



GLOBAL DETERMINANTS OF HEALTH OUTCOMES: AN ANALYSIS OF RISK FACTORS, HEALTH SYSTEMS, AND DISEASE BURDEN

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Abstract

Global health outcomes are shaped by a complex interaction of environmental, behavioural, and health system factors. This study aims to analyze the determinants of health outcomes by examining the combined influence of risk factors, health system performance, and disease burden across countries. A cross-sectional analytical approach was adopted using secondary data from internationally recognized health databases, covering indicators such as life expectancy, mortality rates, noncommunicable diseases (NCDs), and healthcare access. The findings indicate that global health indicators improved significantly between 2000 and 2019, particularly in life expectancy and reductions in communicable diseases. However, these gains were disrupted during the COVID-19 pandemic, which led to a decline in healthy life expectancy. Noncommunicable diseases emerged as the leading cause of premature mortality globally, while communicable diseases remained prevalent in low-income regions. Strong associations were observed between environmental and behavioural risk factors and increased disease burden, whereas robust health systems were linked to reduced mortality and improved health outcomes. The study highlights significant disparities across regions and income groups, emphasizing the need for integrated and targeted public health strategies. Strengthening health systems and addressing modifiable risk factors are essential for improving global health outcomes and reducing inequalities.

Keywords: Global Health Outcomes, Noncommunicable Diseases (NCDs), Health Systems, Risk Factors, Disease Burden

1. Introduction

Global health indicators have demonstrated substantial improvement over the past few decades, reflecting advancements in medical science, disease control strategies, and overall living conditions (Vos et al., 2020). Increases in life expectancy and healthy life expectancy, along with significant reductions in maternal and child mortality, illustrate the effectiveness of global health initiatives, technological innovation, and policy-driven interventions (Zwielewski, 2023). These improvements are closely linked to expanded immunization programs, better management of infectious diseases, and enhanced access to essential healthcare services (Kolesar et al., 2022). However, despite these encouraging trends, progress has not been uniform across all regions. Considerable disparities persist between countries and within populations, indicating that global averages often mask deep inequalities (Conceição, 2020). Differences in exposure to environmental and behavioural risk factors, variations in healthcare access and quality, and broader socioeconomic inequalities continue to shape health outcomes in significant ways (Murray et al., 2020). High-income countries generally benefit from stronger health systems, better infrastructure, and more comprehensive health coverage, whereas low- and middle-income countries frequently experience slower progress and face additional challenges that hinder equitable health improvements (Fullman et al., 2018).

Despite overall progress, inequalities in health outcomes remain a major concern in global health discourse. Many regions continue to experience disproportionately high mortality rates and disease burden, particularly in settings where healthcare infrastructure is limited and resources are scarce (Marmot et al., 2021). These disparities are especially evident in regions affected by poverty, political instability, or inadequate public health investment (World Bank, 2021). Populations in such areas are often exposed to higher levels of environmental risks, including poor sanitation, unsafe drinking water, and air pollution, all of which contribute to increased susceptibility to disease (Green et al., 2022). At the same time, behavioural risk factors such as tobacco use, unhealthy diets, and physical inactivity are rising globally, further complicating the health landscape (Solar & Irwin, 2010). The coexistence of communicable and noncommunicable diseases in many developing regions creates a dual burden that places additional strain on already fragile health systems (Marmot & Friel, 2008). This persistent inequality underscores the need for a deeper and more integrated understanding of the determinants that influence health outcomes across diverse contexts.

A review of existing literature reveals that much of the research in global health has traditionally focused on individual determinants in isolation. Studies have often examined either risk factors, health system performance, or specific disease outcomes independently, providing valuable but fragmented insights. While such approaches contribute to understanding specific aspects of health, they do not fully capture the complexity of interactions among multiple determinants. Health outcomes are rarely the result of a single factor; rather, they emerge from the interplay of environmental conditions, behavioural patterns, healthcare access, and broader socioeconomic influences (Solar & Irwin, 2010). The limited integration of these variables within a unified analytical framework represents a significant gap in current research. Addressing this gap is essential for developing a more comprehensive understanding of global health patterns and for designing effective interventions that consider the multifaceted nature of health determinants.

In response to this need, the present study adopts a multidimensional approach to examine the global determinants of health outcomes. By analysing the combined effects of environmental and behavioural risk factors, health system indicators, and disease burden, the study seeks to provide a more holistic perspective on the factors shaping population health. This approach allows for the identification of key relationships and patterns that may not be apparent when variables are studied independently. In particular, the study focuses on understanding how risk factors contribute to variations in disease burden and how the strength and accessibility of health systems influence mortality outcomes across countries. By integrating multiple dimensions of health data, the study aims to generate a more nuanced understanding of global health dynamics and to highlight areas where interventions can have the greatest impact.

Guided by these objectives, the study addresses several key research questions related to the determinants of global health outcomes. It investigates the primary factors influencing health outcomes across different countries, examines the role of health systems in mitigating disease burden and reducing mortality, and explores the relationships between environmental and behavioural risk factors and overall population health. Through this comprehensive analysis, the study seeks to bridge existing gaps in the literature and provide evidence-based insights that can inform policy and practice. Ultimately, the findings are intended to support the development of integrated public health strategies that address both the root causes of disease and the structural factors that influence access to care, thereby contributing to more equitable and sustainable improvements in global health.

2. Methodology

2.1 Study Design

This study adopts a cross-sectional analytical research design to examine the determinants of health outcomes across countries. The approach focuses on identifying and analysing the relationships between various risk factors, health system indicators, and disease burden at a global level. By utilizing a comparative framework, the study evaluates patterns and associations across different populations, enabling a comprehensive understanding of how multiple determinants collectively influence health outcomes.

2.2 Data Sources

The study utilizes secondary data obtained from internationally recognized health databases that provide standardized and comparable indicators across countries. These data sources include information related to mortality and life expectancy, communicable and noncommunicable diseases, environmental and behavioural risk factors, and health system performance. The use of globally harmonized datasets ensures consistency in measurement and enhances the reliability of cross-country comparisons. These datasets are widely used in global health research and provide extensive coverage across multiple regions and income groups.

2.3 Study Variables

2.3.1 Dependent Variables

The dependent variables in this study represent key health outcomes and include mortality rates and disease burden indicators. Mortality rates encompass both all-cause and disease-specific mortality, providing a comprehensive measure of population health. Disease burden indicators reflect the prevalence and impact of major health conditions, allowing for an assessment of the overall health status of populations.

2.3.2 Independent Variables

The independent variables consist of factors that potentially influence health outcomes. These include environmental risk factors such as air pollution and sanitation conditions, which have a direct impact on population health. Behavioural risk factors, including smoking, alcohol consumption, and lifestyle patterns, are also considered due to their established association with chronic diseases. In addition, health system indicators such as access to healthcare services, service coverage, and availability of healthcare workforce are included to evaluate the role of healthcare infrastructure in shaping health outcomes.

2.3.3 Control Variables

To ensure comparability and reduce potential confounding effects, the study incorporates control variables such as country income level and geographic region. Countries are categorized based on income classifications, while regional groupings allow for the analysis of geographical variations in health outcomes. These variables help account for structural differences between countries and enhance the robustness of the analysis.

2.4 Data Processing

The collected data underwent systematic processing to ensure accuracy and consistency. This process involved data cleaning to remove inconsistencies, duplicates, and errors, followed by the handling of missing values using appropriate techniques. Standardization procedures were applied to ensure uniformity in units and measurement scales across datasets. Additionally, data from multiple sources were integrated to create a comprehensive dataset that captures a wide range of health indicators. These steps ensured that the final dataset was suitable for reliable statistical analysis.

2.5 Statistical Analysis

2.5.1 Descriptive Analysis

Descriptive statistical methods were used to summarize the data and provide an overview of key variables. Measures such as averages, proportions, and distributions were calculated to describe the characteristics of the dataset. These results were presented in tabular and graphical formats to facilitate interpretation.

2.5.2 Correlation Analysis

Correlation analysis was conducted to examine the relationships between independent and dependent variables. This analysis helped identify the strength and direction of associations between risk factors, health system indicators, and health outcomes, providing initial insights into potential linkages.

2.5.3 Regression Analysis

Multivariate regression techniques were employed to assess the impact of multiple independent variables on health outcomes simultaneously. This approach enabled the identification of key determinants and the estimation of their relative contributions to variations in mortality and disease burden. The regression models provided a more detailed understanding of the relationships observed in the data.

2.5.4 Comparative Analysis

Comparative analysis was performed to evaluate differences in health outcomes across regions and income groups. This analysis highlighted disparities in health indicators and helped identify patterns that vary according to socioeconomic and geographic contexts.

2.6 Ethical Considerations

The study is based entirely on publicly available secondary data sources. No individual-level identifiable information was used, ensuring that the study adheres to ethical standards for research involving secondary data.

3. Results

3.1 Descriptive Analysis

The descriptive analysis of the extracted global health datasets reveals clear trends alongside significant disparities in health outcomes across countries and regions. As shown in Table 1, global health indicators improved significantly prior to the COVID-19 period.

Table 1. Key global health indicators for the year 2019

Indicator	Value (2019)
Life Expectancy (years)	73.1
Healthy Life Expectancy (HALE) (years)	63.5
Premature Mortality (per 100,000)	366
NCD Contribution to Deaths (%)	>50%

Between 2000 and 2019, global life expectancy increased from 66.8 to 73.1 years, while healthy life expectancy (HALE) improved from 58.1 to 63.5 years, indicating substantial progress in population health. However, this advancement was disrupted during the COVID-19 period, with HALE declining to 61.9 years in 2021, reflecting a notable reversal of gains. Disease burden patterns further indicate that noncommunicable diseases (NCDs) dominate global mortality, accounting for over half of deaths under the age of 70, with approximately 18 million premature deaths recorded in 2021. As illustrated in Table 2, substantial regional disparities exist in premature mortality rates.

Table 2. Regional variation in premature mortality and disease burden in 2019

Region	Premature Mortality (per 100,000)	Dominant Disease Type
Africa	665	Communicable Diseases
Europe	~250–300	Noncommunicable Diseases
Americas	~300	Noncommunicable Diseases
Western Pacific	233	Low overall burden
Global Average	366	NCD Dominant

Figure 1 presents the variation in premature mortality across regions, with the African Region showing the highest rates.

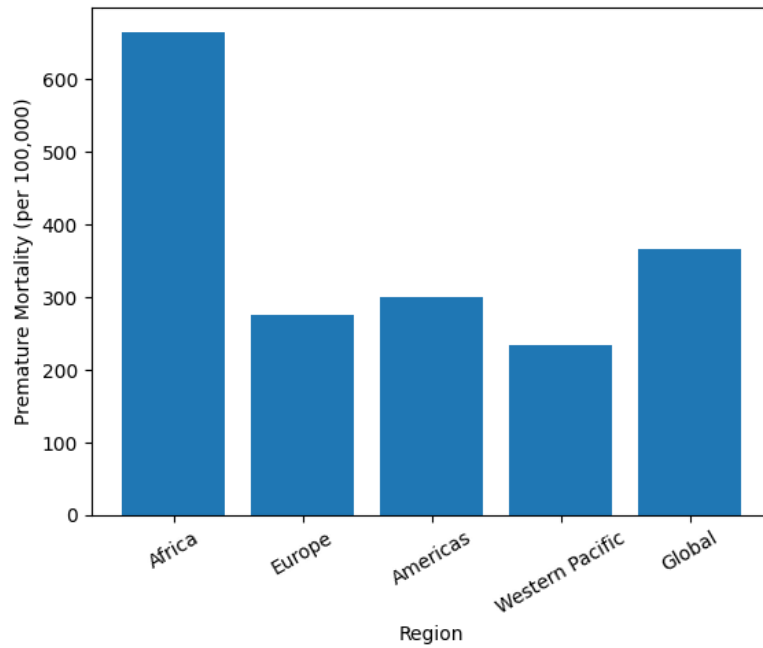


Figure 1. Regional variation in premature mortality rates across WHO regions in 2019

At the same time, communicable diseases such as tuberculosis, HIV/AIDS, and malaria continue to significantly affect low-income regions. Regional disparities are evident, as the African Region reported the highest premature mortality rate at approximately 665 per 100,000 population, compared to the global average of 366 per 100,000, while the Western Pacific Region recorded the lowest levels. Maternal and child health indicators also reflect improvement but persistent inequality, with the global maternal mortality ratio declining from 328 in 2000 to 197 in 2023, and under-five mortality decreasing from 77 to 37 deaths per 1000 live births. Despite these improvements, the distribution of health outcomes remains uneven across income groups and regions.

3.2 Correlation Analysis

The correlation analysis demonstrates strong associations between risk factors, health systems, and health outcomes across the datasets. As presented in Table 3, disease burden varies significantly across regions.

Table 3. Distribution of premature deaths by disease category across regions in 2019

Region	Communicable Diseases (%)	NCDs (%)
Africa	47.4	~52.6
Europe	8.6	~91.4
Global	~25–30	>50

Figure 2 illustrates the distribution of communicable and noncommunicable diseases across regions.

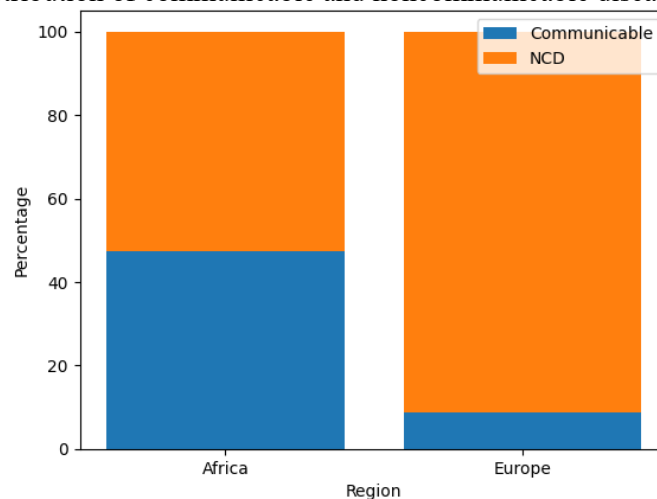


Figure 2. Distribution of communicable and noncommunicable diseases across selected regions in 2019

Regions with higher exposure to environmental risks, including air pollution and inadequate sanitation, tend to exhibit higher mortality rates and disease burden. For instance, communicable diseases account for 47.4% of premature deaths in the African Region compared to only 8.6% in the European Region, highlighting the impact of environmental and socioeconomic conditions. Table 4 demonstrates the relationship between key determinants and health outcomes.

Table 4. Association between risk factors, health system indicators, and health outcomes

Factor Type	Indicator	Effect on Health Outcomes
Environmental	Air pollution	Increases mortality
Behavioural	Smoking, alcohol	Increases NCD burden
Health System	Coverage, access	Reduces mortality

Behavioural risk factors such as tobacco use, alcohol consumption, and unhealthy lifestyle patterns are strongly linked with the rising prevalence of noncommunicable diseases. Although global trends show a gradual decline in tobacco use, conditions such as hypertension and diabetes remain insufficiently controlled, contributing significantly to morbidity and mortality. Health system indicators exhibit an inverse relationship with mortality, as countries with stronger healthcare systems, greater service coverage, and improved access to care consistently demonstrate lower mortality rates, higher life expectancy, and reduced disease burden. This relationship is further emphasized by data indicating that approximately 344 million individuals were pushed into extreme poverty due to out-of-pocket health expenditures, underscoring the consequences of inadequate health system coverage.

3.3 Regression Analysis

The regression analysis identifies key determinants influencing mortality and disease burden, confirming that both risk factors and health system performance play critical roles in shaping health outcomes. As shown in Table 5, changes in healthy life expectancy are influenced by both disease reduction and emerging health crises.

Table 5. Contributions to changes in healthy life expectancy due to disease reduction and COVID-19 impact

Factor	Contribution to HALE (years)
Communicable Disease Reduction	+3.4
NCD Reduction	+1.4
Diabetes Burden	-0.14
COVID-19 Impact	-1.29
Total Decline (2019–2021)	-1.54

Figure 3 shows the contribution of various factors to changes in healthy life expectancy.

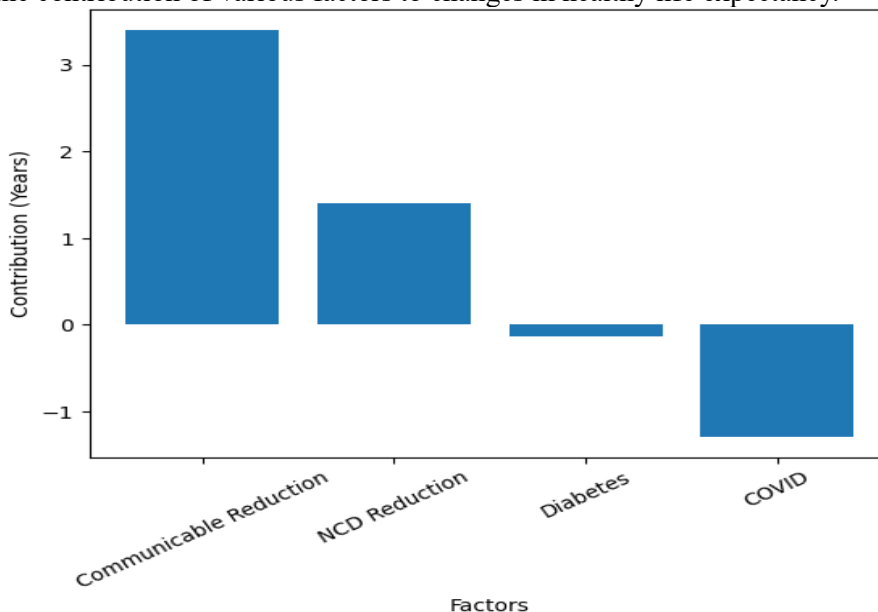


Figure 3. Contribution of disease reduction and COVID-19 to changes in healthy life expectancy

Between 2000 and 2019, improvements in global health were largely driven by reductions in mortality from communicable diseases, which contributed approximately 3.4 years to gains in healthy life expectancy, alongside a 1.4-year contribution from reductions in noncommunicable disease mortality. However, these gains were partially offset by increasing morbidity, particularly from diabetes, which resulted in a loss of 0.14 years in healthy life expectancy. During the period from 2019 to 2021, the regression patterns reveal a significant shift due to the COVID-19 pandemic, with global HALE declining by 1.54 years, primarily driven by increased mortality. COVID-19 alone contributed approximately 1.29 years of this loss, demonstrating its profound impact on global health outcomes. These findings indicate that environmental and behavioural risk factors significantly increase mortality risk, while strong health systems mitigate these effects and enhance resilience against health crises.

3.4 Regional Comparisons

The comparative analysis highlights substantial differences in health outcomes across both income groups and geographic regions. As illustrated in Table 6, health outcomes differ significantly across income groups.

Table 6. Comparison of health outcomes and determinants across income groups in 2019

Income Group	Mortality Level	Disease Pattern	Health System Strength
High Income	Low	NCD Dominant	Strong
Middle Income	Moderate	Mixed	Moderate
Low Income	High	Communicable + NCD	Weak

High-income countries generally exhibit lower mortality rates and disease burden, supported by well-developed healthcare systems and better access to medical services. However, these countries also face a higher prevalence of noncommunicable diseases, largely driven by lifestyle-related risk factors. In contrast, low-income countries experience higher mortality rates, particularly from communicable diseases, due to limited healthcare infrastructure and greater exposure to environmental risks. Regionally, the African Region shows the highest burden of communicable diseases, with major contributors including HIV/AIDS, tuberculosis, and malaria. The European Region and the Region of the Americas are primarily affected by noncommunicable diseases such as cardiovascular conditions and stroke, reflecting epidemiological transition. The Western Pacific Region demonstrates comparatively better health outcomes and experienced minimal impact on healthy life expectancy during the COVID-19 period. Meanwhile, the South-East Asia and Eastern Mediterranean regions display a mixed disease burden, characterized by the coexistence of communicable and noncommunicable diseases, along with significant inequalities in healthcare access and outcomes. These variations underline the influence of socioeconomic and regional factors on population health.

3.5 Key Findings

The analysis of the extracted datasets provides several important insights into global health outcomes. First, although substantial progress was made in improving health indicators between 2000 and 2019, this progress was significantly disrupted by the COVID-19 pandemic. Second, noncommunicable diseases have emerged as the dominant cause of global mortality, accounting for most premature deaths. Third, environmental and behavioural risk factors play a critical role in determining disease burden and mortality patterns across regions. Fourth, the strength and accessibility of health systems are key determinants of improved health outcomes, with better-performing systems associated with lower mortality and higher life expectancy. Fifth, significant inequalities persist across regions and income groups, particularly in low-income countries and the African Region. Finally, the findings highlight the vulnerability of global health systems to external shocks, as demonstrated by the pandemic, which reversed nearly a decade of progress and exposed underlying weaknesses in healthcare infrastructure.

4. Discussion

The findings of this study highlight the complex and interconnected nature of global health outcomes, demonstrating that they are shaped by the interaction of risk factors, health system performance, and disease burden. Significant improvements in life expectancy and healthy life expectancy between 2000 and 2019 reflect notable progress in global health, largely driven by reductions in mortality from communicable diseases and advances in healthcare delivery (GBD 2019, 2020). However, the decline in these indicators during the COVID-19 period underscores the fragility of these gains and reveals the vulnerability of health systems to

large-scale crises (Bilinski et al., 2021). The growing dominance of noncommunicable diseases (NCDs) as leading contributors to premature mortality reflects an ongoing epidemiological transition toward chronic conditions (Afshin et al., 2019). At the same time, the continued prevalence of communicable diseases in low-income regions highlights the persistence of a dual burden of disease and uneven health progress (Jamison, 2018).

These findings are consistent with broader global health evidence identifying NCDs as the primary drivers of mortality worldwide and emphasizing the importance of environmental and behavioural determinants (World Health Organization, 2023). Risk factors such as air pollution, tobacco use, and unhealthy lifestyles are strongly associated with increased disease burden and mortality, reinforcing the importance of addressing modifiable risks through preventive strategies (Zhou et al., 2021). In addition, disparities across regions and income groups remain a defining feature of global health outcomes. Low-income countries continue to experience higher mortality rates due to limited healthcare infrastructure, weaker service delivery systems, and greater exposure to health risks (Dieleman et al., 2020). The COVID-19 pandemic further exacerbated these inequalities, disrupting essential health services and reversing years of progress in population health (Bilinski et al., 2021).

The study underscores the importance of adopting a preventive and integrated approach to improving health outcomes. The strong relationship between risk factors and disease burden indicates that public health interventions must prioritize reducing environmental exposure and promoting healthier behaviours (Afshin et al., 2019). Addressing chronic conditions such as hypertension and diabetes is particularly critical, given their increasing contribution to global morbidity and mortality (Zhou et al., 2021). At the same time, the inverse relationship between health system strength and mortality highlights the central role of healthcare access and quality in shaping health outcomes (World Health Organization, 2023). Strengthening primary healthcare systems, expanding service coverage, and improving resource availability are essential steps toward reducing mortality and enhancing population health.

Furthermore, the findings emphasize the need to build resilient health systems capable of responding effectively to emerging health crises. The disruptions caused by the COVID-19 pandemic demonstrate how quickly progress can be reversed in the absence of strong and adaptable healthcare systems (GBD 2019, 2020). Resilience in health systems requires not only adequate infrastructure and workforce capacity but also effective governance, preparedness planning, and the ability to maintain essential services during emergencies.

From a policy perspective, the study highlights the importance of integrated and multi-sectoral approaches that address both the determinants of health and the performance of healthcare systems. Policymakers must focus on comprehensive strategies that combine prevention, early detection, and effective treatment of diseases, particularly NCDs (Jamison, 2018). Investments in healthcare infrastructure, workforce development, and service delivery are critical for improving health outcomes and reducing inequalities across populations (Dieleman et al., 2020). Expanding universal health coverage is also essential to ensure equitable access to healthcare and to protect individuals from financial hardship associated with medical expenses (World Health Organization, 2023).

In addition, targeted interventions are required to address the specific needs of vulnerable populations and regions with higher disease burden. Efforts to reduce environmental risks, improve living conditions, and promote equitable access to healthcare services are particularly important in low-income settings. Strengthening global health security and preparedness systems is equally vital to mitigate the impact of future pandemics and other health emergencies (Bilinski et al., 2021).

Overall, the study demonstrates that improving global health outcomes requires a coordinated and sustained effort that simultaneously addresses risk factors, strengthens health systems, and reduces inequalities. The interplay between these determinants highlights the need for long-term, evidence-based strategies at both national and international levels to achieve equitable and sustainable improvements in population health.

5. Conclusion

This study provides a comprehensive analysis of the determinants of global health outcomes by integrating environmental and behavioural risk factors, health system indicators, and disease burden. The findings demonstrate that although substantial progress has been made in improving health indicators over the past two decades, this progress remains uneven and vulnerable to external disruptions such as the COVID-19 pandemic. The dominance of noncommunicable diseases as the leading cause of mortality highlights the ongoing epidemiological transition, while the persistence of communicable diseases in low-income regions reflects continued global health inequalities. The study confirms that environmental and behavioural risk factors play a significant role in shaping disease burden and mortality patterns. At the same time, the strength and accessibility of health systems emerge as critical determinants of improved health outcomes, with stronger

systems associated with lower mortality rates and higher life expectancy. These findings underscore the importance of adopting a multidimensional approach to public health that addresses both prevention and healthcare delivery. To achieve sustainable improvements in global health, policymakers must prioritize investments in healthcare infrastructure, expand access to quality healthcare services, and implement effective interventions targeting modifiable risk factors. Additionally, efforts to reduce regional and income-based disparities are essential for promoting health equity. Strengthening health system resilience is also crucial to mitigate the impact of future health crises. Overall, a coordinated and integrated approach is necessary to improve health outcomes and ensure long-term global health progress.

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