



# IMPACT OF HUMAN DEVELOPMENT INDICATORS ON CHILD MORTALITY: THE CASE STUDY OF IRAN

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## ABSTRACT

*The mortality rate of children under the age of five is of particular importance, as it is often related to the general level of health and living standard condition of the household in the society. The study aimed to investigate the effects of the Human Development Index on public health with particular reference to the under-five mortality rate in Iran. As a method a descriptive-analytical method including ordinary least square regression analysis was used to identify the causal relationship between the human development index and the under-five mortality rate during the period of the study (1987-2017) in Iran. The results show that there is a negative and meaningful relationship between the human development index (HDI) level and the under-five mortality rate. Moreover, the control variables including inflation rate, unemployment rate, and income distribution inequality index showed a positive and meaningful impact on the under-five mortality rate. Given that human capital is considered the engine of economic growth and development, it can be concluded that any increase in health expenditures through improvements in human capital inventory leads to increased economic growth, increased life expectancy, and decreased under-five mortality rate.*

## KEYWORDS

Human Development Index, Under-Five Mortality, Unemployment, Inflation, Income Distribution Inequality, Iran.

## 1. INTRODUCTION

Health is the cause and result of socio-economic growth and development in any society and can be a powerful tool for poverty reduction. Considering a correlation between health and economic growth means that promoting the health of people motivates the economic growth that leads to improving the level of health of the country (Suri et al., 2011). Health not only helps to improve personal income in terms of microeconomics but also in terms of macroeconomic gross domestic products growth (Bloom & Canning, 2007). The analysis of the effects of health improvements on economic growth and development has been illustrated effectively by the Policymakers in the modern economy (Boachie, 2017). Providing, maintaining, and improving the level of community health, followed by the health of the children under five as a vulnerable group, has a special place in health services. The under-five mortality rate is referred to as the most important index showing the level of public health and welfare in communities, which is affected by the macroeconomic and social variables, such as the index of human development (Jahan, 2016). From the point of view of international organizations, human development means achieving an acceptable level of health, knowledge, and ability to organize life and above all, the main goal of development is to benefit human beings (Yakunina & Bychkov, 2015).

Iran, with a population of 83.5 million, is the second-largest country in the Middle East in West Asia. Iran's economy is a transitional economy, consisting of a large public sector that is centrally managed and governed. While Iran's economy relies on oil and gas exports, which account for about 60% of the government revenue, it has significant infrastructure in the service, industrial and agricultural sectors that empower the country's economy. The country's health status improved dramatically After World War II, eliminating smallpox, and virtually eradicating plague malaria in its homeland. In Iran, public hospitals, along with private institutions, provide health services to the people and the Ministry of Health and Medical Education oversees the country's health services. However, the health facilities are insufficient and there is a shortage of doctors, nurses, and medical equipment in this country and only 73% of the population is covered by health insurance.

According to the World Health Organization, the performance of the health system in Iran is ranked 93rd among the governments of the world and the total medical expenditures were equal to 4.20% of GDP (WHO, 2019). Life expectancy in Iran is 75 years for men and 78 years for women, and in this regard, Iran is ranked 73rd in the world among 199 countries. According to the statistics of 2017, the maternal mortality rate in this country was 16 per 100,000 live births (ranked 50 out of 185 countries) and therefore, Iran has the 13th place in terms of reducing the maternal mortality rate in recent years. The child mortality rate is obtained by dividing the number of deaths by people under the age of five in a community over a year by the number of people under the age of five in that community multiplied by 1,000. This index shows that out of every thousand live children born, a few die before reaching the age of five. According to the country's estimates in 2019, infant mortality was 12 per 1,000 live births.

## 2. BACKGROUND

According to the theory of human capital, health is considered an economical and durable commodity, and all people are born with reserves of health, some of which benefit less and some more. The basis of how other socio-economic variables affect health finds its roots in the functions

of desirability and the importance of health as a commodity for individuals. In his theoretical studies, Grossman (2000), considered health capital as a capital commodity in utility functions and emphasized that one's health plays an important role in determining the amount of time one can spend to earn money and produce. He believes that in countries with a higher human development index, people have better education and people with better education produce health more efficiently. Fuchs (1992) proposed a theory claiming that a rich country in addition to high per capita income has a high level of education and generally a high human development index. Detollenaere et al. (2018), analyzed the controlling demographic and socio-economic characteristics of selected societies and found that income inequality was significantly associated with behavioral outcomes, including heavy drinking, obesity, and heart disease. Many studies that promote economic policies to eradicate growing income inequality in developing and underdeveloped countries may address some of the most troubling health statistics (Rosendo et al., 2018). Endemic disease and poor population health play a major role in keeping less-developed countries locked in a poverty trap.

Ogundari and Aokas (2018) considered two different criteria for human capital including health status and education level; while reviewing the potential impact of human capital on the economic growth in sub-Saharan Africa and the results indicate that two criteria of human capital have positive effects on economic growth and development, whilst the share of health is relatively greater than the effect of education (Webber, 2002). Bloom et al. (2004) showed that life expectancy as a proxy for health status has a significant positive effect on the economic growth of societies and concluded that there is a real productivity effect of health on economic growth. Life expectancy has a significant positive effect on economic growth accompanying an old concern that life expectancy is a proxy for work experience and the extension of a lifetime represents higher workforce participation rather than representing improvements in the health status of the workforce participants (Jonas et al., 2019). The Human Development Index, developed by Al-Haq (1990), averages the three components of healthy living, knowledge, and standard of living. In general, Human Development Index defines healthy living through the life expectancy index at birth, adult knowledge-based literacy rate and employment ratio in primary, middle, and high school, and standard of living with per capita production. This index varies between zero and one; it indicates the manpower of a country, no matter how much it tends towards one (Lee et al., 1997).

Improving the higher level of education is an important tool for promoting economic growth and development of the country and plays a vital role in generating human resource capabilities increment through knowledge, skills, and the creative power of the society (Barnett, et al., 2021). A higher standard of education level is important not only for the national economy but also for an individual's life welfare (Bjorke, 2017). That is natural to assume that employment opportunities increase is quite related to individual education level, and thus the level of income is probably related to the level of education. That is obvious to expect that a perfect level of higher education enhances the quality of education standards in emerging economies. The fundamental role of higher education is not restricted to increasing the economic development of societies and generating more opportunities for individuals, but also it promotes the cultural diversity of political democracy and trade. In other words, higher education can provide a better society and enhance international cooperation (Barnett, et al., 2021).

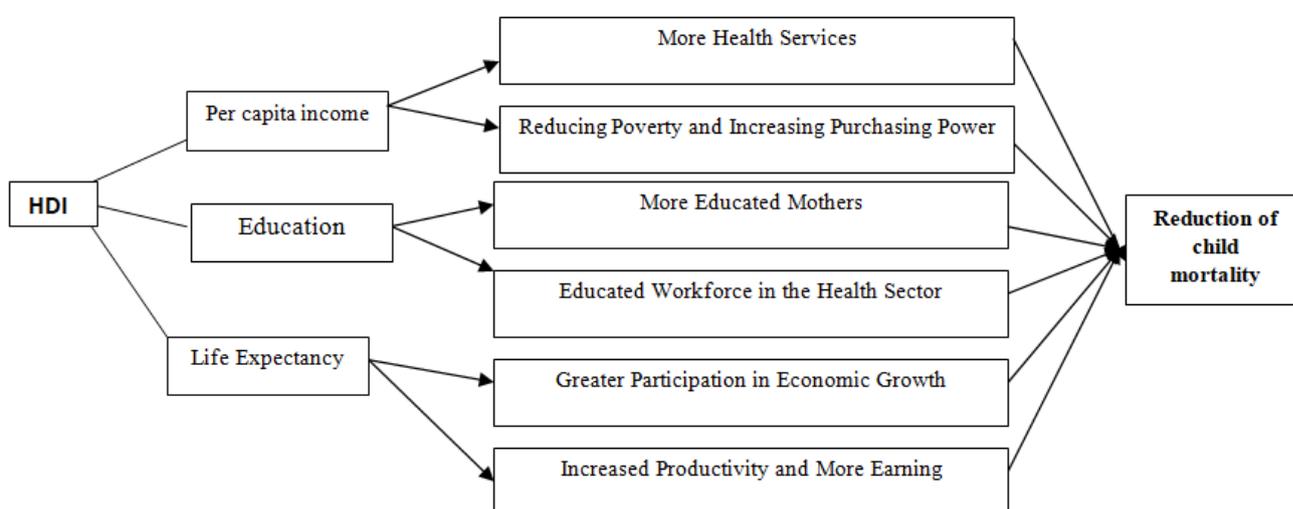
The positive effect of health on economic growth is more related to the case of less-developed countries concerning children's health and increased investment in human capital (Chakraborty, 2004). For developing and less-developed countries, both forces i.e. increased female labor force participation, and reduced fertility together can help trigger a takeoff toward long-run economic

growth (Bloom et al., 2014). The strategic policies to improve the health care status of women and children, such as iodine supplementation or vaccination against the human papillomavirus are likely to yield very high returns in terms of economic growth, well-being, and development in the long run (Frey et al., 2000). It can be said that the categories of economic development, income distribution inequality, and health care are closely interacting with one another, so that with economic development and reduction of income inequality, the available income of individuals and households increases, and through this, the health of individuals is provided and promoted (Alvarez, 2009).

On the other hand, increasing the health status of the society provides the necessary grounds for the economic development of the community. One of the most critical indexes in any society for indicating the income distribution status is the income inequality index (Hajebi & Razmi, 2014). In this regard, Subremanin and Kwachi (2004) reviewed the relationship between income inequality and health in different economies and found that despite differences in different societies, the income differences or income distribution inequalities were still a serious threat to public health. Income inequality is a negative aspect of income distribution and the indicators (Gini coefficient) show the lack of proper distribution of income in society (Matthew & Brodersen, 2018). The Gini coefficient is an international indicator that is widely used to indicate the severity of income inequality and is a value between 0-1, so that the closer the Gini coefficient is to zero, the lower the inequality. In general, by reducing income inequality distribution of income, and increasing the rate of economic growth, health level is expected to increase (Klaus & Tom, 2019). Therefore, simultaneous attention to economic development and income redistribution (reducing inequality) is the best strategy for providing and promoting health.

The channels through which the human development index (HDI) affects the Under-five mortality rate of children could be illustrated by Graph (1). As it is illustrated, the human development index through the per capita income, education, and life expectancy affects the mortality of children Under-five mortality rate. An increase in per capita income has a positive impact on reducing poverty and increasing consumption of goods and services and access to health care and health that ultimately improve health conditions. Human Development also encourages increased education; especially maternal education can bring a positive significant effect on reducing child mortality since educated mothers have more knowledge in the field of child care.

**Graph1.** The Conceptual Framework of the Human Development Index Affects Under-five Mortality Rate



### 3. METHODS

The main purpose of the study is to determine the effect of the human development index on the under-five mortality rate in Iran for the period 1987 to 2017. The Human Development Index is expected to play a major role in determining the under-five mortality rate by considering the three main indicators, namely education, life expectancy, and income (Lotfalipur et al., 2011). For this purpose, time-series information related to the studied years of the website of the Central Bank of Iran, the World Development Indicator (WDI), the United Nations Development Program (UNDP), and the World Health Organization (WHO) were used (Appendix 1). To study the effect of the human development variable on the under-five mortality rate: the estimation model is introduced as follows (Eq. 1).

$$MOR_{it} = \beta_0 + \beta_1 HDI_{it} + \beta_2 INF_{it} + \beta_3 UNE_{it} + \beta_4 Gini_{it} + \varepsilon_{it} \quad (1)$$

Where;  $MOR_{it}$ : indicates Under-Five Mortality Rate,  $HDI_{it}$ : indicates Human Development Index,  $INF_{it}$ : represents Inflation Rate,  $UNE_{it}$ : represents Unemployment Rate, and  $Gini_{it}$ : represents the coefficient of the income distribution as a vector of macroeconomic control variables.

In the calculation of the Human Development Index which consists of the main indicators of life expectancy, literacy rate, and per capita national income, Different methods will be. The numerical value of each of the above indicators will vary between zero and a Human Development Index (HDI) is calculated as the simple average and, therefore, can take between zero and one. Table (1) the sign of the expected impact of each of the variables used in the model due to theoretical and experimental studies are presented.

**Table 1.** The Expected Effects (sign) of the Variables on Under-five Mortality rate

Definition of Variable	Variable symbol	Dependent variable: Child mortality under five years
Human Development Index	HDI	-
Inflation	INF	+
Unemployment	UNE	+
Inequality	Gini	+

### 4. RESULTS

Based on the theoretical frameworks described, the research model has been estimated and the results are summarized in Table 2, showing the estimated coefficients of all the variables are statistically significant. The determinant coefficient ( $R^2$ ) represents a reasonable descriptive power of the model. Moreover, the inflation variable (INF) coefficient shows a positive and significant effect

on the mortality of children under-five years, indicating that as inflation rises, under-five mortality also increases. The coefficient of unemployment variable (UNE) shows a positive and significant effect on mortality of children under five years, indicating that as unemployment rises and income declines, mortality of children under five years increases. Gini coefficient (Gini) as an indicator of social welfare and income distribution, shows a positive and significant effect on mortality of children under five years, indicating that as the Gini coefficient and income distribution status deteriorates, under-five mortality also increases. Research findings also indicate that Human Development Index (HDI) has a negative and significant effect on the mortality rate of children under-five years, indicating that with the promotion of human development indicators, mortality of children under five years of decline.

**Table 2.** The Estimation Results of Variables Effect on the Under-Five Mortality Rate

Definition of Variable	Variable symbol	Coefficient	T-statistics	P-Value
Intercept	C	-175.6	-4.56	0.000
Inflation	INF	5.21	6.3	0.002
Human Development Index	HDI	-52.13	-2.64	0.028
Unemployment	UNE	12.02	2.87	0.042
Inequality	Gini	180.44	4.05	0.003
$R^2$	$R^2$ Adjusted	F-statistic	Durbin-Watson (D.W)	
0.917	0.893	26.02 (0.000)	1.98	

Source: research findings

In general, the results of model estimation in this study show that the Human Development Index (HDI) has a significant negative effect on under-five mortality, and by improving the human development index, under-five mortality reduces. Moreover, refer to other control variables affecting under-five mortality; the inflation variable (INF) has a positive significant effect on under-five mortality. The Unemployment rate (UNE) has a positive significant effect on child mortality, i.e. with an increase in unemployment and income decline, the under-five mortality rate increases. Gini coefficient as an indicator of welfare and income distribution of the society illustrates a positive and significant effect on child mortality, i.e., with an increasing Gini coefficient, under-five mortality also increases.

## 5. DISCUSSION and CONCLUSIONS

Human Development Index (HDI) has a significant effect on improving income-education-health and strengthening this structure can always lead to a reduction in mortality, especially in children under 5 years. The promotion of the Human Development Index emphasizes that with economic growth and increased per capita income, it is possible to reduce poverty and increase access to health care. Higher per capita income provides better health by improving living conditions such as access to safe drinking water, proper roads, and proper nutrition because higher per capita income creates more purchasing power that can improve the quality and quantity of health care. Improve directly. The results also emphasize improving the quality of education and how people use the facilities available in the community because increasing individual knowledge and skills help people to optimize resources better and avoid risks. Raising the level of knowledge of people in the

community, especially mothers, and benefiting from more technical knowledge in providing and consuming health services can greatly help reduce the mortality rate. In addition, education, on the one hand, generates more income and higher welfare in the future, and on the other hand, increasing education and awareness of family members, especially mothers, reduces the risk of child death; because educated mothers learn more about how to care for their children.

Improving the human development index, particularly in the fields of education, income-generating employment, and community health can be considered the most important and effective indicator to reduce under-five mortality rates; therefore it is highly recommended that policies in the field of health, the government should be in line with human development programs and its subdivisions, i.e. per capita income, education, and life expectancy, to reduce the under-five mortality rate. Moreover, the results show, to reduce child mortality, it is suggested that human development and each of the subsets of the human development index, including per capita income, education, and life expectancy, must be given more attention, and the educational environment in the country for People expand society. Considering human capital index improvement as the engine of economic growth and development, it can be concluded that any increase in health expenditures through improvements in human capital inventory, leads to increased economic growth, increased life expectancy, and decreased under-five mortality rate.

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