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Role of High-Quality Economic Development on Health in China

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ABSTRACT

China faces declining fertility, persistent regional health disparities, and rising mortality pressures despite economic progress. This study examines how high-quality economic development (HQED) affects fertility and mortality using panel data from 31 provinces between 2013 and 2022. System GMM results show that HQED significantly increases fertility and reduces mortality, with more potent effects in central–western regions. Innovation, green governance, and welfare expansion drive most improvements. Policy should prioritise pollution reduction, expand childcare and health insurance subsidies, and channel HQED-related fiscal support toward lagging central–western provinces to maximize demographic resilience and accelerate convergence in population health outcomes.

Keywords: high-quality economic development; fertility rate; mortality rate; GMM model

INTRODUCTION

High-quality economic development (HQED) has become the central guiding principle in China's transition from rapid growth to a more sustainable, innovation-driven, equitable, and human-centered development model. Unlike traditional GDP-focused growth, HQED emphasizes structural transformation, social welfare, environmental protection, technological progress, and balanced regional development. This shift reflects China's recognition that economic expansion alone is insufficient to address the complex demographic and health challenges emerging nationwide. A critical question, therefore, arises: Does HQED translate into measurable improvements in population health, specifically in fertility patterns and mortality outcomes?

China's demographic landscape has undergone profound change over the past decade. Fertility rates have continued to decline despite the relaxation of family planning policies, prompting widespread concern about population aging, shrinking labor supply, and long-term economic resilience. At the same time, mortality patterns exhibit heterogeneous trends across regions, with eastern provinces benefiting from stronger health systems and western regions experiencing higher disease burdens and weaker access to medical services. These demographic pressures coincide with significant environmental challenges, rising healthcare costs, rapid urbanization, and complex social transitions—all of which make population health a crucial benchmark of development quality.

As shown in Table 1, several key issues emerge. First, significant provincial disparities exist in core health indicators, with infant mortality ranging from 3.2 to 12.5 per 1,000 and maternal mortality varying fourfold—indicating persistent inequality in basic health outcomes across China. Second, service access gaps remain substantial, as physician density and hospital bed availability vary widely across provinces, suggesting uneven healthcare capacity. Third, environmental inequality is pronounced, with PM2.5 levels ranging from 12 to 68 μg/m³, reinforcing that pollution remains a critical driver of health disparities.

Table 1: Health Inequality Across Chinese Provinces (2013–2022)

Indicator	Mean	Std. Dev.	Min–Max	Literature Basis
Infant Mortality Rate (per 1,000)	6.8	2.5	3.2 – 12.5	Currie & Neidell (2020); Guo & Tao (2022)
Under-5 Mortality Rate (per 1,000)	8.9	3.1	4.8 – 16.0	Ferreira (2023)
Life Expectancy at Birth (years)	77.4	2.7	71.8 – 82.1	Birdsall & Wheeler (2022)
Maternal Mortality Ratio (per 100,000)	20.8	9.4	9.0 – 41.0	Fang & Lu (2020)
Fertility Rate (per 1,000)	9.6	3.5	5.2 – 15.8	Li (2021); Ma (2022)
Crude Mortality Rate (per 1,000)	6.5	0.9	4.9 – 8.6	Currie (2020)
PM2.5 Concentration (μg/m³)	35.2	14.8	12.0 – 68.0	Forastiere (2020); Lucas et al. (2023)
Hospital Beds per 10,000 people [Access]	62.3	11.4	41.7 – 88.5	Gu Hai et al. (2020)
Physicians per 10,000 people [Availability]	29.1	6.3	18.6 – 42.0	Coneus & Spiess (2020)
Health Expenditure per capita in RMB [Spending]	2860	1310	1,120 – 6,240	Guo & Tao (2022)

Against this backdrop, HQED offers a multidimensional framework that integrates economic efficiency with welfare improvement, equitable development, and environmental sustainability. Its five core dimensions—innovation, coordination, green development, openness, and sharing—represent not only macroeconomic priorities but also key determinants of health. Innovation enhances medical technology and diagnostic capacity; coordinated development reduces interregional inequalities in health infrastructure; green development improves environmental conditions; openness facilitates technological diffusion and public health collaboration; and shared development expands welfare systems and access to essential services. These mechanisms collectively suggest that HQED may enhance both fertility and mortality outcomes in measurable ways.

However, empirical evidence directly linking HQED to population health remains scarce. Most existing research relies on single-dimensional measures, such as GDP per capita or pollution indicators, which fail to capture the broader institutional, technological, and welfare structures that influence health. Moreover, fertility and mortality are rarely studied jointly, despite their interdependence as fundamental components of population dynamics. Another limitation is the reliance on static empirical models that overlook the persistence of health outcomes and the potential for reverse causality between development and health. Regional disparities also remain largely unexplored, even though China's provinces vary widely in socioeconomic capacity, environmental governance, and public health infrastructure.

To address these gaps, this study develops a comprehensive HQED index using the entropy-weight method. It applies a dynamic system GMM framework to evaluate the relationship between HQED and health across 31 Chinese provinces from 2013 to 2022. The dynamic specification captures the persistence of demographic outcomes, while system GMM addresses endogeneity concerns by using internal instruments. By examining both fertility and mortality, the study provides a more complete assessment of how development quality influences population health. Furthermore, regional heterogeneity is explored to assess whether the benefits of HQED differ between eastern and central–western provinces.

The findings of this study have substantial theoretical and policy relevance. Understanding how HQED influences health provides insight into the broader societal implications of China's development strategy and informs policymaking aimed at improving demographic sustainability and public well-being. The study also contributes to development economics by illustrating how multidimensional development, rather than income alone, shapes health outcomes in a rapidly transforming economy.

LITERATURE REVIEW

Upon reviewing the existing literature, the paper will measure the health of China's residents through fertility and mortality rates. Regarding the linkage between high-quality economic development and fertility rates, some scholars have posited a positive effect, arguing that it increases people's incomes, thereby raising their willingness to have children (Lu, 2024). This view is based on the income effect theory in economics, which suggests that as family economic conditions improve, parents are better able to bear the costs of child-rearing, including education, healthcare, and living expenses, thereby increasing their willingness to have children. Moreover, high-quality economic development often comes with improvements in social security systems, such as maternity leave and fertility insurance, which provide better institutional support for family childbearing and further increase fertility rates. At the same time, high-quality economic development also promotes the comprehensive upgrading of social security systems (Sayantani et al.,2022). The government has increased investments in healthcare, pension systems, and education, creating a wide-ranging and robust social safety net (Georgios, 2024). These policies not only directly reduce the economic burden on families during childbirth and child-rearing but also enhance family satisfaction and well-being by improving the quality of public services. High-quality healthcare and educational resources act like magnets, attracting families and making them more willing and able to assume the responsibility of childbearing and child-rearing (Sun, 2023). Furthermore, the government has further stimulated enthusiasm for fertility by flexibly adjusting fertility policies, such as implementing fertility subsidies and extending maternity and paternity leave, thereby injecting strong momentum into sustained fertility growth.

However, other scholars take an opposite view, suggesting that high-quality economic development might actually lead to a decrease in fertility rates (Li, 2020). This conclusion is mainly based on several considerations: first, as economic development increases, women's educational levels and employment opportunities rise significantly, making them more focused on career development and quality of life, thereby postponing or abandoning childbearing plans. Second, high-quality economic development is often accompanied by accelerated urbanization, where the high pressure and costs of urban life may suppress the willingness to have children. Finally, from a cultural perspective, as society becomes more open and diverse, traditional family and fertility concepts gradually fade, further contributing to the decline in fertility rates.

A few scholars have proposed a more complex view, suggesting a "U-shaped" relationship between fertility rates and high-quality economic growth (Zhou, 2024). This view suggests that, in the early stages of economic development, as income levels rise, fertility rates may decline due to higher living costs and greater female employment. However, once the economy reaches a certain level, fertility rates may gradually recover as social security systems improve, fertility policies are adjusted, and fertility concepts shift (Guo, 2023). This "U-shaped" dynamic reveals the complexity and variability in the impact of high-quality economic development on fertility rates (Zhou, 2024). In the macro blueprint of high-quality economic development, changes in fertility and mortality rates are not isolated but are closely connected to multiple dimensions of economic growth (Pedro, 2020).

This aspect concerns the mechanism by which high-quality economic development affects mortality rates. Existing research generally suggests that promoting high-quality economic development significantly reduces mortality rates among residents. The pathways of this effect primarily manifest in improving public service provision, strengthening ecological environmental governance, and perfecting the social security system, among other aspects. Firstly, high-quality economic development guides public finance to place greater emphasis on people's livelihoods (Li, 2024), increasing investment in medical and health care, basic public services, and health infrastructure. This has significantly improved the accessibility and coverage of medical resources, effectively reducing mortality rates from illness and the incidence of preventable diseases (Danut, 2015). Secondly, driven by the concept of green development, environmental governance has become a core issue in high-quality development. Given that factors such as air pollution, water pollution, and soil heavy metal pollution are closely related to chronic diseases and premature death, especially in urban agglomerations and industrial-intensive areas, the high-quality development, by promoting the application of green technologies, controlling pollutant emissions, and advancing the transition to clean energy, not only improves the quality of the ecological environment but also reduces the mortality risks caused by environmental pollution (Feng, 2024).

Furthermore, the implementation of the shared development concept has facilitated improvements to the medical security system. With medical insurance coverage continuously expanding and health service capacity in rural and remote areas continually enhanced, the problems of "death due to illness" and "delay due to illness" were further alleviated. Especially after the pandemic, the construction of the public health system has become a national strategic priority, strengthening disease prevention and control capabilities and the efficiency of responding to public health events, thereby reducing mortality rates in the medium and long term.

However, some studies have noted that high-quality economic development faces challenges of regional disparities and diminishing marginal returns in reducing mortality rates. For example, although some developed provinces have high levels of medical technology and financial capabilities, due to the intensification of aging and a heavy burden of chronic diseases, the scope for mortality reduction is limited. In regions with weaker economic foundations, medical resources are still insufficient, and high-quality development has not yet fully unleashed the health dividend (Liang, 2023). Overall, high-quality economic development plays a positive role in reducing mortality rates through multiple mechanisms. However, its effects are limited by factors such as regional development stage, demographic characteristics, and governance capabilities, and exhibit significant spatial heterogeneity and stage-specific characteristics. Combined with the previous analysis of fertility rates, it can be seen that high-quality economic development exhibits complex, bidirectional, and even nonlinear effects on population dynamics (including births and deaths). Moreover, it has become an important frontier issue in current population and development research.

At the same time, the continuous improvement of medical standards provides strong protection for residents' lives and health. With the deepening of technological progress and medical system reforms, advanced diagnostic and treatment equipment, modern medical technology, and high-quality medical staff are continuously extended to the grassroots level. The success rate of treating major diseases has significantly increased, chronic disease management has become increasingly refined and systematic, residents' life expectancy has steadily extended, and the mortality rate due to illness has significantly decreased. Secondly, improvements in the ecological environment quality have become an important factor in reducing mortality. Under the guidance of the green development concept, the country has continuously increased investment in the treatment of air, water, and soil pollution, promoted the substitution of clean energy, eliminated backward production capacity, established ecological red lines, and taken other measures to effectively improve residents' living environments. Numerous studies have shown that air pollution is closely associated with cardiovascular and cerebrovascular diseases, respiratory diseases, and other conditions. Improving environmental quality helps reduce the incidence of disease at the source and the risk of premature environmental-related death.

Meanwhile, advances in social equity and improvements in the public service system are also quietly contributing to the ongoing decline in mortality rates. The popularization of education has enhanced residents' health awareness and self-care abilities. The continuous improvement of basic medical insurance and critical illness insurance systems has alleviated issues such as delayed medical treatment or "death due to illness" caused by economic burden. Against the backdrop of an increasingly aging population, the government has continued to increase investment in elderly care services and long-term care systems, thereby enhancing the elderly population's access to health care and reducing their mortality risk to some extent. In summary, high-quality economic development has jointly promoted increases in fertility rates. It reduces mortality rates through multiple channels, such as raising residents' incomes, improving the social security system, and optimizing the fertility policy environment. This process not only demonstrates the positive interaction between economic development and population changes but also reflects the government's strategic foresight and proactive actions in promoting long-term balanced population development.

In terms of mortality rates, developed regions boast abundant and well-distributed medical resources, including a concentration of high-level hospitals, sufficient numbers of medical staff, and advanced medical technology. These factors provide residents with high-quality, timely, and adequate medical services, thereby significantly enhancing the cure rate for diseases and the success rate of emergency treatment and reducing the risk of death from illness. On the other hand, developed regions possess stronger ecological governance capabilities and a higher level of green development. The quality of air, water, and living environment is generally superior to that of the central and western regions. Residents who live in a good ecological environment for a long time tend to have higher levels of health and longevity (Bruno, 2024). This reduces the phenomenon of abnormal deaths due to economic reasons.

A growing body of literature emphasizes the role of socioeconomic factors, including urbanization, education, industrial structure, pollution, medical expenditure, and income, in shaping health outcomes. Urbanization generally improves access to hospitals and public services (Mitchell & Dorling, 2020) but may also worsen mental health due to stress, congestion, and pollution (Morello & Jesdale, 2020). Education is widely viewed as a key factor in improving health literacy, preventive care, and healthy behaviors (Currie, 2020). Industrial structure remains highly relevant in China, where heavy-industry provinces tend to face greater pollution and occupational risks (Lucas et al., 2023). Air pollution, particularly PM2.5, is one of the strongest predictors of mortality (Currie & Neidell, 2020) and has adverse effects on fertility and birth outcomes. Medical expenditure enhances treatment access, although high out-of-pocket burdens may limit its benefits (Guo & Tao, 2022). Economic development improves living standards, nutrition, and access to healthcare, but exhibits diminishing returns at higher income levels (Birdsall & Wheeler, 2022).

METHODOLOGY

The empirical framework builds on the understanding that population health is inherently dynamic. Both fertility and mortality rates demonstrate state dependence, meaning that their current levels are influenced by their past values due to behavioral, biological, and institutional inertia. To capture this structure, the analysis employs a dynamic panel model in which health outcomes depend on their own lag, the *HQED* index, and a set of socioeconomic control variables.

$$HE_{it}=a_0+a_1HE_{i,t\text{-}1}+a_2HQED_{it}+a_3\sum_{i=1}^{6} OTHER_{it}+\varepsilon_{it}$$

HE stands for health and is represented by fertility and mortality rates. Among the crucial *OTHER* factors justified by past studies are: (i) urbanization level (*URB*), where the proportion of urban population to total population is used as the proxy variable, (ii) human capital level (*HCAP*) which is measured by the number of students enrolled in higher education institutions/total population, (iii) social consumption level (*CONS*), represented by the total sales of social consumer goods/gross regional domestic product, (iv) tax burden level (*TAX*), characterized by tax revenue/gross regional domestic product, (v) industrialization degree (*IND*), measured by the proportion of the added value of the secondary industry in GDP, (vi) medical level (*MED*), represented by the natural logarithm of the number of medical and health institutions. The details on the measurements used for *HQED* are given in Table 2 below:

Table 2: System for High-Quality Economic Development

Primary Index	Secondary Index	Indicator Measurement
Innovation Development (ID)	R&D Investment Intensity	R&D expenditure of industrial enterprises over GDP
	Technology Trading Activity	Technology transaction amount/GDP
Coordinated Development (CD)	Urban-Rural Structure	Urbanization rate
	Government Debt Burden	Government debt balance/GDP
Green Development (GD)	Energy Consumption Elasticity	Energy consumption growth rate/GDP growth rate
	Wastewater per Unit of Output	Wastewater discharge/GDP
	Emissions per Unit of Output	Sulfur dioxide emissions/GDP
Open Development (OD)	Degree of Marketization	Regional marketization index
Shared Development (SD)	Labor Compensation Share	Labor compensation/GDP
	Social Welfare Expenditure Share	Share of local government expenditure on education, health, housing, and social security

Sources: The data in this table is sourced from the 2024 China Statistical Yearbook.

This study focuses on data from 31 provincial-level administrative regions in mainland China (excluding Hong Kong, Macau, and Taiwan) from 2013 to 2023, examining fertility and mortality rates, economic development conditions, and related economic indicators. The analysis uses panel data spanning 10 years. The data primarily come from the China Statistical Yearbook and official publications of the National Bureau of Statistics of China, ensuring the dataset's comprehensiveness and reliability. To address a few missing data points, linear interpolation was used to fill gaps, ensuring data completeness and continuity. The final data set contains 310 valid observations across all variables. The detailed definitions and descriptive statistics for each variable are summarized in Table 2, laying a solid foundation for the subsequent empirical analysis (Mao et al., 2023).

The existing literature on economic development has gradually shifted from a single-dimensional measurement to a multidimensional index system. Based on current research, this study constructs an evaluation index system for high-quality economic development, drawing on the five dimensions of the new development concept. The entropy-weighted method was used to calculate the index (Yang et al., 2023). The specific indicators used to construct this system are outlined in Table 2.

When constructing a high-quality economic development index system, it is crucial to assign reasonable weights to the sub-indicators to ensure the objectivity and accuracy of the evaluation results. To avoid subjective bias, this study uses the entropy-weighting method, which assigns weights based on each indicator's information content. The specific steps are as follows:

To ensure comparability and rationality in the calculations, the indicators are standardized. Specifically, for positive indicators, a range normalization method is used to map them to values in the [0,1] range, reflecting their positive contribution to high-quality development. For reverse indicators, the values are adjusted to align with the logic of positive growth. The adjustment formulas are as follows:

$$\text{Positive indicators:} x_{ij}^{+}=\frac{x_{ij}-x_{i\,min}}{x_{i\,max}-x_{i\,min}}; \qquad \text{Reverse indicators:} x_{ij}^{-}=\frac{x_{i\,max}-x_{ij}}{x_{i\,max}-x_{i\,min}}$$

where $x_{i\,max}$ and $x_{i\,min}$ represent the maximum and minimum values for the i indicator, and x_{ij} represents the value of the *i* indicator in the *j* year. The construction of the evaluation matrix. Assuming that the dimension of the economic high-quality development index of a particular province in year m to be measured includes n indicators x_{ij}, the original coefficient matrix A is as follows:

$$A=\begin{pmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{pmatrix}$$

where m is the number of evaluation indicators, and n is the number of years. Nn To calculate the entropy, a logarithmic transformation is applied. To avoid any zero values after standardization, this paper shifts the initial standardized data only to the right by 0.01 units. The entropy e_j for the j-th indicator is expressed as:

$$e_j=-\frac{1}{\ln n}\sum_{i=1}^{n}(f_{ij}\ln f_{ij})$$

$$f_{ij}=x_{ij}/\sum_{i=1}^{n}x_{ij}$$

Calculating the Coefficient of Variation: The coefficient of variation reflects the relative importance of each indicator in the evaluation process. The larger the coefficient, the more information the indicator provides, thus having a more significant impact on the overall evaluation:

$$g_j=1-e_j$$

Calculating Indicator Weights ω_j, The weights for each indicator are determined based on the coefficient of variation, and normalized so that the total sum of the weights equals 1:

$$\omega_j=\frac{g_j}{\sum_{j=1}^{n} g_j}$$

Calculating the Economic High-Quality Development Index for Province i:

$$S_i=\sum_{j=1}^{n}\omega_j\, f_{ij}$$

Subscripts *i* and *t* represent individuals and years, respectively. *a* represents the coefficient to be estimated;$a_0$represents the constant term. Control represents the information set, that is, all control variables except the core explanatory variable. *ε* represents the random disturbance term that follows a white noise process. Table 3 summarizes the variables.

Table 3: Descriptive statistical results of each variable

Variable	Mean	Std.Dev	Min	Max
Health (HE)				
Birth rate (FR)	3.996	3.542	-5.751	11.471
Mortality (MR)	6.367	0.984	4.26	9.091
High-quality economic development (HQED)	0.281	0.114	0.067	0.839
Urbanization level (URB)	0.597	0.116	0.239	0.896
Level of human capital (HCAP)	0.021	0.006	0.009	0.044
Social consumption level (CONS)	0.002	0.002	0.001	0.009
Tax burden level (TAX)	0.082	0.029	0.035	0.234
Degree of industrialization (IND)	0.305	0.086	0.072	0.498
Medical level (MED)	10.085	0.848	8.354	11.417

RESULTUS AND DISCUSSION

From Table 4, system GMM (SGMM) diagnostics reinforce the robustness of the estimation. The Hansen test of overidentifying restrictions indicates that the internal instruments used in both models are valid. In contrast, the AR(2) test fails to reject the null hypothesis of no second-order autocorrelation in the differenced residuals. Together, these diagnostics confirm that the dynamic specification is correctly identified and that the GMM results may be interpreted with confidence.[1] The 2-Step SGMM results indicate that the HQED coefficients yield precise, theoretically consistent results. In the fertility model, HQED shows a positive association (0.782) with provincial fertility rates that is statistically significant. However, the numerical magnitude is modest—as typical in demographic regressions—the direction and significance suggest that higher development quality helps alleviate constraints on childbearing. This pattern aligns with literature showing that welfare systems, environmental quality, and access to childcare services reduce the financial and psychological costs of raising children, thereby supporting fertility intentions. Provinces achieving higher HQED scores tend to have better public services, cleaner environments, and more comprehensive social protection systems, which collectively mitigate the pressures associated with urbanization, high living costs, and employment competition.

Table 4: Regression results of GMM [DV: Health]

	1-Step				**2-Step**			
	DGMM		**SGMM**		**DGMM**		**SGMM**	
	HE = FR	**HE =MR**	**HE = FR**	**HE =MR**	**HE = FR**	**HE =MR**	**HE = FR**	**HE =MR**
	0.624***	0.565***	0.865***	0.925***	0.665***	0.641***	0.884***	0.925***
HE(-1)	-0.132	-0.141	-0.041	-0.063	-0.136	-0.159	-0.05	-0.112
	0.880*	-0.715*	0.754***	-0.682**	0.989**	-0.846*	0.782***	-0.712***
HQED	-0.488	-0.376	-0.231	-0.265	-0.485	-0.435	-0.247	-0.286
	-0.247	0.081	-0.193***	0.075	-0.248	-0.108	-0.186***	0.065
URB	-0.151	-0.115	-0.046	-0.054	-0.176	-0.114	-0.052	-0.057
	-0.809***	0.631***	-0.231***	0.211**	-0.763***	0.723***	-0.222**	0.212**
HCAP	-0.184	-0.175	-0.069	-0.079	-0.2	-0.158	-0.093	-0.084
	-0.596**	0.519*	-0.621***	0.564**	-0.772**	0.524	-0.643***	0.584**
CONS	-0.27	-0.264	-0.19	-0.224	-0.317	-0.318	-0.205	-0.245
	-0.102	-0.343**	0.132**	-0.141**	-0.105	-0.333**	0.125*	-0.131*
TAX	-0.12	-0.13	-0.052	-0.056	-0.154	-0.144	-0.067	-0.069
	0.049	0.297**	0.169***	-0.089**	0.077	0.247*	0.165***	-0.074*
IND	-0.099	-0.11	-0.03	-0.039	-0.119	-0.136	-0.032	-0.043
	-1.801*	-0.103	-0.145***	0.086	-1.576	-0.684	-0.141**	0.072
MED	-0.98	-0.899	-0.051	-0.053	-1.081	-1.082	-0.066	-0.069
Constant			-0.110***	0.113***			-0.115***	0.108***
	-	-	-0.032	-0.03	-	-	-0.038	-0.036
AR(1)	0	0.06	0.004	0.02	0.025	0.057	0.007	0.038
AR(2)	0.632	0.832	0.402	0.897	0.545	0.787	0.396	0.898
Hansen	0.467	0.591	0.752	0.999	0.467	0.417	0.752	0.999
#Obs	217	217	248	248	217	217	248	248

*Note: The numbers in parentheses below the estimated coefficients are the robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. DGMM refers to the difference GMM, and SGMM denotes the system GMM. AR and Hansen refer to the p-value.*

In contrast, the 2-Step SGMM results for the mortality model show that HQED is negatively associated with mortality (-0.712), consistent with the expectation that high-quality development improves survival and health outcomes. The negative coefficient reflects the contributions of green development, coordinated health resource allocation, medical innovation, and welfare expansion. These dimensions help reduce exposure to pollution, enhance access to medical care, improve preventive health measures, and strengthen institutional capacity in public health governance. The results confirm that HQED promotes health not only through economic improvement but also via structural, environmental, and technological pathways.

The possible explanations for the above results are as follows: In terms of fertility rates, as economic development improves, society can provide more comprehensive public services, higher-quality educational resources, a more comprehensive social security system, and more flexible work arrangements. These factors collectively affect family decision-making, reduce the cost of childbirth and child-rearing, and thus stimulate people's willingness to have children. In terms of mortality rate, high-quality economic development enables more efficient allocation of medical resources, makes advanced medical technology and equipment more accessible, significantly improves the accessibility and quality of medical services, and enables residents to obtain disease prevention, diagnosis, and treatment services in a more timely and effective manner, thereby reducing the risk of death after illness. At the same time, high-quality economic development promotes the popularization of health management concepts and the development of the health industry. Residents' health awareness is enhanced, and their lifestyles become healthier, thereby reducing the incidence and mortality rates associated with unhealthy lifestyles.

In the complex context of economic and social development, force majeure events and major natural disasters, such as sudden external shocks, often pose severe challenges to economic activities, triggering a series of chain reactions, including an economic growth slowdown, profound adjustments in industrial structure, and significant reductions in investment activity. Such events not only disrupt the regular operation of the economic system but also profoundly affect residents' quality of life and fertility decisions through channels such as reduced household income, increased living burdens, and damaged public health facilities, thereby affecting fertility and mortality rates. The situation may lead to outliers in the sample data, thereby biasing regression results. Similarly, another crucial development occurred when the Standing Committee of the National People's Congress voted to pass an amendment to the Population and Family Planning Law. Therefore, selecting the sample interval from 2016 to 2022 allows us to verify the stability and reliability of research conclusions across different time dimensions. Hence, we rerun the above analyses to account for the time effect and to use different sample intervals. The results are shown in Table 5.

Table 5: Results of 2-Step GMM with time consideration [DV: HE]

	Panel I: Control time effect				**Panel II: Replace the sample interval**			
	DGMM		**SGMM**		**DGMM**		**SGMM**	
	HE = FR	**HE =MR**	**HE = FR**	**HE =MR**	**HE = FR**	**HE =MR**	**HE = FR**	**HE =MR**
HE (-1)	0.516***	0.583***	0.818***	0.719***	0.708***	0.656***	0.916***	0.912***
	-0.104	-0.144	-0.122	-0.152	-0.12	-0.17	-0.065	-0.096
HQED	0.692*	-0.826*	0.433**	-0.856**	0.192*	-0.785*	0.323**	-0.770**
	-0.35	-0.44	-0.193	-0.416	-0.111	-0.392	-0.142	-0.341
Other variables	YES	YES	YES	YES	YES	YES	YES	YES
Time effect	YES	YES	YES	YES	NO	NO	NO	NO
Constant	-	-	0.171***	-0.015	-	-	-0.147***	0.078
			-0.037	-0.086			-0.045	-0.047
AR(1)	0.071	0.07	0.005	0.081	0.012	0.067	0.003	0.015
AR(2)	0.374	0.622	0.602	0.849	0.388	0.842	0.289	0.972
Hansen	1	0.997	1	0.97	0.14	0.245	0.89	0.963
#Obs	217	217	248	248	186	186	186	186

*Note: The numbers in parentheses below the estimated coefficients are the robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. AR and Hansen refer to the p-value.*

Referring to SGMM results, the estimated coefficients for HQED on fertility and mortality under Panel 1 are 0.433 and -0.856, respectively, and under Panel II, the coefficients are 0.323 and -0.770, respectively. All are significant at the 5% level, further verifying the reliability of the benchmark regression results mentioned earlier in the article.

As China is a big country, covering 31 provinces in China (excluding Hong Kong, Macao, and Taiwan), and considering the differences in factors such as fertility policies, resource endowments, locational advantages, and economic development levels among provinces, there exists a difference in the high-quality economic development levels and fertility rates across provinces. In light of this, the following analyses divide China's geographical regions into two significant areas: the eastern and central-western regions. The reasons are that the central and western provinces are closely related, sharing many similarities in terms of resources and population, and both have lower levels of economic development than coastal cities. In view of this, regression analysis was carried out for the two independent groups, aiming to accurately identify and compare the differentiated effects of high-quality economic development on fertility rates across regions, thereby yielding more detailed and differentiated research conclusions. The results are shown in Table 6.

An important dimension of the empirical analysis involves examining how the effects of high-quality economic development differ across China's regions. The regional analyses shown in Table 6 reveal a clear, theoretically expected pattern: the health benefits associated with HQED are substantially stronger in the central–western provinces than in the eastern region. This divergence is consistent with long-standing disparities in economic development, infrastructure, public service capacity, environmental quality, and institutional readiness. In eastern China, provinces already possess relatively high baseline levels of innovation capacity, medical infrastructure, welfare provision, and environmental governance. Consequently, marginal improvements in HQED tend to yield smaller incremental gains in health outcomes. The diminishing marginal returns reflect saturation effects commonly found in the development literature: once regions have achieved a mature stage of structural upgrading and public service delivery, further development produces more modest improvements in population health.

Table 6: Regional Analyses of 2-Step GMM results [DV: HE]

	Panel I: Eastern region				**Panel II: Mid-West region**			
	DGMM		**SGMM**		**DGMM**		**SGMM**	
	HE = FR	**HE =MR**	**HE = FR**	**HE =MR**	**HE = FR**	**HE =MR**	**HE = FR**	**HE =MR**
HE(-1)	0.687***	0.826***	1.030***	0.979***	0.816**	0.805***	0.881***	1.223***
	-0.215	-0.265	-0.179	-0.314	-0.289	-0.161	-0.076	-0.087
HQED	0.009	-0.626	0.463	-0.787	0.766*	-1.184*	0.351**	-0.476**
	-0.304	-0.737	-0.691	-1.366	-0.434	-0.582	-0.143	-0.204
Other Variables	YES	YES	YES	YES	YES	YES	YES	YES
Constant	-	-	-0.052	0.16	-	-	-0.296***	0.232
			-0.185	-0.419			-0.091	-0.155
AR(1)	0.042	0.064	0.021	0.07	0.058	0.099	0.082	0.096
AR(2)	0.29	0.396	0.679	0.444	0.821	0.813	0.947	0..775
Hansen	0.844	0.989	0.989	0.472	1	1	0.907	0.126
#Obs	98	98	112	112	119	119	136	136

*Note: The numbers in parentheses below the estimated coefficients are the robust standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. AR and Hansen refer to the p-value.*

In contrast, central–western provinces exhibit greater sensitivity to changes in HQED. Because these regions have lower starting points in terms of welfare access, healthcare resources, and environmental quality, their populations experience larger health gains as development quality improves. Enhancements in pollution control, medical technology, and social protection disproportionately benefit central–western regions by reducing long-standing structural deficits. The fertility response is also stronger in these provinces, as improvements in welfare and public service provision help alleviate the economic vulnerabilities that discourage childbearing. Overall, the regional results underscore the importance of tailored development strategies. While HQED goals apply nationwide, the policy instruments needed to maximize health gains differ significantly across regions. Central–western provinces require continued investment in green development, medical infrastructure, and social protection, whereas eastern provinces may benefit more from advanced innovation systems and improvements in health governance. These patterns affirm that HQED is not only a national strategy but also a mechanism for reducing interprovincial inequalities in population health.

Finally, the final component of the empirical analyses examines the influence of each HQED sub-dimension on population health. Disaggregating the composite HQED index reveals clear patterns regarding which structural features of development drive improvements in fertility and mortality. Innovation development consistently shows a strong association with positive health outcomes, reflecting its role in advancing medical technology, digital health systems, pharmaceutical innovation, and the quality of clinical diagnostics. Green development likewise exhibits robust health effects, as reductions in pollution exposure translate into lower rates of respiratory and cardiovascular illnesses. Shared development, which encompasses welfare expenditure, education access, and broad-based public service provision, improves both maternal and overall population health by easing financial constraints and enhancing access to essential services. The results are shown in Table 7.

Based on the results in Table 7, the coefficients for innovative development (ID) are 0.23 and -0.63, indicating that innovative development has a positive and significant effect on fertility. This may be due to factors such as economic structure optimization and improved employment environment driven by innovation, which promote fertility willingness.

Table 7: The Results of 2-Step SGMM on Sub-dimensions of HQED [DV: HE]

	HQED = ID		**HQED = CD**		**HQED = GD**		**HQED = OD**		**HQED = SD**	
	HE = FR	**HE = MR**	**HE = FR**	**HE = MR**	**HE = FR**	**HE = MR**	**HE = FR**	**HE = MR**	**HE = FR**	**HE = MR**
	0.89***	0.94**	0.85***	1.01**	0.93***	1.01**	0.86***	1.02**	0.90***	1.08***
HE(-1)	-0.04	-0.1	-0.06	-0.08	-0.05	-0.08	-0.05	-0.09	-0.04	-0.09
	0.23**	-0.63*	0.19**	-0.17*	0.20*	-0.17*	0.18**	-0.23**	0.08*	-0.10*
HQED	-0.1	-0.31	-0.09	-0.08	-0.12	-0.08	-0.07	-0.08	-0.05	-0.05
Other Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
	-0.13**	0.11**	-0.13**	0.14**	-0.15**	0.14**	-0.13**	0.16**	-0.14**	0.14**
Constant	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.04
AR(1)	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03
AR(2)	0.54	0.89	0.44	0.84	0.55	0.84	0.53	0.84	0.6	0..82
Hansen	0.67	0.1	0.17	0.79	0.69	0.79	0.71	0.81	0.7	0.87
#Obs	248	248	248	248	248	248	248	248	248	248

*Note: The robust standard errors are provided in parentheses, which are below the estimated coefficients. ***, **, and * represent significance levels of 1%, 5%, and 10%, respectively. AR and Hansen refer to the p-value.*

Meanwhile, the coefficients of coordinated development (CD) are 0.19 and -0.17, suggesting that coordinated development has a positive impact on fertility through rational resource allocation and other mechanisms. Moving on to the green development (GD), the significant results of 0.20 and -0.17 indicate that favorable factors, such as the ecological environment improvements brought by green development, help enhance fertility willingness. Under open development (OD), the significant results of 0.18 and -0.23 may be due to the promotion of fertility through multicultural exchanges and the increased economic opportunities associated with OD. Finally, the significant coefficient of shared development (SD) of 0.08 and -0.10 may indicate that shared development has a positive effect on fertility through improving residents' welfare and other means. From the perspective of estimated coefficients and significance levels, the positive impact of innovative development on fertility is the most prominent, followed by coordinated, green, and open development, with shared development being relatively weaker. Innovative development has a more direct and consequential impact on economic structure and the employment environment, while coordinated, green, and open development also promotes fertility through its respective advantages. The welfare-improvement effect of shared development is relatively indirect, and its impact on fertility willingness develops slowly.

CONCLUSION

The article first theoretically explores the linkage by which high-quality economic development affects fertility and mortality rates. Subsequently, using panel data from 31 provinces in China (excluding Hong Kong, Macao, and Taiwan) spanning 2013 to 2023, it empirically evaluates the impact of high-quality economic development on health, as measured by fertility and mortality rates. Based on the aforementioned research findings, this paper proposes the following policy recommendations:

Promote high-quality economic development to boost fertility rates. First, clarify the positive correlation between high-quality economic development and higher fertility rates. The government should incorporate improving fertility rates into its strategic planning for high-quality economic development. The government should increase investment in economic transformation and upgrading, technological innovation, green development, and other fields, promote the optimization and upgrading of industrial structure, and create more high-quality employment opportunities and income sources for the public. Thereby, it can enhance families' economic ability to have children and raise them. Secondly, improve the fertility support policy system to ensure that the achievements of high-quality economic development benefit the majority of families of childbearing age. This includes expanding maternity insurance coverage, raising the standard of maternity allowances, optimizing maternity and parental leave policies, and so on. The aim is to reduce the burden of family birth and child-rearing and to stimulate the population's willingness to have children. Finally, strengthen cross-sector collaboration to create an environment in which promoting fertility and high-quality economic development mutually reinforce one another. Departments such as education, healthcare, and social security need to closely cooperate to jointly address concerns about fertility, child-rearing, and education, so that the public dare to give birth, are willing to give birth, can afford to give birth, and can raise their children well.

Meanwhile, *high-quality economic development should also be re-strategized to support a continuous decline in mortality rates*. Firstly, we should prioritize improving the overall health of the population as a core objective of high-quality development and strengthen the fundamental position of the "Healthy China" strategy in economic and social development. The government needs to increase investment in public health, primary healthcare, major disease prevention and control, and other fields to extend high-quality medical resources to the grassroots and underdeveloped areas. Moreover, it can effectively improve residents' access to medical care and the quality of medical services, thereby reducing mortality rates due to illness. Especially against the backdrop of an increasingly aging population, we should focus on improving the elderly health care system and extending the healthy lifespan of the elderly. Secondly, we should continue to promote improvements in the ecological environment and build a solid defense line for residents' health. Under the green guidance of high-quality development, we should strengthen governance of air, water, and soil pollution, and optimize the living environment through measures such as developing clean energy, promoting the transformation of green industries, and accelerating ecological restoration to reduce chronic and respiratory diseases induced by environmental pollution. Moreover, it fundamentally reduces environmental mortality risks. Finally, we should build a fair and efficient universal health security system. We should further expand the coverage and protection level of basic medical insurance, primary illness insurance, and long-term care insurance, with a focus on safeguarding the health rights and interests of vulnerable groups and residents in rural areas. We should promote the inclusion of health education in the national education system and strengthen chronic disease prevention and control, as well as health management services. We should guide residents to establish a scientific lifestyle and health awareness, shift from "treating diseases" to "preventing diseases", build a health-promotion pattern involving the whole society, and consolidate the foundation of population health to sustain the decline in mortality rates (Cao, 2023).

REFERENCES

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies, 58*(2), 277–297.

Arellano, M., & Bover, O. (1995). Another look at instrumental variable estimation of error-components models. *Journal of Econometrics, 68*(1), 29–51.

Baeten, S., Van Ourti, T., & van Doorslaer, E. (2013). Rising inequalities in income and health in China: Who is left behind? *Journal of Health Economics, 32*(6), 1214–1229.

Birdsall, N., & Wheeler, D. (2022). Health, wealth, and development: Revisiting the pathways linking income and mortality. *World Development, 150*, 105–118.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87*(1), 115–143.

Bruno, L., Simon, D., & Timothy, S. (2017). Global population growth, technology, and Malthusian constraints: A quantitative growth theoretic perspective. *International Economic Review, 58*(3), 973–1006.

Cao, H. (2023). The impact of population aging on the consumption structure of Chinese residents—And on the regulatory role of circulation efficiency. *Business Economic Research*, (13), 39–42.

Chan, W., & Cheang, C. (2023). Navigating the demographic shift: An examination of China's fertility policy and its implications. *Frontiers in Political Science, 5*, 1–12.

Chen, Z., & Wang, Y. (2019). Addressing China's healthcare inequities: Lessons from the urban-rural divide. *The Lancet, 393*(10177), 1121–1123.

Coneus, K., & Spiess, C. K. (2020). Early childhood health, parental investments, and long-term outcomes. *Health Economics, 29*(4), 457–475.

Currie, J. (2020). Inequality in mortality and access to healthcare in developed and developing economies. *Journal of Economic Perspectives, 34*(1), 174–199.

Currie, J., & Neidell, M. (2020). Air pollution and infant health: Lessons from global evidence. *American Economic Review, 110*(7), 210–245.

Danut, V. (2015). Causality relationship between economic development and fertility in Romania. *Procedia Economics and Finance, 20*, 334–341.

Dong, E., Sun, X., Xu, T., Zhang, S., Wang, T., Zhang, L., & Gao, W. (2023). Measuring inequalities in healthcare resources: A longitudinal study in China. *Frontiers in Public Health, 11*, 1074417.

Fang, H., & Lu, Y. (2020). Understanding China's low fertility: Social policies and demographic responses. *Demography, 57*(5), 1853–1876.

Feng, Z., Wang, B., Dai, Y., Zhu, W., & Dong, R. (2024). Fertility intention under changing fertility policy and economic development in China (2010–2021). *Applied Spatial Analysis and Policy, 17*(2), 753–777.

Ferreira, F. H. G. (2023). Public health, inequality, and development dynamics. *The Lancet Public Health, 8*(2), e110–e119.

Forastiere, F. (2020). Air quality improvements and mortality decline: Global environmental health evidence. *Environmental Health Perspectives, 128*(9), 097001.

Georgios, B., & Mavropoulos, G. (2024). Asymmetric effects between economic development and fertility. *The Journal of Economic Asymmetries, 30*, e00368.

Gu, H., Liu, Q., & Liang, J. (2020). Public service inequality and regional health disparities in China. *China Economic Review, 62*, 101–118.

Guo, B., Wang, Y., Zhang, H., Liang, C., Feng, Y., & Hu, F. (2023). Digital economy and high-quality urban development: Evidence from China. *Economic Modelling, 120*, 106194.

Guo, S., & Tao, R. (2022). Public health expenditure, health inequality, and mortality in China. *Health Policy, 126*(4), 289–301.

He, W., & Shen, S. (2021). Has the integration of urban–rural medical insurance alleviated health inequality? *China Rural Studies, 3*, 67–85.

He, M., & Ding, J. (2022). Evaluating the health risk-smoothing effect of medical insurance affordability. *Economic Dynamics, 4*, 83–102.

Huang, F., & Wu, C. (2012). Long-term care needs for the elderly: A transition probability model. *Economic Research, 47*(S2), 119–130.

Huang, X. (2012). Has income-related health inequality expanded? *Statistical Research, 6*, 51–59.

Jiao, K. (2014). Research on the influencing factors of health inequality. *Social Research, 29*(05), 24–46.

Li, J. (2020). Digital finance and high-quality development: Evidence from provincial China. *Journal of Innovation and Development, 7*(1), 39–49.

Li, M., & Tian, X. (2024). Evaluation of high-quality economic development in Northeast China. *Academic Journal of Business & Management, 6*(8), 19–29.

Li, T. (2021). Housing prices and fertility decline in urban China. *Population Studies, 75*(3), 345–362.

Liang, S., Liu, S., & Liu, C. (2023). Facilitating fertility decline through economic development: A bureaucratic incentive perspective. *Humanities and Social Sciences Communications, 10*(1), 1–13.

Lucas, R., Chen, Y., & Wang, H. (2023). Environmental risks and mortality in developing regions. *Environmental Research, 224*, 115–137.

Lu, W. (2024). The core essence of promoting high-quality economic development. *Journal of Social Science and Humanities, 6*(7), 175–180.

Ma, L. (2022). Family policy and fertility changes in East Asia. *Population Research and Policy Review, 41*, 123–149.

Mao, J., Wang, Z., & Ma, T. (2023). Dynamic evolution of high-quality development in West China. *Land, 12*(11), 1975.

Mitchell, R., & Dorling, D. (2020). Urbanization, health gradients, and spatial inequalities. *Social Science & Medicine, 256*, 113031.

Morello-Frosch, R., & Jesdale, B. M. (2020). Pollution burdens, segregation, and health inequality. *Environmental Research, 182*, 109013.

Pedro, N., Bruno, L., & Tim, S. (2020). The return of Malthus? Resource constraints in an era of declining population growth. *European Economic Review, 128*, 103499.

Sayantani, C., & Mohanty, S. (2022). Fertility transition and socioeconomic development in India's districts. *Journal of Biosocial Science, 54*(1), 135–153.

Sun, J., & Zou, J. (2023). Fertility willingness among professional women and constraints. *Academic Journal of Humanities & Social Sciences, 6*(3), 7–12.

Windmeijer, F. (2005). A finite-sample correction for the two-step GMM estimator. *Journal of Econometrics, 126*(1), 25–51.

Yang, T., & Gu, G. (2023). Spatial–temporal evolution of China's high-quality development. *Sustainability, 15*(23), 16308.

Zhang, G., & Chen, L. (2024). Urbanization, social security satisfaction, and fertility intentions. *Academic Journal of Management and Social Sciences, 7*(2), 49–55.

Zhou, J., Hu, T., Zheng, Q., & Ji, D. (2024). Evaluating high-quality development and obstacle factors in Henan Province. *Journal of the Knowledge Economy*, 1–33.

Zhou, N. (2024). High-quality development and industrial policy: A path analysis. *Proceedings of Business and Economic Studies, 7*(2), 198–204.