Population Surveys From 5 High- to Low-Income Countries. CJC open, 6(3), 582–596. https://doi.org/10.1016/j.cjco.2023.11.021