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Regular Article

Economic inequality and corruption as social determinants of health: An empirical analysis across 136 countries (2001–2020)

Chun Kai Leung [a,b,c,1,*], Jeremy Ko [d,**,1], Fangzheng Liang [e], Wai Kit Ming [f]

[a] Global Sustainability and Society Lab, The Faculty of Social Sciences, The University of Hong Kong, Hong Kong
[b] Institute for the Humanities and Social Sciences, The University of Hong Kong, Hong Kong
[c] Fairbank Center, Faculty of Arts and Sciences, Harvard University, Cambridge MA, USA
[d] Center for Comparative and International Studies, ETH Zurich, Switzerland
[e] Department of Economics, University of Wisconsin-Madison, Madison, WI 53706, USA
[f] Department of Infectious Diseases and Public Health, City University of Hong Kong, Hong Kong

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ABSTRACT

This study examines the compounded effects of corruption and economic inequality on public health outcomes across 136 countries from 2001 to 2020. By employing panel regression analysis with fixed effects on data from Transparency International's Corruption Perceptions Index, the World Inequality Database's post-tax income Gini coefficient, and health indicators from the World Bank, the study reveals that corruption and inequality independently worsen health outcomes. More importantly, their interaction exacerbates these effects, highlighting a structural synergy that restricts access to essential health resources and disproportionately harms already vulnerable populations. The findings indicate that this compounded impact is most severe in low- and lower-middle-income countries, where systemic governance failures intersect with structural inequities to undermine health systems. Robustness checks using alternative health indicators and econometric methods strengthen the validity of the conclusions. By emphasizing the systemic interplay between governance and economic structures, this study challenges reductionist approaches to public health that overlook broader structural determinants. The results underscore the urgent need for integrated policy interventions targeting both corruption and inequality to mitigate health disparities and advance global health equity. These findings call for a global rethinking of governance and economic priorities in addressing structural health inequities.

1. Introduction

Economic inequality and corruption are two deeply entrenched structural determinants of health that profoundly influence public health outcomes worldwide. Despite notable advancements in global health—such as increased life expectancy and declining child mortality rates—many populations remain vulnerable due to systemic inequities in healthcare access and utilization. These disparities are not merely accidental or isolated phenomena but are products of governance failures, economic systems that prioritize profit over equity, and socio-political dynamics that perpetuate exclusion. The World Health Organization (WHO) has emphasized the importance of addressing these structural determinants, yet global health policy often underestimates the interconnectedness of governance quality, economic inequality, and public health outcomes (see Table 1).

This study aims to investigate the compounded effects of corruption and economic inequality on population health, focusing on how their interaction exacerbates adverse health outcomes. While existing research has extensively explored these factors independently, there is limited understanding of how they interact to produce complex and compounded effects. This gap is particularly concerning given the persistence of health inequities in countries with weak governance and high inequality. By addressing this gap, the study critiques existing health frameworks that often overlook systemic interdependencies and calls for a more integrated approach to tackling structural health determinants.

* Corresponding author. Room 221, May Hall, The University of Hong Kong, Hong Kong.
** Corresponding author. Haldeneggsteig 4, 8092 Zürich. Switzerland.
E-mail addresses: ckleungz@hku.hk (C.K. Leung), jereko@ethz.ch (J. Ko).
[1] Co-First Authors.

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1.1. Economic inequality and health

Economic inequality, defined as the unequal distribution of income or wealth within a society, affects health through mechanisms of relative deprivation. Wilkinson and Pickett (2009) argue that heightened inequality generates psychosocial stress, eroding social cohesion and trust, which in turn negatively affects mental and physical health. This "relative deprivation hypothesis" highlights that inequality is not only about material scarcity but also about social positioning, power dynamics, and perceptions of unfairness. Individuals who perceive themselves as disadvantaged experience chronic stress, reduced opportunities for upward mobility, and diminished access to healthcare, compounding their vulnerability to adverse health outcomes.

While globalization and technological advancements have reduced between-country inequality, they have often exacerbated within-country disparities, particularly in low- and middle-income regions. Policies that prioritize market liberalization without addressing systemic inequities have disproportionately benefited elites while leaving marginalized groups with limited access to healthcare and greater exposure to health shocks. By interrogating how inequality interacts with governance failures, this study critiques the structural dimensions of inequality and its implications for public health, challenging conventional narratives that attribute disparities solely to economic underdevelopment.

1.2. Corruption and health

Corruption, broadly defined as the misuse of public power for private gain, reflects deeper governance failures that distort resource allocation and erode institutional trust. In the healthcare sector, corruption manifests in practices such as bribery, embezzlement, and favoritism, which disproportionately affect marginalized populations. For example, embezzled funds intended for public health infrastructure exacerbate resource scarcity, increase the cost of medical services, and divert resources from underserved communities to elites or private interests.

Existing research demonstrates that corruption correlates with increased mortality rates, lower life expectancy, and reduced healthcare quality (Factor & Kang, 2015; Hsiao et al., 2019). However, these studies often treat corruption as an isolated variable, neglecting its entanglement with broader structural factors such as economic inequality and global financial flows. By focusing on the interplay between corruption and inequality, this study challenges "reductionist" approaches (Wilkinson & Pickett, 2009) that fail to interrogate the systemic conditions enabling corruption, including international financial systems, weak accountability mechanisms, and the capture of state resources by elites.

1.3. Interaction effects: corruption and economic inequality

This study advances the literature by analyzing the interaction between economic inequality and corruption, arguing that their combined effects are more detrimental to public health than their individual impacts. The interplay between relative and actual deprivation provides the theoretical foundation for this analysis. While economic inequality fosters psychosocial stress and limits access to healthcare, corruption amplifies these effects by creating actual deprivation—misallocating resources, weakening institutions, and exacerbating inequality-driven disparities. Together, these forces form a feedback loop that intensifies health inequities, particularly in governance-challenged contexts.

For example, in countries with pervasive corruption, public health resources are often siphoned off or misallocated, disproportionately affecting low-income groups. This amplifies the stress, exclusion, and anxiety already caused by economic inequality, undermining collective health outcomes. The compounded effects of corruption and inequality challenge the efficacy of siloed policy interventions, revealing the need for systemic approaches that address these interconnected structural determinants.

1.4. Research objectives and hypotheses

The primary research question guiding this study is: Does the interaction between corruption and economic inequality exacerbate adverse public health outcomes? To address this question, the study tests the following hypotheses:

- **H1**: Higher levels of corruption are associated with poorer population health outcomes.
- **H2**: Higher levels of economic inequality are associated with poorer population health outcomes.
- **H3**: The combined effects of corruption and economic inequality exacerbate negative public health outcomes, leading to higher infant mortality, higher under-five mortality, and lower life expectancy.

These hypotheses engage with existing frameworks, challenging the assumption that corruption and inequality are merely additive factors. Instead, they are conceptualized as interacting variables that co-produce structural barriers to equitable health outcomes.

1.5. Contribution to the literature

This study contributes to the literature in three significant ways. First, it bridges two distinct but interconnected research streams: the effects of corruption on health and the effects of inequality on health. By integrating these perspectives, it critiques the fragmentation of existing research and emphasizes the need for a holistic understanding of

Table 1
Descriptive statistics of variables used in the study.

Variable	Mean	S.D.	Minimum	Maximum	Source
Infant Mortality Rate (logged)	3.1605	1.0841	0.0000	5.2470	World Bank (2023)
Under Five Mortality Rate (Logged)	3.4241	1.1692	0.6931	5.8319	World Bank (2023)
Life Expectancy (logged)	4.1995	0.1592	2.6462	4.4485	World Bank (2023)
Corruption (logged)	3.9412	0.5565	0	4.5643	Transparency International (2024)
Economic Inequality	0.5162	0.1296	0.1243	0.7500	World Inequality Database (2024)
Democracy	2.1800	7.0132	−10.0000	10.0000	Marshall and Gurr (2022)
Natural Resources (logged)	0.6610	2.1397	−4.6052	4.4840	World Bank (2023)
Economic Development (logged)	8.0716	1.6412	3.1290	12.2264	World Bank (2023)
Population (logged)	1.4921	2.2050	−4.6052	7.2521	World Bank (2023)
Birth Rate (logged)	1.0870	0.5356	−0.2357	2.1815	World Bank (2023)
Urbanization (logged)	3.8629	0.5511	1.4679	4.6052	World Bank (2023)
Government Spending (logged)	2.7081	0.4124	0.7178	4.3760	World Bank (2023)
Educational Level (logged)	4.5628	0.2584	2.6391	5.1191	World Bank (2023)
Foreign Direct Investment (logged)	0.6059	1.5167	−4.6052	7.1567	World Bank (2023)

All variables are logged in the regression analysis except for Democracy and Economic Inequality.

Table 2
Correlation matrix of variables used in the study.

	Infant Mortality Rate	Under Five Mortality Rate	Life Expectancy	Corruption	Economic Inequality	Democracy	Natural Resources	Economic Development	Population	Birth Rate	Urbanization	Government Spending	Educational Level	FDI
Infant Mortality Rate	1													
Under Five Mortality Rate	0.9919	1												
Life Expectancy	−0.8744	−0.9006	1											
Corruption	0.6737	0.6543	−0.5436	1										
Economic Inequality	0.6958	0.6830	−0.5306	0.6109	1									
Democracy	−0.3909	−0.3847	0.3029	−0.3633	−0.4500	1								
Natural Resources	0.4910	0.4911	−0.4514	0.4290	0.5166	−0.5099	1							
Economic Development	−0.8753	−0.8741	0.7975	−0.6923	−0.5611	0.3162	−0.4179	1						
Population	0.1192	0.1216	−0.1141	0.1664	0.0489	−0.0317	0.2871	−0.2526	1					
Birth Rate	0.8325	0.8534	−0.8072	0.4767	0.5681	−0.3530	0.4863	−0.6828	0.0814	1				
Urbanization	−0.6134	−0.6199	0.5681	−0.4590	−0.3536	0.2006	−0.1099	0.6575	−0.0160	−0.5373	1			
Government Spending	−0.4136	−0.4082	0.2682	−0.3394	−0.3872	0.2389	−0.2136	0.3635	−0.3070	−0.2506	0.2362	1		
Educational Level	−0.1694	−0.1953	0.2277	−0.0495	−0.0286	0.1445	−0.0622	0.1275	−0.0178	−0.2418	0.0422	0.0403	1	
FDI	−0.1522	−0.1574	0.1806	−0.1528	−0.1676	0.0983	−0.1659	0.2071	−0.3070	−0.2090	0.1211	−0.0079	0.0263	1

structural determinants. Second, it employs advanced econometric techniques, including interaction analysis and robustness checks, to ensure reliable and generalizable findings. These methodological innovations address the limitations of prior studies that often overlook the compounding nature of corruption and inequality.

Third, the study interrogates the systemic and structural conditions underpinning corruption and inequality, offering critical insights for policymakers. By highlighting the role of global financial systems, governance failures, and socio-political dynamics in sustaining health disparities, it challenges policymakers to move beyond technocratic solutions. Integrated strategies addressing governance reforms and redistributive policies are essential to dismantling the structural inequities that perpetuate health disparities.

The findings of this study carry significant implications for global health policy. They underscore that addressing corruption and inequality requires not only national interventions but also global efforts to reform financial systems, enhance accountability, and promote equitable resource distribution. These results challenge policymakers to adopt transformative, systemic approaches that prioritize health equity over narrow, market-driven solutions.

2. Literature review

2.1. Economic inequality and health

The relationship between economic inequality and public health has been a focal point of academic inquiry for decades. Wilkinson and Pickett (2009) emphasize that economic inequality, defined as the unequal distribution of income or wealth within a society, adversely affects health outcomes by fostering relative deprivation. Relative deprivation refers to the perception of disadvantage experienced by individuals when comparing themselves to others in their society, contributing to psychosocial stress, reduced social cohesion, and poorer mental and physical health.

Empirical studies largely support these claims. Wilkinson and Pickett (2015) found that higher levels of economic inequality correlate with lower life expectancy, increased mortality rates, and poorer mental health outcomes. These effects are not confined to the economically disadvantaged but extend to the entire population, as inequality erodes trust and increases societal tensions. Subramanian and Kawachi (2003) argue that inequality weakens social capital and collective investments in public goods like healthcare, further exacerbating health disparities. However, dissenting voices, such as Lynch et al. (2004), suggest that the health effects of inequality diminish in affluent nations, raising questions about the universality of the relative deprivation hypothesis.

Despite these insights, much of the literature frames economic inequality as an isolated determinant of health, often neglecting its intersections with governance quality and global economic structures. This framing obscures how inequality is perpetuated by systemic forces such as neoliberal economic policies, labor market deregulation, and transnational corporate practices that entrench wealth concentration. The role of international financial systems, which often privilege elite interests while exacerbating inequality in low- and middle-income countries, remains underexplored. By investigating the compounded effects of economic inequality and corruption, this study critiques the lens that isolates inequality from its socio-political and economic contexts.

2.2. Corruption and health

Corruption, defined as the misuse of public power for private gain (Nye, 1967), directly undermines the provision and accessibility of healthcare services. It manifests in embezzlement, bribery, and favoritism, disproportionately harming marginalized populations by diverting resources away from public health systems. Transparency International's Corruption Perceptions Index (2024) consistently

highlights the prevalence of corruption, particularly in low- and middle-income countries with weaker governance structures.

Existing research establishes a negative relationship between corruption and health outcomes. Factor and Kang (2015) demonstrate that corruption reduces life expectancy and increases child mortality rates by limiting access to healthcare resources. Corruption exacerbates inefficiencies in healthcare delivery, such as shortages of medical supplies, reduced healthcare workforce productivity, and inflated costs of medical services. Hsiao et al. (2019) illustrate that corruption widens health disparities by creating barriers to equitable healthcare access, particularly for marginalized groups.

However, the literature often stops short of interrogating the structural roots of corruption, framing it as a localized governance failure rather than a symptom of broader systemic issues. For instance, global financial systems that enable illicit financial flows and tax evasion create environments where corruption thrives. The complicity of international actors, such as multinational corporations and financial institutions, in perpetuating corrupt practices remains underexplored. By focusing on how corruption interacts with economic inequality, this study highlights the inadequacy of approaches that treat corruption as a discrete variable divorced from systemic dynamics.

2.3. Interaction effects: economic inequality and corruption

Emerging research suggests that economic inequality and corruption interact to exacerbate health disparities, creating a dynamic relationship that is more harmful than the sum of their individual effects. This interaction is grounded in the interplay between relative and actual deprivation. Economic inequality fosters relative deprivation by heightening perceptions of social stratification and psychosocial stress, while corruption creates actual deprivation by restricting access to essential resources through rent-seeking and misallocation.

For instance, Clemente and De Sousa (2024) argue that corruption disproportionately harms lower-income groups, compounding the stress and deprivation caused by economic inequality. Similarly, Khan et al. (2022) highlight how governance failures during the COVID-19 pandemic intensified health inequities, as corruption and inequality jointly undermined equitable access to healthcare services. Yan and Wen (2020) find that these factors negatively impact subjective well-being, illustrating how corruption and inequality fuel broader societal tensions.

Yet, these studies often focus on specific regions or crises, limiting their generalizability. They also rarely employ robust econometric frameworks to rigorously test the synergistic effects of corruption and inequality. Furthermore, they do not sufficiently critique the global systems and policies—such as structural adjustment programs or tax haven practices—that enable corruption and inequality to persist. This study addresses these gaps by analyzing how these structural determinants interact to shape public health outcomes across diverse socio-political and economic contexts.

2.4. Mechanisms and theoretical framework

The compounded effects of economic inequality and corruption on population health can be understood through interconnected mechanisms of deprivation and social dynamics. At the core of this framework is the interaction between relative deprivation, driven by inequality, and actual deprivation, exacerbated by corruption.

Economic inequality undermines health by fostering social stratification, eroding trust in institutions, and creating psychosocial stress. Wilkinson and Pickett (2009) argue that individuals experiencing relative deprivation suffer chronic stress, which weakens social cohesion and reduces access to healthcare resources. Kondo et al. (2012) emphasize that these disparities disproportionately affect marginalized populations, leading to poorer health outcomes, particularly in societies with entrenched inequality. However, the global drivers of inequality—such as regressive taxation, labor exploitation, and wealth concentration—are often overlooked in these discussions.

Corruption exacerbates these effects by institutionalizing resource misallocation and reinforcing systemic inequities. Practices such as embezzlement, bribery, and favoritism distort public health resource distribution, disproportionately harming vulnerable populations (Factor & Kang, 2015). For example, Ferrari and Salustri (2020) highlight how corruption inflates healthcare costs, reduces workforce efficiency, and limits the availability of essential medical supplies. These mechanisms perpetuate actual deprivation, deepening health inequities and eroding public trust in healthcare systems.

The interplay between corruption and inequality creates a feedback loop that perpetuates health inequities. Inequality generates heightened reliance on public services, while corruption undermines the efficiency and equity of these services, reducing collective investments in public goods like healthcare (Subramanian & Kawachi, 2003). This dynamic not only worsens health disparities among marginalized groups but also destabilizes broader societal well-being.

By integrating these mechanisms, this study challenges approaches that treat corruption and inequality as independent variables. Instead, it posits that the interaction between relative deprivation from inequality and actual deprivation from corruption amplifies stress, limits healthcare access, and entrenches health disparities. This perspective underscores the urgency of addressing the global systems and governance failures that sustain these inequities.

Policy interventions must recognize the structural roots of these issues, adopting redistributive measures to reduce inequality while strengthening governance frameworks to combat corruption. Moreover, global efforts should target systemic enablers of corruption and inequality, such as tax avoidance, financial secrecy jurisdictions, and exploitative trade practices. Only through such integrated and systemic approaches can policymakers address the compounded impacts of these structural determinants, ultimately fostering equitable and resilient healthcare systems.

3. Methodology

3.1. Key explanatory variables

Corruption is measured using Transparency International's Corruption Perceptions Index (CPI) (2024), a widely recognized indicator of public sector corruption across 185 countries. The CPI aggregates data from expert assessments and business executive surveys, producing scores that range from 0 (high corruption) to 100 (corruption-free). While the CPI is often lauded for its comprehensiveness, it has been critiqued for reflecting perceptions rather than objective realities of corruption (Li & An, 2020). These perceptions may be shaped by global power dynamics, where high-income countries often define and measure corruption in ways that align with their geopolitical interests, potentially downplaying the structural and systemic forms of corruption embedded in global financial systems.

To facilitate interpretation, this study reverses the CPI scores so that higher values correspond to greater corruption severity. A logarithmic transformation is applied to these reversed scores to address skewness, stabilize variability, and mitigate the influence of extreme outliers. This transformation ensures that the regression analysis is robust to statistical anomalies. However, the reliance on CPI data risks reinforcing "reductionist" narratives that frame corruption as a localized governance failure, ignoring its systemic dimensions, such as the role of international financial flows, tax havens, and regulatory capture, in perpetuating corruption globally.

Economic inequality is measured using the post-tax income Gini coefficient, sourced from the World Inequality Database (2024). This metric reflects income distribution after accounting for government taxation and social welfare programs, offering a nuanced measure of inequality by capturing the resources available to households (Acheampong et al., 2024; Biglaiser & McGauvran, 2021). With a mean

of 0.5162 and a range from 0.1243 to 0.7500, the Gini coefficient in this dataset highlights substantial global disparities in income inequality. However, focusing solely on income inequality may obscure other dimensions of inequality, such as wealth concentration, social mobility, and access to essential services. This study thus acknowledges the limitations of relying on a single metric to capture the complex, multidimensional nature of inequality.

By applying logarithmic transformations to both corruption and inequality metrics, the study addresses statistical concerns such as heteroscedasticity and skewness. However, while these transformations enhance the robustness of the analysis, they may also obscure nuanced variations in the data, particularly in extreme cases. This methodological choice reflects a broader tension in quantitative research: the need to balance statistical rigor with the preservation of contextual specificity.

3.2. Dependent variables

Population health is assessed using three widely recognized indicators: life expectancy, infant mortality rate, and under-five mortality rate. These metrics reflect both long-term trends and immediate health outcomes, making them suitable for analyzing the structural determinants of health. Life expectancy at birth serves as a summary measure of overall population health, capturing the cumulative effects of socio-economic and environmental factors (Achim et al., 2020). Infant and under-five mortality rates focus on vulnerable populations, reflecting the availability and quality of healthcare services during critical developmental stages (Lio & Lee, 2016; Sommer, 2020).

The dataset reveals substantial variability in these health indicators, underscoring the persistence of global health inequities. For example, the infant mortality rate averages 27.18 per 1000 live births, with a standard deviation of 25.15, highlighting significant disparities between countries. To stabilize variance and reduce the influence of extreme values, logarithmic transformations are applied to all three health indicators. While this enhances the reliability of the regression analysis, it also raises questions about the interpretability of transformed variables, particularly in policy contexts where absolute differences in mortality rates carry practical significance.

This study's reliance on conventional health indicators, while methodologically sound, risks reinforcing biomedical perspectives that focus on individual-level outcomes without sufficiently addressing the structural and systemic determinants of health. Future research could expand this framework by incorporating alternative metrics, such as measures of morbidity, health equity, or access to healthcare services, to capture a broader range of health outcomes.

3.3. Covariates

The analysis includes a set of socio-economic and political control variables to account for confounding factors that influence population health outcomes. These covariates are selected based on their theoretical relevance and empirical robustness:

- **Democratic Development:** Measured using the Polity IV dataset (Marshall & Gurr, 2022), this variable reflects the extent of democratic governance, which is often associated with better health outcomes due to greater public accountability and responsiveness to citizen demands (Chou & Zhang, 2020; Wong, 2022). However, this metric does not account for the erosion of democratic institutions in nominally democratic states, raising questions about its validity in capturing the complex relationship between governance and health.
- **Natural Resource Rent:** Expressed as a percentage of GDP, this variable captures the reliance on natural resource to examine "resource curse" effect (Ko, Leung, & Yu, 2024), where resource wealth undermines governance and fosters rent-seeking behavior, negatively impacting public health (El Anshasy & Katsaiti, 2015). However, the inclusion of this variable assumes that all resource-dependent economies experience similar governance challenges, which may overlook significant regional and contextual variations.
- **Economic Development:** GDP per capita is included as a proxy for economic capacity, reflecting a country's ability to invest in healthcare infrastructure. While widely used, GDP per capita is a narrow measure of development that fails to capture inequality, informal economic activities, or the quality of public spending.
- **Population Size and Birth Rate:** These demographic variables are critical for understanding how resource constraints (Ko, Leung, Chen, & Palmer, 2024) affect health outcomes. Larger populations and higher birth rates can strain healthcare systems, particularly in low-income settings. However, these variables may inadvertently pathologize high-birth-rate societies, shifting attention away from systemic factors that drive resource scarcity.
- **Urbanization:** The proportion of the population living in urban areas is controlled for, as urbanization can have both positive and negative effects on health. While urban centers often provide better access to healthcare, they are also sites of environmental degradation and socio-economic inequality (Moore et al., 2003).
- **Government Spending:** Measured as a percentage of GDP, this variable reflects fiscal priorities and the state's commitment to public welfare. However, it does not account for how effectively these resources are allocated, raising questions about the quality of public spending.
- **Educational Level:** The proportion of individuals completing primary education is included as a proxy for human capital. While education is strongly correlated with better health outcomes, this measure fails to capture disparities in education quality or access (Mirowsky, 2017; Zajacova & Lawrence, 2018; Cutler & Lleras-Muney, 2010).
- **Foreign Direct Investment (FDI):** Expressed as a percentage of GDP, this variable captures the impact of external investment on economic growth and healthcare access. However, FDI's effects are often uneven, benefiting specific sectors while bypassing marginalized populations. (Azémar & Desbordes, 2009; Burns et al., 2017).

Logarithmic transformations are applied to GDP per capita, population size, birth rate, urbanization, government spending, education level, and FDI to normalize distributions and minimize the influence of extreme values. Potential collinearity among these variables is evaluated using a correlation matrix, with a threshold of 0.7 to identify problematic correlations (Wen et al., 2021). While this approach ensures statistical robustness, it may mask the interconnectedness of these variables, which often operate in tandem to influence health outcomes.

3.4. Model specifications and estimation methods

This study employs a country-year panel regression analysis with fixed effects to examine the effects of corruption and economic inequality on population health outcomes. The fixed-effects model controls for unobserved heterogeneity across countries, isolating within-country variations while accounting for time-invariant characteristics such as geography, cultural norms, and historical legacies. By incorporating year fixed effects, the model captures global shocks and trends, such as the 2008 financial crisis and the COVID-19 pandemic, which influence health outcomes across all countries. However, while fixed-effects models are effective at addressing unobserved heterogeneity, they do not eliminate endogeneity risks stemming from bidirectional causality or omitted variables, which can bias the estimates.

$$InfantMort_{it} = \alpha 1 + \alpha 2(Corruption_{it}\ x\ EconInq_{it}) + \alpha 3X_{it} + \upsilon_i + \varsigma_\tau + \varepsilon_{it} \quad (1)$$

$$Under5Mort_{\iota\tau} = \alpha 1 + a2(Corruption_{\iota\tau}\ x\ EconInq_{\iota\tau}) + a3X_{\iota\tau} + \upsilon_{\iota} + \varsigma_{\tau} + \varepsilon_{\iota\tau} \quad (2)$$

$$LifeExp_{\iota\tau} = \alpha 1 + a2(Corruption_{\iota\tau}\ x\ EconInq_{\iota\tau}) + a3X_{\iota\tau} + \upsilon_{\iota} + \varsigma_{\tau} + \varepsilon_{\iota\tau} \quad (3)$$

In these models:

- $InfantMort_{\iota\tau}$, $Under5Mort_{\iota\tau}$, and $LifeExp_{\iota\tau}$ represent the infant mortality rate, under-five mortality rate, and life expectancy, respectively, for a specific country (ι) and year (τ).
- $Corruption_{\iota\tau}$ and $EconInq_{\iota\tau}$ represent corruption severity and economic inequality, respectively, in a given country-year.
- The interaction term $Corruption_{\iota\tau}\ x\ EconInq_{\iota\tau}$ captures the combined effect of corruption and economic inequality on population health.
- $X_{\iota\tau}$ denotes control variables that account for other socio-economic and political factors influencing health outcomes.
- υ_{ι} and ς_{τ} represent country fixed effects and year fixed effects, respectively, while $\varepsilon_{\iota\tau}$ is the error term.

$InfantMort_{\iota\tau}$, $Under5Mort_{\iota\tau}$, and $LifeExp_{\iota\tau}$ represents the infant mortality rate, under-five mortality rate, and life-expectancy in a country-year. ι and τ refers to country and year dummies. $Corruption_{\iota\tau}$ and $EconInq_{\iota\tau}$ refers to severity of corruption and economic inequality in a specific country-year respectively, where the x refers to the interaction of these two variables, since our study wanted to assess the combined effects of corruption and economic inequality on population health. Moreover, υ_{ι}, ς_{τ}, and $\varepsilon_{\iota\tau}$ refers to the country fixed effect, year fixed effect, and error term, respectively.

The panel dataset, comprising 1627 observations from 136 countries spanning 2001–2020, offers substantial temporal and spatial coverage. However, its unbalanced nature, caused by missing data for certain countries and years, introduces potential biases. Smaller or less-developed nations, which are often excluded due to data limitations, may exhibit systematic differences from those included in the sample. This underscores the need for caution in interpreting the findings as globally representative.

Robust standard errors clustered at the country level address heteroscedasticity and serial correlation, ensuring reliable coefficient estimates and valid statistical inference. However, these adjustments cannot fully account for structural dependencies between countries, particularly in regions characterized by shared economic and political systems. This limitation suggests that while the results are statistically robust, they may not fully capture the interconnectedness of global health determinants (see Table 2).

The results in Table 3 indicate that corruption and economic inequality independently worsen health outcomes, as evidenced by higher infant and under-five mortality rates and lower life expectancy. The significant interaction term $Corruption_{\iota\tau}\ x\ EconInq_{\iota\tau}$ in all models confirms that corruption and inequality together have more severe consequences than their individual effects. For example, Model 2 demonstrates that a one-unit increase in the interaction term corresponds to a marked increase in the infant mortality rate, supporting the hypothesis that corruption amplifies the adverse effects of inequality on public health. Nevertheless, reliance on linear models oversimplifies the complex socio-political dynamics at play, and interaction effects may vary non-linearly across different levels of corruption and inequality—a nuance that these models do not fully capture. The study produces interactive graphical illustrations to show how corruption and economic inequality jointly worsen health outcomes, presenting the results on their original scales to facilitate straightforward comparison and analysis. To examine the impact at different corruption levels, the analysis creates binary variables representing "Low Corruption" and "High Corruption." The methodology classifies country-years with an inversed CPI score of 0–49 as "Low Corruption" and those with a score of 50–100 as "High Corruption," which allows the assessment of how corruption and inequality jointly affect population health outcomes in various contexts. Figs. 1–3 display infant mortality rates, under-five mortality rates, and life expectancy, respectively.

To ensure the robustness of these findings, additional analyses are conducted using alternative health indicators, measures of inequality, and econometric techniques. Table 4 explores outcomes such as maternal mortality, neonatal mortality, and gender-specific life expectancy, with the interaction term remaining significant across specifications. Table 5 evaluates alternative measures of inequality, including the pre-tax Gini coefficient and the share of wealth held by the top 10 %, further confirming the reliability of the results. While these tests demonstrate consistency, they also highlight the limits of relying on traditional metrics that may not fully capture the multidimensional nature of inequality and health disparities.

Endogeneity poses a vital challenge, as poor health outcomes may exacerbate both corruption and inequality, introducing reverse causality. To address this, the study employs an Instrumental Variable Two-Stage Least Squares (IV-2SLS) method, detailed in Table 10 The interaction term is instrumented using lagged values and external instruments, such as historical governance indicators. Diagnostic tests, including the Kleibergen-Paap F-statistic and Hansen J-test, confirm the

Table 3
Main regression results: Corruption, economic inequality, and health outcomes.

	Infant Mortality		Under-Five Mortality		Life Expectancy	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Corruption (I)	.0627** (.0243)	−.2326*** (.0555)	.0714*** (.0245)	−.2776*** (.0556)	−.0080** (.0040)	.0218** (.0091)
Economic Inequality (II)	.4528*** (.1580)	−2.9047*** (.5897)	.3715** (.1591)	−3.5978*** (.5913)	−.0091 (.0257)	.3300*** (.0966)
I X II		.8428*** (.1427)		.9964*** (.1431)		−.0851*** (.0234)
Democracy	.0028 (.0022)	.0031 (.0022)	.0014 (.0022)	.0017 (.0022)	.0015*** (.0003)	.0014*** (.0004)
Natural Resources	0176*** (.0063)	.0180*** (.0063)	.0140*** (.0064)	.0145** (.0063)	.0000 (.0010)	.0000 (.0010)
Economic Development	−.3011*** (.0107)	−.2909*** (.0108)	−.3073*** (.0108)	−.2952*** (.0108)	.0181*** (.0017)	.0170*** (.0018)
Population	−.3986*** (.0509)	−.3987*** (.0503)	−.4738*** (.0512)	−.4738*** (.0504)	.1319*** (.0083)	.1320*** (.0082)
Birth Rate	−.3517*** (.0541)	−.3680*** (.0535)	−.3385*** (.0544)	−.3577*** (.0537)	.0517*** (.0088)	.0534*** (.0088)
Urbanization	−.7765*** (.0896)	−.7584*** (.0886)	−1.0324*** (.0902)	−1.0109*** (.0889)	.2266*** (.0146)	.2247*** (.0145)
Government Spending	−.0210 (.0259)	−.0171 (.0256)	−.0183 (.0260)	−.0136 (.0256)	−.0053 (.0042)	−.0056 (.0042)
Educational Level	.3438*** (.0633)	.3613*** (.0627)	.3539*** (.0638)	.3747*** (.0629)	−.0216** (.0103)	−.0233** (.0103)
Foreign Direct Investment	.0134*** (.0042)	.0124*** (.0042)	.0080* (.0042)	.0069 (.0041)	.0010 (.0007)	.0011 (.0007)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Countries	136	136	136	136	136	136
Observations	1627	1627	1627	1627	1627	1627
R-Squared (Adj)	0.3549	0.3469	0.3466	0.3377	0.1609	0.1576

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.

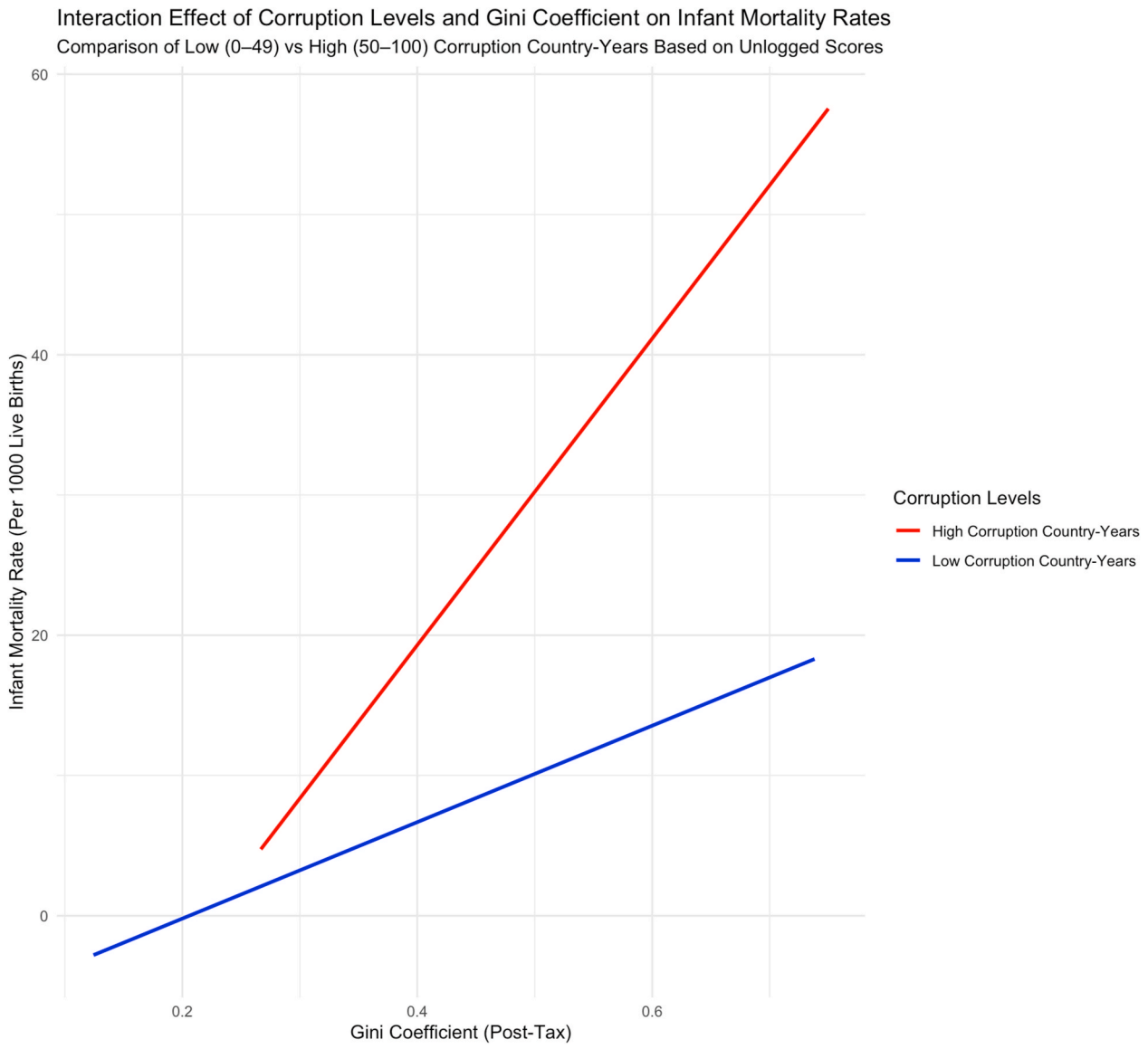

Fig. 1. Interactive effects of corruption and income inequality on infant mortality rate.

relevance and validity of the instruments. However, the choice of instruments, while methodologically defensible, is not without limitations. Historical governance indicators may reflect deep-seated structural factors rather than contemporary dynamics, complicating causal interpretations.

Further robustness checks, reported in Table 9., include Feasible Generalized Least Squares (FGLS) and Panel Corrected Standard Errors (PCSE) methods. These approaches account for heteroscedasticity and cross-sectional dependence, validating the reliability of the results. Nevertheless, they may obscure the underlying systemic factors that influence health outcomes, such as regional economic integration or transnational governance systems.

Heterogeneity analysis, presented in Tables 7 and 8, examines the interaction effects across income groups. The results reveal that the combined effects of corruption and inequality are most pronounced in low- and lower-middle-income countries, where healthcare systems are under-resourced, and governance structures are weaker. While this finding underscores the vulnerability of these contexts, framing the issue as primarily a "developing country problem" risks overlooking the global dimensions of corruption and inequality. For instance, transnational corporations and financial secrecy jurisdictions based in high-income countries contribute significantly to governance challenges in lower-income regions. Similarly, international economic systems often perpetuate inequalities that transcend national borders, further complicating policy responses.

By employing fixed-effects regression alongside rigorous robustness checks and addressing endogeneity concerns, this study provides a comprehensive analysis of how corruption and economic inequality interact to shape global health outcomes. However, the methodological choices, while robust, reflect broader tensions in quantitative research: the need to balance statistical precision with the preservation of contextual and systemic insights. The consistent significance of the interaction term across multiple models and alternative specifications highlights the compounded impact of corruption and inequality on health. These findings call for integrated policy interventions that address the structural roots of health inequities, offering critical insights for both national and global health governance.

4. Results

The fixed-effects regression analysis reveals significant relationships between corruption, economic inequality, and population health out-

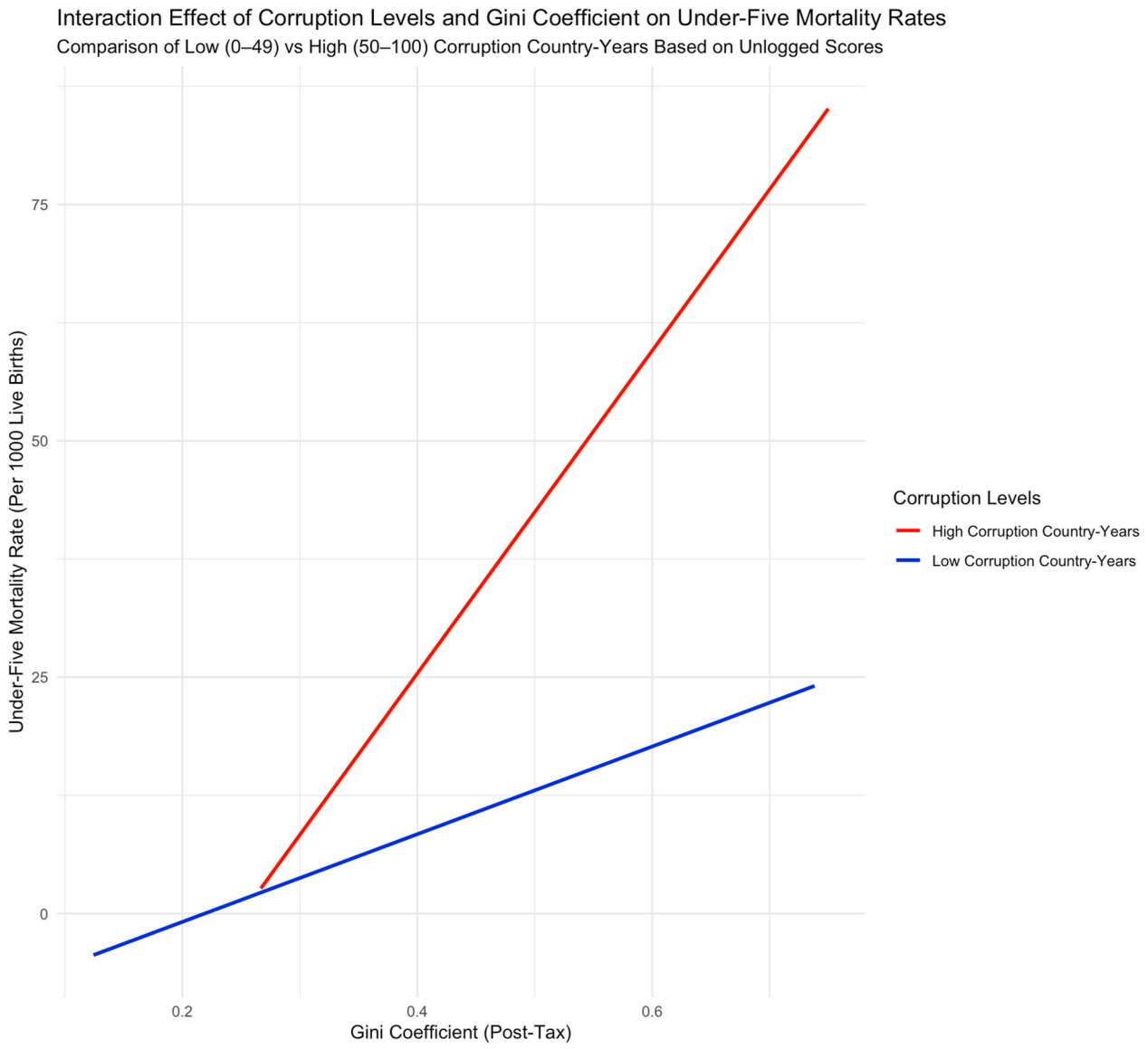

Fig. 2. Interactive effects of corruption and income inequality on under-five mortality rate.

comes, underscoring the structural dynamics that exacerbate health disparities. Table 3 presents the main results for infant mortality, under-five mortality, and life expectancy. Models 1, 3, and 5 examine the independent effects of corruption and economic inequality, while Models 2, 4, and 6 incorporate the interaction term $Corruption_{it}$ *x* $EconInq_{it}$, capturing their compounded impact.

For infant mortality, Model 1 demonstrates that a one-unit increase in corruption severity is associated with a 0.0627 rise in the infant mortality rate, while a one-unit increase in economic inequality results in a 0.4528 increase. Adding the interaction term in Model 2 magnifies these effects: a one-unit increase in the interaction term leads to a 0.8428 rise in infant mortality. These findings highlight how corruption intensifies the health impacts of economic inequality by exacerbating barriers to healthcare access and amplifying deprivation. Fig. 1 depicts a compounded effect where higher levels of economic inequality, as represented by the Gini Coefficient, associate with increased infant mortality rates. The analysis shows that high-corruption contexts intensify this relationship compared to low-corruption contexts. The red line (high corruption) reveals a steeper slope, which implies that the combined effects of economic inequality and corruption intensify the adverse impact on infant mortality. In contrast, the blue line (low corruption) presents a milder slope, indicating that economic inequality exerts a relatively weaker influence on infant mortality in low-corruption settings. These results underline the compounding influence of corruption and inequality on population health outcomes.

Similarly, for under-five mortality, Model 3 indicates independent increases of 0.0714 and 0.3715 associated with corruption and economic inequality, respectively. Model 4 shows that the interaction term amplifies these effects, with a one-unit increase in the interaction term linked to a 0.9964 rise in under-five mortality. Similarly, Fig. 2 highlights that higher levels of economic inequality (Gini Coefficient) associate with increased under-five mortality rates. The relationship intensifies within high-corruption contexts. The red line (high corruption) exhibits a steeper slope, indicating that corruption and economic inequality significantly exacerbate under-five mortality. In contrast, the blue line (low corruption) shows a less steep slope, suggesting a weaker relationship between inequality and under-five mortality in low-corruption settings.

Life expectancy, analyzed in Model 5, is negatively associated with corruption and economic inequality, with coefficients of −0.0080 and −0.0091, respectively. The interaction term in Model 6 reveals a pronounced compounding effect: a one-unit increase leads to a significant

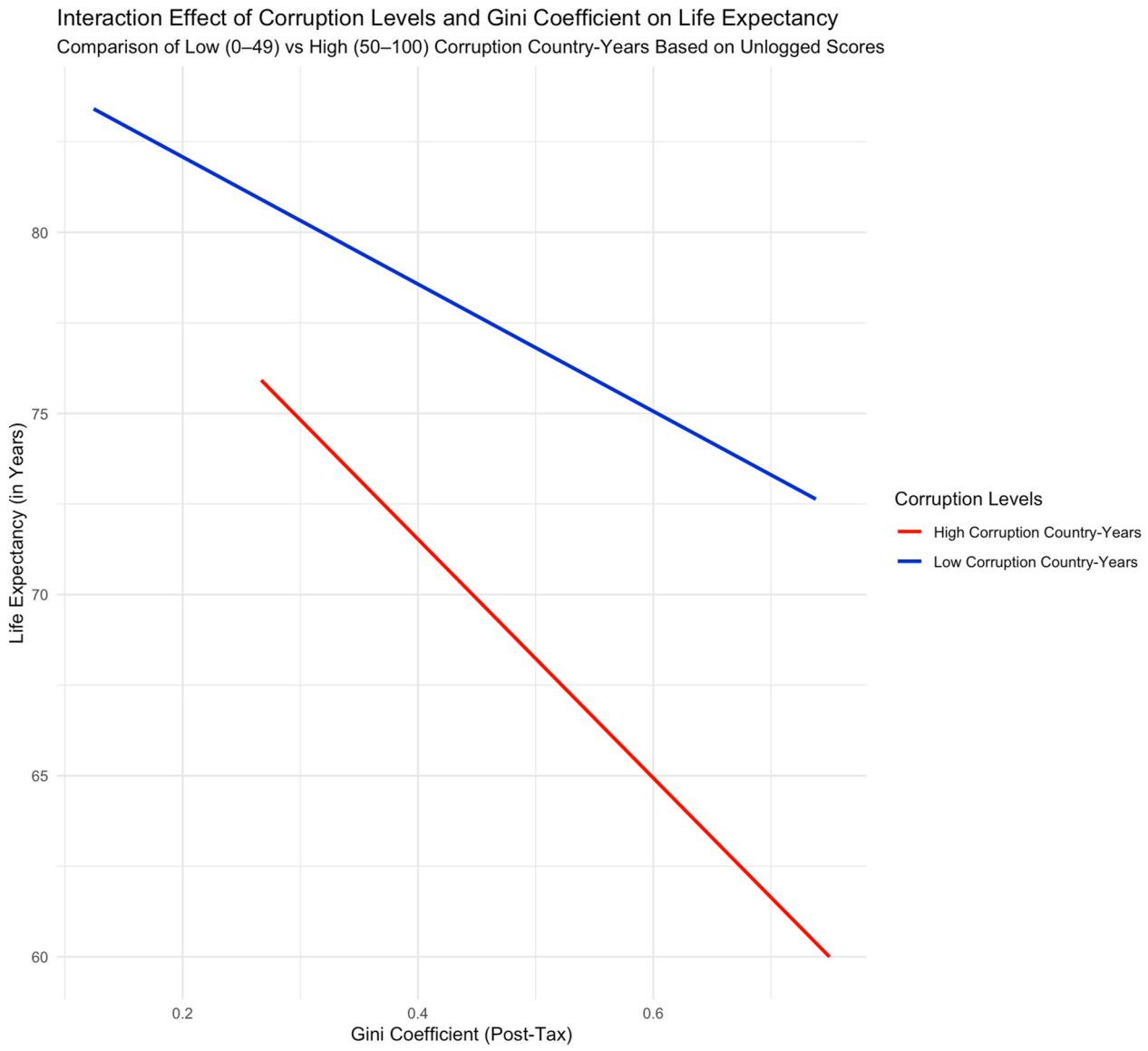

Fig. 3. Interactive effects of corruption and income inequality on life expectancy.

Table 4
Regression results: Corruption, economic inequality, and alternative health outcome measures.

	Maternal Mortality	Neonatal Mortality	5–14 Years Old Mortality	Female Under-Five Mortality	Male Under-Five Mortality	Female Life Expectancy	Male Life Expectancy
	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Corruption (I)	−.1385** (.0745)	−.1439** (.0615)	−.1595* (.1017)	−.2667*** (.0574)	−.3019*** (.0542)	.0179* (.0093)	.0263*** (.0092)
Economic Inequality (II)	−3.7173*** (.7916)	−2.0439*** (.6535)	−2.5085*** (.9646)	−3.6404*** (.6104)	−3.8168*** (.5754)	.3308*** (.0992)	.3346*** (.0974)
I X II	1.0020*** (.1916)	.6474*** (.1582)	.7609*** (.2322)	1.0155*** (.1478)	1.0673*** (.1393)	−.0821*** (.0240)	−.0898*** (.0236)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	136	136	132	136	136	136	136
Observations	1627	1627	1627	1627	1627	1627	1627
R-Squared (Adj)	0.0010	0.3623	0.6447	0.3497	0.3380	0.1815	0.1407

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.

Table 5
Regression results: Corruption, alternative measures of economic inequality, and health outcomes.

	Infant Mortality	Under-Five Mortality	Life Expectancy	Infant Mortality	Under-FiveMortality	Life Expectancy
	Model 14	Model 15	Model 16	Model 17	Model 18	Model 19
Corruption (I)	−.2096* (.1160)	−.2779** (.1099)	.0352*** (.0116)	−1.0874*** (.2201)	−1.3529*** (.2209)	.1147*** (.0360)
Economic Inequality (II)	−1.6314 (.9691)	−2.5960*** (.9132)	.2314** (.0963)	−1.1788*** (.2587)	−1.5310*** (.2593)	.1313*** (.0423)
I X II	.6049** (.2490)	.7152*** (.2345)	−.0823*** (.0247)	.3393*** (.0642)	.4195*** (.0643)	−.0361*** (.0105)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Countries	126	126	126	136	136	136
Observations	1059	1059	1059	1627	1627	1627
R-Squared (Adj)	0.8328	0.1243	0.0191	0.3393	0.3311	0.1603

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.
ˆEconomic inequality is measured using the Pre-Tax Gini Coefficient.
ˆEconomic inequality is measured using the share of wealth held by the richest 10 %.

Table 6
Regression results: Alternative corruption measures, economic inequality, and health outcomes.

	Infant Mortality	Under-Five Mortality	Life Expectancy	Infant Mortality	Under-Five Mortality	Life Expectancy
	Model 20ˆ	Model 21ˆ	Model 22ˆ	Model 23ˆ	Model 24ˆ	Model 25ˆ
Corruption (I)	−.1102*** (.0414)	−.1611*** (.0421)	.0288*** (.0073)	−.5720*** (.1759)	−.7691*** (.1850)	.1290*** (.0375)
Economic Inequality (II)	−1.1774*** (.4050)	−1.7736*** (.4117)	.4303*** (.0716)	−.5164*** (.1915)	−.5336*** (.2015)	.1097*** (.0408)
I X II	.3070*** (.0944)	.4621*** (.0960)	−.1047*** (.0167)	.7867** (.3187)	1.1295*** (.3353)	−.2429*** (.0679)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Countries	137	137	137	137	137	137
Observations	2175	2175	2175	3121	3121	3121
R-Squared (Adj)	0.6907	0.6626	0.3606	0.7924	0.7663	0.4436

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.
ˆCorruption is measured using the Corruption Index from the Fraser Institute (2024).
ˆCorruption is measured using the Political Corruption Index from V-Dem (2024).

Table 7
Regression results: Corruption, economic inequality, and health outcomes by income group (low and lower-middle income countries).

	Infant Mortality	Under-Five Mortality	Life Expectancy	Infant Mortality	Under-Five Mortality	Life Expectancy
	Model 26ˆ	Model 27ˆ	Model 28ˆ	Model 29ˆ	Model 30ˆ	Model 31ˆ
Corruption (I)	−1.5761** (.6392)	−.9051 (.7979)	−.2743 (.2889)	−2.6103*** (.5510)	−2.2176*** (.6247)	.2449** (.1063)
Economic Inequality (II)	−12.2199*** (4.6373)	−7.8851 (5.7887)	−1.9577 (2.0957)	−17.6641*** (4.2268)	−13.6449*** (4.7921)	2.4416*** (.8153)
I X II	2.9727*** (1.0743)	1.9623 (1.3410)	.4906 (.4855)	4.0042*** (1.0019)	3.0855*** (1.1359)	−.5950*** (.1933)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Countries	44	44	44	58	58	58
Observations	344	344	344	422	422	422
R-Squared (Adj)	0.0571	0.0397	0.0104	0.0088	0.0090	0.1185

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.
ˆIncludes low-income countries only.
ˆIncludes lower-middle-income countries only.

3.5978 reduction in logged life expectancy. This steep decline in Fig. 3 indicates that higher economic inequality, measured by the Gini Coefficient, decreases life expectancy, especially in high-corruption contexts. The red line (high corruption) exhibits a steeper negative slope, showing that corruption and inequality combine to significantly reduce life expectancy. In contrast, the blue line (low corruption) displays a less pronounced decline, which suggests that economic inequality exerts a smaller effect on life expectancy in low-corruption settings. These results highlight how corruption amplifies the detrimental impact of inequality on population health, particularly regarding longevity.

The robustness of these results is reinforced by alternative analyses. Table 4 explores additional health outcomes, including maternal mortality, neonatal mortality, and child mortality for ages 5–14, with consistent significance of the interaction term. For instance, a one-unit increase in the interaction term corresponds to a 1.0020 rise in maternal mortality and a 0.6474 rise in neonatal mortality. These findings highlight that the compounded effects of corruption and inequality extend beyond the initial health metrics analyzed, permeating multiple dimensions of public health.

Table 5 evaluates alternative measures of economic inequality, such as the pre-tax Gini coefficient and the share of wealth held by the top 10 %. The interaction term remains significant, demonstrating that the findings are robust to variations in inequality metrics. Similarly, Table 6 uses alternative corruption measures, including indices from the Fraser Institute and V-Dem, with consistent results. These tests collectively confirm that corruption and inequality, whether measured differently, maintain their compounded adverse effects on health outcomes.

The heterogeneity of these effects is further analyzed across income levels, as detailed in Tables 7 and 8 The interaction term exerts the most significant impact in low- and lower-middle-income countries, where

Table 8
Regression results: Corruption, economic inequality, and health outcomes by income group (upper-middle and high-income countries).

	Infant Mortality	Under-Five Mortality	Life Expectancy	Infant Mortality	Under-Five Mortality	Life Expectancy
	Model 32ˆ	Model 33ˆ	Model 34ˆ	Model 35˜	Model 36˜	Model 37˜
Corruption (I)	1.1290*** (.3766)	−1.4096*** (.3758)	−.0894 (.0586)	−.0205 (.0779)	−.1233* (.0696)	.0133** (.0052)
Economic Inequality (II)	2.4984 (2.9210)	−5.8552** (2.9149)	−.4292 (.4541)	.3606 (.8142)	−1.0568 (.7271)	.0731 (.0541)
I X II	−.8058 (.7189)	1.6251** (.7174)	.1126 (.1118)	−.1144 (.2408)	.2050 (.2150)	−.0294* (.0160)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Countries	48	48	48	45	45	45
Observations	386	386	386	485	485	485
R-Squared (Adj)	0.0025	0.0009	0.0765	0.0000	0.0269	0.2091

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.
ˆIncludes upper-middle-income countries only.
˜Includes high-income countries only.

Table 9
FGLS and PCSE results: Corruption, economic inequality, and health outcomes.

	Infant Mortality	Under-Five Mortality	Life Expectancy	Infant Mortality	Under-Five Mortality	Life Expectancy
	Model 38ˆ	Model 39ˆ	Model 40ˆ	Model 41˜	Model 42˜	Model 43˜
Corruption (I)	−.2326*** (.0856)	−.2776** (.1071)	.0260* (.0148)	.0092 (.0503)	.0202 (.0544)	.0075 (.0061)
Economic Inequality (II)	−2.9047** (1.0832)	−3.5978*** (1.1676)	.3718* (.2064)	.1612 (.5109)	.2367 (.5317)	.1376* (.0752)
I X II	.8428*** (.2586)	.9964*** (.2893)	−.0961* (.0529)	.2828** (.1310)	.2300* (.1384)	−.0526*** (.0202)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Countries	137	137	137	137	137	137
Observations	1627	1627	1627	1627	1627	1627
R-Squared (Adj)	0.3469	0.3377	0.1777	0.9454	0.9509	0.9991

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.
ˆEstimates obtained using Feasible Generalized Least Squares (FGLS).
˜Estimates obtained using Panel-Corrected Standard Errors (PCSE).

Table 10
IV-2SLS results: Corruption, economic inequality, and health outcomes (instrumental variable = distance from the equator).

	Infant Mortality	Under-Five Mortality	Life Expectancy
	Model 44	Model 45	Model 46
Corruption (I)	.1244** (.0503)	.2042*** (.0513)	.0036 (.0103)
Economic Inequality (II)	.2994 (.5702)	1.3813** (.5812)	.1581 (.1033)
I X II	.2522* (.1502)	.3918*** (.0153)	−.0612** (.0278)
Controls	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Countries	137	137	137
Observations	1491	1491	1491
Kleibergen-Paap F Test	109.40	77.20	93.40
Hansan J (p-value)	0.5203	0.6422	0.1662

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.
Distance from the equator is used as an instrumental variable to address endogeneity concerns.

healthcare systems are underfunded, and governance is weaker. For example, in low-income countries, the interaction term is associated with a 1.2543 rise in infant mortality and a 1.1765 increase in under-five mortality. These results reflect systemic vulnerabilities in resource allocation and institutional capacity, which leave poorer nations disproportionately exposed to the compounded harms of corruption and inequality. However, this framing also calls for a more nuanced critique. While low-income countries bear the immediate burden of these dynamics, the structural roots of corruption and inequality are often tied to global financial systems, transnational corporations, and policy frameworks imposed by international institutions, which perpetuate inequities.

To address methodological concerns, advanced econometric techniques are employed. Table 9 presents results from FGLS and PCSE analyses, both of which confirm the significance of the interaction term. These methods account for heteroscedasticity and serial correlation, enhancing the robustness of the results. However, they also reveal the limitations of conventional econometric techniques in fully capturing the systemic interdependencies that shape health outcomes, such as global trade dynamics or regional political alliances.

Table 10 details the results of the IV-2SLS method, addressing potential endogeneity concerns. Geographic distance from the equator is used as an instrument, grounded in prior research linking equatorial proximity to colonial legacies and governance challenges (Gillanders, 2014; Treisman, 2007). While diagnostic tests confirm the validity of this instrument, its use raises questions about geographic determinism and the extent to which historical contexts can adequately explain contemporary health inequities. Nevertheless, the IV-2SLS results reinforce the causal interpretation of the interaction term, which remains significantly associated with poorer health outcomes.

The results consistently show that corruption and inequality interact to compound public health disparities, undermining health systems and exacerbating deprivation. Subgroup analyses emphasize the disproportionate burden on low- and lower-middle-income countries, while robustness checks validate the findings across alternative measures and methods. However, these findings also highlight systemic gaps in global governance. Addressing these compounded effects requires not only national policy reforms but also international efforts to regulate financial secrecy, redistribute global wealth, and enforce corporate accountability. These broader structural interventions are essential to mitigate the entrenched inequalities and governance failures that

perpetuate health disparities.

5. Discussion and conclusion

This study highlights the compounded effects of corruption and economic inequality on population health outcomes, providing evidence that these factors interact to exacerbate health disparities. While the findings align with existing literature on social determinants of health, they also expose significant gaps in current governance and development paradigms. The interaction between corruption and inequality reflects deeper structural failings that require interrogation, particularly in how policy and institutional responses have perpetuated rather than alleviated these issues.

The analysis shows that corruption and inequality independently worsen health outcomes, but their interaction creates a multiplier effect that amplifies deprivation. This compounded effect underscores the inadequacy of existing health and governance frameworks to address the root causes of health disparities. By focusing on downstream interventions, such as healthcare access improvements, policymakers often overlook the upstream drivers—governance failures and structural inequities—that perpetuate poor health outcomes. This finding challenges "reductionist" public health approaches that prioritize individual and community-level interventions while failing to engage with broader political and economic systems.

5.1. Critical interpretation of results

The compounded impact of corruption and inequality is most pronounced in low- and lower-middle-income countries, as the subgroup analysis in Tables 7 and 8 reveals. These countries often face a dual burden of weak governance and fragile healthcare systems, making them particularly vulnerable to the interactive effects of these structural determinants. However, framing these findings solely as failures of low-income countries risks obscuring the global dimensions of corruption and inequality. For instance, international financial systems, corporate tax avoidance, and uneven economic globalization have contributed to the concentration of wealth and power, exacerbating inequality even in ostensibly "developed" nations. Similarly, corruption in high-income countries often manifests in subtler but equally pernicious forms, such as regulatory capture and lobbying, which distort resource allocation and policymaking.

The results also raise critical questions about the role of development assistance and international organizations in addressing these issues. While global health initiatives often target symptoms—such as maternal mortality or vaccination rates—they rarely confront the structural causes of corruption and inequality. Moreover, donor-driven conditionalities, such as austerity measures imposed by international financial institutions, can weaken public institutions and exacerbate inequality, undermining their purported goals of health equity and development.

In high-income contexts, where the compounded effects of corruption and inequality are less pronounced, the findings suggest that robust institutions and stronger healthcare systems can mitigate some of these impacts. However, this relative resilience masks underlying inequities that persist within these countries. For example, racial and ethnic minorities, low-income groups, and other marginalized populations in high-income settings continue to experience disproportionate health burdens, reflecting the interplay of structural racism, economic stratification, and governance failures. This observation challenges the universality of existing policy solutions, which often assume that strengthening institutions is sufficient to address health disparities.

5.2. Rethinking policy responses

The findings demand a reevaluation of policy approaches to corruption and inequality. Anti-corruption strategies have historically focused on technocratic solutions, such as transparency initiatives and institutional capacity building, which often fail to address the political economies that sustain corruption. For example, international anti-corruption efforts frequently emphasize prosecuting individual actors while neglecting systemic reforms to dismantle patronage networks or regulate private sector influence. Similarly, redistributive policies aimed at reducing inequality—such as taxation and social welfare programs—are often undermined by elite capture and weak enforcement, limiting their effectiveness.

A more transformative approach would recognize corruption and inequality as mutually reinforcing phenomena rooted in global economic and political systems. Policies must go beyond addressing corruption as a moral failure or inequality as an economic inevitability. Instead, they should focus on disrupting the structures that enable wealth and power concentration. For instance, global governance reforms could address tax havens, illicit financial flows, and transnational corporate practices that exacerbate inequality and weaken state capacity. Simultaneously, redistributive policies should be designed to empower marginalized communities, ensuring that resources are not only redistributed but also democratized.

5.3. Limitations and the need for structural critique

While this study contributes valuable insights, it is not without limitations. The unbalanced panel dataset may exclude some of the most vulnerable contexts, such as fragile or conflict-affected states, where the compounded effects of corruption and inequality are likely even more severe. Moreover, the reliance on macro-level indicators, such as the Gini coefficient and Corruption Perceptions Index, may obscure the localized and lived experiences of deprivation. Future research could adopt mixed-methods approaches, combining quantitative analyses with qualitative case studies to explore how corruption and inequality manifest in specific socio-political contexts.

The focus on statistical relationships also risks reifying corruption and inequality as discrete, measurable phenomena, rather than as dynamic processes shaped by historical and social forces. For example, the use of geographic distance from the equator as an instrumental variable, while methodologically sound, may inadvertently reinforce colonial framings of development that attribute underdevelopment to geographic determinism rather than historical exploitation and systemic marginalization. Future research should critically interrogate these methodological choices, exploring alternative frameworks that center the agency of marginalized populations and the structural roots of corruption and inequality.

5.4. Toward transformative action

The findings of this study highlight the urgency of addressing corruption and inequality as intertwined challenges that transcend national borders. However, doing so requires more than technical solutions or incremental reforms. It demands a paradigm shift toward systemic change that prioritizes social justice, equity, and sustainability. Policymakers must recognize that health disparities are not merely outcomes of poor governance or insufficient resources but are embedded in broader systems of power and inequality.

For low- and middle-income countries, this means resisting externally imposed conditionalities that prioritize fiscal austerity over social investment. For high-income countries, it means acknowledging and addressing their complicity in global inequalities through tax avoidance, extractive trade practices, and unequal financial systems. International institutions must also shift from focusing on symptomatic interventions to tackling the structural drivers of health inequities, such as neoliberal economic policies and exploitative labor practices.

Ultimately, this study underscores that achieving global health equity requires confronting uncomfortable truths about the distribution of power and resources in the global system. Addressing corruption and inequality as systemic rather than localized issues is not only a moral

imperative but also a practical necessity for creating healthier, more just societies.

CRediT authorship contribution statement

Chun Kai Leung: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Jeremy Ko:** Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Formal analysis, Data curation, Conceptualization. **Fangzheng Liang:** Writing – original draft, Formal analysis, Data curation. **Wai Kit Ming:** Writing – review & editing, Supervision, Funding acquisition.

Ethics statement

Ethical approval is not applicable to this manuscript for it does not involve human participants.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT to improve the readability and language of the manuscript. After using this tool/service, the authors reviewed and edited the content as needed and takes full responsibility for the content of the published article.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssaho.2025.101686.

Appendix

Table A1
Main Regression Results: Corruption, Economic Inequality, and Health Outcomes (Standardized Coefficients)

	Infant Mortality		Under-Five Mortality		Life Expectancy	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Corruption (I)	.0324** (.0126)	−.1042*** (.0174)	.0349*** (.0120)	−.1150*** (.0165)	−.0232** (.0124)	.0912** (.0328)
Economic Inequality (II)	.0513*** (.0179)	−.1473*** (.0177)	.0398** (.0170)	−.1592*** (.0148)	−.0082 (.0233)	.0350*** (.0232)
I X II		.0532*** (.0090)		.0594*** (.0085)		−.0550*** (.0118)
Democracy	.0165 (.0129)	.0182 (.0128)	.0075 (.0123)	.0094 (.0121)	.0686*** (.0168)	.0673*** (.0168)
Natural Resources	.0354*** (.0127)	.0362*** (.0126)	.0265*** (.0121)	.0274** (.0120)	.0007 (.0166)	.0000 (.0165)
Economic Development	−.4411*** (.0157)	−.4260*** (.0158)	−.4251*** (.0150)	−.4082*** (.0149)	.2115*** (.0205)	.1993*** (.0207)
Population	−.8178*** (.1044)	−.8180*** (.1032)	−.9177*** (.0992)	−.9179*** (.0977)	2.1651*** (.1358)	2.1652*** (.1353)
Birth Rate	−.1605*** (.0247)	−.1680*** (.0244)	−.1459*** (.0235)	−.1542*** (.0231)	.1888*** (.0321)	.1948*** (.0320)
Urbanization	−.3583*** (.0413)	−.3499*** (.0409)	−.4497*** (.0393)	−.4403*** (.0387)	.8361*** (.0538)	.8293*** (.0536)
Government Spending	−.0077 (.0095)	−.0063 (.0094)	−.0064 (.0091)	−.0047 (.0089)	−.0155 (.0124)	−.0166 (.0123)
Educational Level	.0500*** (.0092)	.0525*** (.0091)	.0489*** (.0088)	.0514*** (.0086)	−.0251** (.0120)	−.0271** (.0119)
Foreign Direct Investment	.0161*** (.0051)	.0149*** (.0050)	.0091* (.0048)	.0078 (.0047)	.0096 (.0066)	.0105 (.0066)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Countries	136	136	136	136	136	136
Observations	1627	1627	1627	1627	1627	1627
R-Squared (Adj)	0.3549	0.3469	0.3466	0.3377	0.1609	0.1576

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.

Table A2
Regression Results: Corruption, Economic Inequality, and Alternative Health Outcome Measures (Standardized Coefficients)

	Maternal Mortality	Neonatal Mortality	5–14 Years Old Mortality	Female Under-Five Mortality	Male Under-Five Mortality	Female Life Expectancy	Male Life Expectancy
	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Corruption (I)	−.1271** (.0652)	−.1286*** (.0607)	−.1390* (.0885)	−.1746*** (.0199)	−.2016*** (.0251)	.0118* (.0069)	.0130*** (.0041)
Economic Inequality (II)	−.0817*** (.0315)	−.0620*** (.0351)	−.0697*** (.0269)	−.0784*** (.0171)	−.0819*** (.0164)	.0664*** (.0233)	.0676*** (.0235)
I X II	.0812*** (.0079)	.0440*** (.0108)	.0515*** (.0157)	.0803*** (.0088)	.0839*** (.0083)	−.0706*** (.0119)	−.0756*** (.0120)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

(*continued on next page*)

Table A2 (*continued*)

	Maternal Mortality	Neonatal Mortality	5–14 Years Old Mortality	Female Under-Five Mortality	Male Under-Five Mortality	Female Life Expectancy	Male Life Expectancy
	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	136	136	132	136	136	136	136
Observations	1627	1627	1627	1627	1627	1627	1627
R-Squared (Adj)	0.0010	0.3623	0.6447	0.3497	0.3380	0.1815	0.1407

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.

Table A3
Regression Results: Corruption, Alternative Measures of Economic Inequality, and Health Outcomes (Standardized Coefficients)

	Infant Mortality	Under-Five Mortality	Life Expectancy	Infant Mortality	Under-FiveMortality	Life Expectancy
	Model 14	Model 15	Model 16	Model 17	Model 18	Model 19
Corruption (I)	−.0590* (.0280)	−.0511** (.0266)	.0368*** (.0146)	−.0896*** (.0161)	−.1004*** (.0152)	.0796*** (.0210)
Economic Inequality (II)	−.0340* (.0178)	−.0682*** (.0167)	.0064*** (.0021)	−.0402** (.0160)	−.0592*** (.0152)	.0318*** (.0109)
I X II	.0292** (.0120)	.0325*** (.0107)	−.0117*** (.0095)	.0401*** (.0091)	.0559*** (.0086)	−.0407*** (.0118)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Countries	126	126	126	136	136	136
Observations	1059	1059	1059	1627	1627	1627
R-Squared (Adj)	0.8328	0.1243	0.0191	0.3393	0.3311	0.1603

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.
[1]Economic inequality is measured using the Pre-Tax Gini Coefficient.
[2]Economic inequality is measured using the share of wealth held by the richest 10 %.

Table A4
Regression Results: Alternative Corruption Measures, Economic Inequality, and Health Outcomes (Standardized Coefficients)

	Infant Mortality	Under-Five Mortality	Life Expectancy	Infant Mortality	Under-Five Mortality	Life Expectancy
	Model 20[1]	Model 21[1]	Model 22[1]	Model 23[2]	Model 24[2]	Model 25[2]
Corruption (I)	−.0699*** (.0242)	−.0917*** (.0342)	.1196*** (.0205)	−.0580*** (.0170)	−.0584*** (.0163)	.0411*** (.0146)
Economic Inequality (II)	−.0753*** (.0266)	−.0865*** (.0259)	.0455*** (.0239)	−.0609*** (.0264)	−.0645*** (.0258)	.0475*** (.0239)
I X II	.0492*** (.0076)	.0558*** (.0093)	−.0312*** (.0051)	.0463** (.0227)	.0573*** (.0131)	−.0480*** (.0198)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Countries	137	137	137	137	137	137
Observations	2175	2175	2175	3121	3121	3121
R-Squared (Adj)	0.6907	0.6626	0.3606	0.7924	0.7663	0.4436

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.
[1]Corruption is measured using the Corruption Index from the Fraser Institute (2024).
[2]Corruption is measured using the Political Corruption Index from V-Dem (2024).

Table A5
Regression Results: Corruption, Economic Inequality, and Health Outcomes by Income Group (Low and Lower-Middle Income Countries) (Standardized Coefficients)

	Infant Mortality	Under-Five Mortality	Life Expectancy	Infant Mortality	Under-Five Mortality	Life Expectancy
	Model 26[1]	Model 27[1]	Model 28[1]	Model 29[2]	Model 30[2]	Model 31[2]
Corruption (I)	−.0533** (.0211)	−.0233 (.0511)	−.0194 (.1248)	−.1045*** (.0200)	−.1026*** (.0203)	.0131** (.0051)
Economic Inequality (II)	−.2571*** (.0686)	−.1571 (.0786)	−.0220 (.1757)	−.1098*** (.0387)	.0791*** -(.0292)	.0590** (.0199)
I X II	.1876*** (.0678)	.1876 (.1178)	.2476 (.2451)	.0856*** (.0214)	.0584*** (.0215)	−.0680*** (.0220)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Countries	44	44	44	58	58	58
Observations	344	344	344	422	422	422
R-Squared (Adj)	0.0571	0.0397	0.0104	0.0088	0.0090	0.1185

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.
[1]Includes low-income countries only.
[2]Includes lower-middle-income countries only.

Table A6
Regression Results: Corruption, Economic Inequality, and Health Outcomes by Income Group (Upper-Middle and High-Income Countries) (Standardized Coefficients)

	Infant Mortality	Under-Five Mortality	Life Expectancy	Infant Mortality	Under-Five Mortality	Life Expectancy
	Model 32[a]	Model 33[a]	Model 34[a]	Model 35[b]	Model 36[b]	Model 37[b]
Corruption (I)	.2688*** (.0778)	−.2974*** (.7660)	−.11933 (.0892)	−.0290 (.0990)	−.0692* (.0378)	.0427** (.0163)
Economic Inequality (II)	.1249 (0949)	−.1864** (.0944)	−.0594 (.0607)	−.0438 (.0828)	−.0882 (.0802)	.0026 (.0016)
I X II	−.0903 (.0703)	.0585** (.0258)	.0355 (.0353)	−.0162 (.0341)	.0315 (.0330)	−.0058* (.0032)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Countries	48	48	48	45	45	45
Observations	386	386	386	485	485	485
R-Squared (Adj)	0.0025	0.0009	0.0765	0.0000	0.0269	0.2091

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.
[a]Includes upper-middle-income countries only.
[b]Includes high-income countries only.

Table A7
FGLS and PCSE Results: Corruption, Economic Inequality, and Health Outcomes (Standardized Coefficients)

	Infant Mortality	Under-Five Mortality	Life Expectancy	Infant Mortality	Under-Five Mortality	Life Expectancy
	Model 38[a]	Model 39[a]	Model 40[a]	Model 41[b]	Model 42[b]	Model 43[b]
Corruption (I)	−.1042*** (.0331)	−.1150** (.0417)	.0912* (.0451)	.1040 (.0063)	.0177 (.0104)	.0050 (.0044)
Economic Inequality (II)	−.0972** (.0356)	−.1352*** (.0436)	.0164* (.0068)	.0146 (.0282)	.0276 (.0291)	.0126* (.0070)
I X II	.0531*** (.0163)	.0593** (.0172)	−.0485* (.0267)	.0178** (.0082)	.0158* (.0082)	−.0043*** (.0017)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Countries	137	137	137	137	137	137
Observations	1627	1627	1627	1627	1627	1627
R-Squared (Adj)	0.3469	0.3377	0.1777	0.9454	0.9509	0.9991

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.
[a]Estimates obtained using Feasible Generalized Least Squares (FGLS).
[b]Estimates obtained using Panel-Corrected Standard Errors (PCSE).

Table A8
IV-2SLS Results: Corruption, Economic Inequality, and Health Outcomes (Instrumental Variable = Distance from the Equator) (Standardized Coefficients)

	Infant Mortality	Under-Five Mortality	Life Expectancy
	Model 44	Model 45	Model 46
Corruption (I)	.0634** (.0293)	.1032*** (.0243)	.0019 (.0045)
Economic Inequality (II)	.1654 (.3732)	0.6813** (.2814)	.0684 (.0534)
I X II	.1322* (.0702)	.1952** (.0065)	−.0343** (.0135)
Controls	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Countries	137	137	137
Observations	1491	1491	1491
Kleibergen-Paap F Test	109.40	77.20	93.40
Hansan J (p-value)	0.5203	0.6422	0.1662

*p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are in parentheses.
Distance from the equator is used as an instrumental variable to address endogeneity concerns.

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