



# CARDIOVASCULAR DISEASES AND ECONOMIC GROWTH: AN EVALUATION WITH BIBLIOMETRIC DATA<sup>1</sup>

Gülay EKİNCİ<sup>1</sup>, Elem EROĞLU<sup>2</sup>, Mustafa Hakan YILMAZTÜRK<sup>3</sup>


<sup>1</sup>Istanbul Sabahattin Zaim University, Faculty of Health Sciences, Health Management. İstanbul, Turkey, gulay.ekinci@izu.edu.tr

( <https://orcid.org/0000-0003-4773-4821>)

<sup>2</sup>Istanbul Sabahattin Zaim University, Faculty of Health Sciences, Health Management. İstanbul, Turkey, elem.eroglu@izu.edu.tr

( <https://orcid.org/0000-0002-0986-9859>)

<sup>3</sup> Health and Hygiene Manager Istanbul Metropolitan Municipality, Istanbul, Turkey, hakan.yilmazturk@ibb.gov.tr,

( <https://orcid.org/0000-0003-2976-1818>)

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\*Corresponding author

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## Abstract

**Introduction:** This study aims to analyze the global distribution, thematic focus, methodological trends, and citation impact of scientific publications situated at the intersection of health and economics. A total of 86 publications retrieved from the Web of Science (WoS) database were examined using bibliometric methods.

**Method:** Relevant academic publications were identified by searching the Web of Science database using the keywords “gdp AND cardiovascular diseases AND burden of diseases.” The data obtained were examined using bibliometric analysis methods. This analysis included criteria such as the distribution of publications by year, the most cited authors, the most frequently used keywords, and the most productive institutions. The analysis results were visualised using VOSviewer software.

**Findings:** The vast majority of the analyzed publications were in English (91.8%) and consisted of original research articles (94.2%). Thematic analysis revealed a strong emphasis on health and environmental topics. The category "Public, Environmental & Occupational Health" accounted for 35.6% of the publications, followed by cardiovascular systems, environmental sciences, and health care services. Geographically, the United Kingdom, the United States, and Russia were the leading contributors. Citation analysis revealed a high academic impact, with an average of 33.0 citations per publication. The studies primarily employed econometric modeling, spatial analysis, cost-effectiveness analyses, and indicators such as DALY, YLL. The most frequently addressed diseases included cardiovascular diseases, diabetes, cancer, and infectious diseases, while major risk factors identified were obesity, smoking, physical inactivity, and environmental exposures. A significant increase in publication volume was observed in the past decade (85% of the studies), indicating a growing scientific interest in this field—particularly in the post-pandemic era. Topics such as health economics, sustainable development, and social determinants of health have gained international attention. These trends underscore the rising importance of interdisciplinary research and its contribution to health policy development.

**Conclusion:** The analyzed publications demonstrate that environmental and public health topics are highly prominent, while other health-related disciplines also provide substantial contributions. This indicates that health research requires a multidisciplinary approach and highlights the importance of collaboration across diverse fields.

**Keywords:** Health economics, Bibliometric analysis, Cardiovascular diseases, Burden of Disease, Environmental factors, Web of Science.

## 1. Introduction

Cardiovascular diseases (CVD) are among the most significant health problems worldwide, causing high morbidity and a decline in quality of life. According to the World Health Organisation, approximately 17.9 million people die each year from cardiovascular causes, accounting for about one-third of all deaths (WHO, 2025). The effects of CVDs are not only felt on the health of individuals but also on the economic structure of societies in both direct and indirect ways. In particular, the disease burden among working-age groups can create serious pressures on economies by leading to labour force loss, increased healthcare expenditures, and reduced productivity. The two-way

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relationship between economic growth and public health has long been a subject of research in the social sciences and health economics. While it is argued that a healthy society increases economic productivity, it is also claimed that economic growth improves individuals' health levels by increasing access to health services (Karabulut, 1999; Çetin and Ecevit, 2010; Suhrcke and Urban, 2010; Carter et al., 2019). However, the nature of this relationship is more complex in the context of chronic diseases, particularly cardiovascular diseases. Understanding the impact of CVDs on the economic system is critical for shaping sustainable development and health policies.

This study aims to examine the relationship between cardiovascular diseases and economic growth in light of the scientific literature, and to analyse the development dynamics, research trends, and scientific collaborations in the field using bibliometric methods. In this way, it is aimed to evaluate the knowledge base in the relevant field and to provide a structural framework that will guide future research. The economic impacts of cardiovascular diseases are increasingly being addressed in the literature on health economics and public policy. Studies have shown that the direct health expenditures, indirect labour losses and effects on productivity caused by CVDs have a negative impact on economic growth, especially in low- and middle-income countries (Suhrcke and Urban, 2010; Carter et al., 2019, Bloom et al., 2014). In developed countries, with the widespread adoption of early diagnosis and treatment methods, the economic effects of CVDs are more often assessed in the context of the care costs of the elderly population (Ekinci, 2024). Macroeconomic studies have shown that improvements in health support economic growth in the long term, but warn that this relationship may be reversed if the burden of chronic diseases increases. In particular, the impact of cardiovascular diseases on parameters such as individual productivity, labour force participation, and early retirement can directly affect economic development processes (Ekinci, 2023). With the increase in scientific publications in recent years, it has become important to answer questions such as which aspects of the relationship between CVD and economic growth are being researched more, and which countries and institutions are contributing to this field. However, the existing literature shows that there are limited bibliometric analyses that evaluate this relationship in a comprehensive manner. The main objective of this study is to analyse how the relationship between cardiovascular diseases and economic growth is addressed in the scientific literature, its development over time, and collaborations using bibliometric methods. The study aims to reveal current trends and potential research gaps by examining the quantitative and structural characteristics of academic production in this field.

## 2. Methods or experimental section

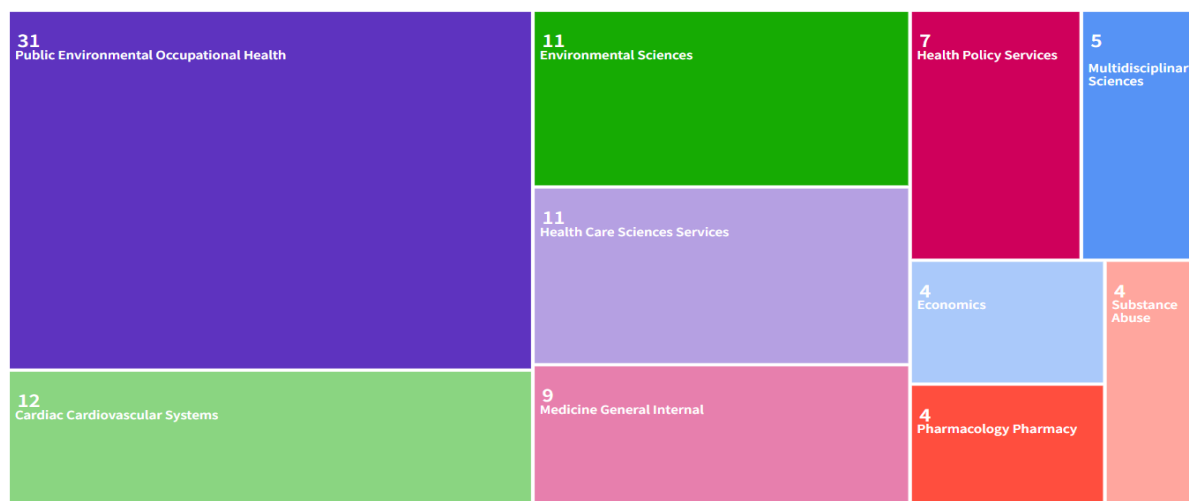
In this study, a literature review was conducted using the Web of Science (WoS) database with the keywords 'GDP AND cardiovascular diseases AND burden of diseases'. The search included research and review articles published between 2003 and 2024. No distinction was made based on the language of publication. This timeframe allows for a comprehensive assessment of the increasing importance of the concept of disease burden in the health economics literature and the dynamics of publications related to the impact of cardiovascular diseases on the global health burden. The academic publications obtained as a result of the search were examined using bibliometric analysis methods. Within the scope of bibliometric analysis, parameters such as changes in the number of publications by year, WoS categories in which the publications were indexed, related research areas, the most frequently encountered keywords, and the most cited studies were evaluated. Through this method, how the concepts of cardiovascular

diseases, GDP (gross domestic product per capita), and disease burden are addressed in the literature, in which disciplines they are concentrated, and their development over time were systematically analysed.

### 3. Results

According to Web of Science data, 86 publications were evaluated within the scope of the research. Of the 86 publications examined, 79 were written in English, 5 in Russian, and 2 in Spanish. Again, 81 of these publications were research articles and 5 were compilations.

The subject distribution of the 86 publications examined shows that health and environment are the most prominent areas. The category with the highest percentage is ‘Public, Environmental & Occupational Health’ (36%), highlighting the interdisciplinary importance of this field. This is followed by ‘Cardiac & Cardiovascular Systems’ (13.9%), ‘Environmental Sciences’ (12.8%), and ‘Health Care Sciences & Services’ (12.8%). This distribution reflects the increasing research interest in the effects of environmental factors on health. In addition, ‘Medicine, General & Internal’ (General and Internal Medicine) at 10.5%, ‘Health Policy & Services’ (Health Policy and Services) at 8.1%, ‘Multidisciplinary Sciences’ (Multidisciplinary Sciences) at 5.8%, and ‘Economics’ and ‘Pharmacology & Pharmacy’ at 4.6%. These data demonstrate that health research encompasses not only biomedical aspects but also social, economic, and political dimensions.



**Figure 1:** Distribution of Publications by Subject, 2003-2024

**References:** <https://www.webofscience.com/>

The countries where the research was published are the United Kingdom (14), the United States (9), Russia (6), the Netherlands (4), Italy (4), Switzerland (4), Germany (3), Brazil and China (2), Canada, Iran, India, Japan, Mexico, Pakistan, Singapore, Australia, Croatia, and Greece (1). The majority of publications appear in scientific journals

based in North America and Europe, reflecting the fact that global scientific production is still concentrated in certain centres, particularly in countries that publish in English. The emergence of developing countries in scientific production indicates an increase in scientific diversity and global collaboration.<sup>2</sup>

The average number of citations these studies received in the WOS category is 29.7 (max: 522; min: 0), while the average number of citations they received from all databases is 33.0 (max: 595; min: 0). The high average number of citations indicates that the publications are generally influential and interesting studies in the academic community. An average value of 33.0 in terms of citations is considered a respectable level, especially in fields such as health or social sciences. The fact that publications receive higher citations in databases other than WOS (Scopus, Google Scholar, etc.) indicates that some publications have high academic accessibility despite not being sufficiently indexed by WoS. The fact that some publications have a minimum citation count of 0 suggests that these publications have not yet gained attention or are very recently published. The high citation impact of the studies and the increasing trend in the number of publications over time indicate that the research field is beginning to mature, has gained universal interest, and that the literature in this field will continue to deepen.

Six of the publications were published between 2003 and 2010; 12 between 2011 and 2015; 34 between 2016 and 2020; and 34 between 2021 and 2024. Publications made in the last 10 years (2016–2024) account for 85% of the total. This situation reveals that scientific interest in the research field has increased significantly, especially in recent years. This increase can be explained by both the international importance of topics such as sustainable development, health economics, and socio-economic determinants, as well as the intensification of global discussions on health systems after the pandemic. The low number of publications in the 2003–2010 period may indicate that the topic had limited presence on the scientific agenda or that the number of indexed journals was low. The fact that the number of publications in the last 4 years (2021–2024) is the same (34 publications) shows that the research pace continues and the topic remains relevant.

Headlines highlighted in relevant publications in light of keywords compiled for publications;

**Research Methods and Modelling:** In the publications examined, econometric modelling, geographically weighted regression techniques, panel-based models and cost-effectiveness analyses are widely used. Additionally, time series analyses and spatial analysis methods, particularly those examining the regional distribution of disease burden and the temporal dynamics of economic-cost relationships, are preferred in research. The combined use of these methods enables the simultaneous modelling of causal relationships between macroeconomic indicators and health outcomes, as well as spatial differences, thereby broadening the scope of the study (Oganov et al., 2011; Baptista et al., 2020; Jyani et al., 2019; He et al., 2023).

**Economics and Cost-Related Themes:** In economics-focused studies, the most commonly used indicators include per capita GDP, cost analyses, the economic burden of the disease, return on investment (ROI), and direct/indirect costs. In this context, cost-effectiveness analyses of clinical interventions (cost-effectiveness analysis, incremental cost-effectiveness ratio, budget impact analysis) have been combined with shuttle models to provide decision-makers with guiding results from a health economics perspective. Thus, the economic-cost dimension is addressed at both the micro level (patient/hospital costs) and the macro level (burden on the national economy), yielding

<sup>2</sup> The publications examined in the study are indicated with an asterisk (\*) in the References

quantitative findings that support budget isolation and prioritisation in health policies (Siqueira et al., 2017; Abushanab et al., 2024; Pichon-Riviere et al., 2016).

**Disease Burden and Epidemiological Measures:** Studies on disease burden use indicators obtained from the World Health Organisation and Global Burden of Disease database; analyses are conducted using age-standardised prevalence rates, disability-adjusted life years (DALYs) from cradle to grave, years of life lost (YLL), and morbidity indicators. Mortality data, particularly focusing on cardiovascular mortality and annual death rates due to chronic diseases, reveal the distribution of the burden over time and space (Muka et al., 2015; Kontsevaya et al., 2018; Feigl et al., 2019; Pallari et al., 2018).

**Biological and Clinical Evaluations:** In studies focusing on biological mechanisms, the main areas of interest are vascular endothelial dysfunction, inflammation, thrombosis, vascular stiffness, and cellular abnormalities. These approaches are linked to surgical methods (coronary angioplasty, cardiac surgery), pharmacological treatments (NSAIDs, RIOCIGUAT, statins), cardiac rehabilitation (home-based and digital therapies), and nutritional interventions (Mg supplements, folic acid, dietary modifications). Thus, a comprehensive perspective on both molecular-cardiovascular pathophysiology and patient care processes is provided (Grantham et al., 2017; Lukenda et al., 2005; Paratz et al., 2021).

**Specific Diseases and Risk Factors:** The majority of studies have focused on cardiovascular diseases (hypertension, coronary artery disease, stroke, atrial fibrillation, etc.). However, other pathologies such as diabetes, chronic kidney disease, oncological diseases (Hodgkin/non-Hodgkin lymphoma, non-melanoma skin cancer, colorectal cancer, breast cancer) and infectious diseases (tuberculosis, HIV, malaria) are also included as comorbidities or in comparative analyses. Risk factors include obesity, body mass index, fat distribution, smoking, lack of physical activity, and environmental exposures (PM2.5, carbon monoxide). These variables are incorporated into multidimensional models both at the individual level in terms of health outcomes and in terms of the relationship between population health and macroeconomic growth (Soares et al., 2013; Maji et al., 2017; Mehrmal et al., 2021; Kang et al., 2003; Nguyen-Thi et al., 2021; Zhang et al., 2022; Zhong et al., 2024).

**Health Systems, Policies, and Interventions:** In health systems and policy-based studies, the impact of national and regional health policies, access to health services, preventive screening strategies, clinical intervention programmes, rehabilitation processes, and the economic sustainability of health systems are examined. Additionally, policy recommendations are developed through health-care disparities, primary and secondary prevention practices, the economic return on infrastructure investments, and health economics reports. In this context, regional distribution analyses and spatial models are used to identify differences in resource management and service access, strategic guidelines for strengthening health systems are provided (Cavalcante et al., 2018; Fray-Aiken et al., 2016; Feigl et al., 2019; Ngalesoni et al., 2017; Ekinici, 2023; Siskind et al., 2010).

**Geographical and Demographic Focus:** The geographical perspective focuses on China, South Africa, Vietnam, Balkan countries such as Croatia, Latin America, and the MENA region in a significant portion of the studies. Since both the epidemiological transition process and economic development dynamics exhibit distinct profiles in these regions, spatial regression models have been employed to account for regional heterogeneity. In terms of demographic groups, analyses of young and elderly populations, gender-specific risk factors, and socioeconomic status variables were used in the models to examine in detail the relationships between health outcomes and

socioeconomic parameters (Iqbal 2012; Bloom et al., 2020; Tomoike et al., 2015; Markovic et al., 2021; Kontsevaya et al., 2018; Gao et al., 2022).

#### 4. Discussion and Conclusion

This study examined how the relationship between cardiovascular diseases, disease burden, and economic growth is addressed in the literature using bibliometric methods. The analysis, conducted on publications in the Web of Science database between 2003 and 2024, revealed that academic production in this field has increased over the years and has been shaped by an interdisciplinary approach. While a large portion of the studies focused on public health, environmental health, and health services management, more specific topics such as cardiovascular system diseases and health policies also occupied an important place. The fact that the majority of the analysed publications originated from developed countries indicates that the relationship between CVD and economic growth is primarily addressed within the framework of these countries' health systems and economic dynamics. The small number of studies from developing countries may be due to data gaps, limited research resources, or differences in the prioritisation of health policies in these countries. However, this situation also points to a significant research gap, given the high disease burden in these countries. The high number of citations in publications indicates that the subject matter has attracted academic interest and has had a strong impact on the literature. However, it has been observed that some topics (e.g., substance abuse, psychiatry, nutrition, demography, etc.) are not adequately represented in this literature. Studies in these areas will contribute to a better understanding of the multidimensional nature of cardiovascular diseases. In this context, the following recommendations can be made based on the main findings of the study:

- The economic impacts of cardiovascular diseases vary from country to country. Therefore, research based on local data and reflecting regional characteristics should be encouraged.
- The relationship between CVD and economic growth should be considered not only in medical terms but also in terms of sociological, economic, environmental, and political factors. Therefore, collaboration between health economists, public health experts, environmental scientists, and policymakers should be increased.
- Evidence in the literature shows that CVD can have serious effects on macroeconomic growth. Therefore, data obtained from scientific research should be used effectively in determining health policies, and preventive strategies should be developed to reduce the burden of disease.
- It is recommended that bibliometric analyses be updated periodically. This will enable the direction of scientific production, emerging trends, collaboration networks, and research gaps to be continuously monitored.

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#### CONFLICT OF INTEREST

The authors must declare that they have any conflict of interest.

## AUTHOR STATEMENT

The authors have to declare that if there is any ethical approval, consent to participate, consent for publication, availability of data and material, and code availability etc.

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