Website: http: jebhpme.ssu.ac.ir
EBHPME 2018; 2(2): 80-90 pISSN: 2538-5070

EBHPME

ORIGINAL ARTICLE

Evidence Based Health Policy, Management & Economics
Health Policy Research Center, Shahid Sadoughi University of Medical Sciences

The Effect of Social and Economic Factors on Maternal Mortality in Provinces of Iran within 2009-2013

Hanie Gholampoor [1*], Abolghasem Pourreza [1], Hasan Heydari [2]

[1] Department of Management and Health Economic, School of public Health, Tehran university of medical sciences, Tehran, Iran
[2] Department of Management and Economic, School of Economics, Tarbiat Modares University, Tehran, Iran

ARTICLEINFO

Article History:
Received: 29 Jan 2018
Revised: 3 Apr 2018
Accepted: 19 June 2018

***Corresponding Author:**
Hanie Gholampoor
Department of Management and Health Economic, School of Public Health, Poursina St,.Tehran, Iran.

Email:
H.gholampoor800@yahoo.com

Tel:
+98-9357345995

ABSTRACT

Background: The mothers' role in health of family members is very important, and her death has uncompensable losses for the family and society. With regard to the importance of maternal mortal ratio in development indicators of the United Nations (UN) this study is conducted to investigate the impact of socioeconomic factors on maternal mortality ratio

Methods: In the current study the role of socioeconomic factors on maternal mortal ratio was investigated by panel regression. Data include number of maternal mortality, total fertility, number of hospital beds, number of midwifes, number of physicians and urbanization in the period between 2008 and 2012. Since the dependent variable was in count form, Poisson estimator, Hausman test, and Breusch-pagan test were used.

Results: Based on the findings, household's income and fertility rate had direct and inverse association with maternal mortality, respectively. Investigating the association between midwifes and maternal mortality showed that increasing the number of midwifes decrease it, but no significant association was found between the number of physicians and maternal mortality. Number of hospital beds also showed a direct association (significant at 10%).

Conclusion: All of the variables to somehow are related with the level of development. In developed regions, per capita income, access to health resource and urbanization is higher and there is more equity in distribution of health resources. It could be concluded from the findings that by increasing the level of development, maternal mortality would decrease.

Keywords: Maternal Mortality, Iran, Poisson Regression, Panel Data

Citation

This paper should be cited as: Gholampoor H, Pourreza A, Heydari H. **The Effect of Social and Economic Factors on Maternal Mortality in Provinces of Iran within 2009-2013.** Evidence Based Health Policy, Management & Economics. 2018; 2(2): 80-90.

[Downloaded from jebhpme.ssu.ac.ir on 2026-11-22]

Copyright: ©2017 The Author(s); Published by Shahid Sadoughi University of Medical Sciences. This is an open-access article distributed under the terms of the Creative Commons Attribution License (https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Introduction

Maternal mortality is one of the major threatening dangers to human life that has caused many deaths over the years (1). A mother's death cannot be merely regarded as death of one person, yet, it implies the death and disability of a family as well as a society (2). Promoting maternal health is regarded as an essential part of health care. In the early years of the establishment of the health system Iran, the health of pregnant mothers, as a vulnerable group, was specially taken into consideration by policy makers of health programs (3).

At the beginning of this century, 189 countries committed to implement the Millennium Development Goals. These goals included eight objectives (objective 5 involved maternal health), according to which the maternal mortality rate was considered in order to measure progress rate towards this goal (4). According to definition proposed by the World Health Organization, maternal mortality can refer to the death of a woman during pregnancy up to 42 days after delivery, regardless of the duration and site of the pregnancy, due to any reasons related to or exacerbated by the pregnancy or its management (5).According to the World Health Organization (WHO) in 2014, mothers' deaths in developing countries are 18 times higher than in developed countries. (6)

Regarding the United Nations' Millennium Development Goals (MDGs), maternal mortality rate should be reduced up to 75% by 2015 compared to its basic level in 1990 (7), while this figure was reduced only up to 5% by 2005 (8). Per year, 600,000 mothers die as a result of pregnancy and childbirth complications in all over the world. Out of the all maternal mortalities in the world, 4000 cases were reported in the developed countries and 596,000 cases were in the developing countries. It is possible to reduce the number of maternal mortalities to a significant extent by adopting appropriate measures as well as taking adequate proceedings in the course of pregnancy and delivery.

Investing in better maternal health not only improves the mother's health and the family, but also increases the number of women productive of workforce and improves the economic status of the society and country. There are some complications of pregnancy and childbirth that cannot be treated that is to say that per year, 20 to 10 million women do not seem to be able to support themselves and their families (9).

Today, providing health of a mother and a child can be regarded as a main goal for social and economic development of society. Women comprise almost 50% of the human resources of each society who play an important role as a mother and a wife in maintaining the warmth of the family. Moreover, they have an important status in the development of social, economic, cultural and educational factors. Therefore, Putting efforts into increasing their health level are considered as priorities of the health programs (9).

Reducing mortality rate among mothers needs to be given great prominence due to several reasons, including the fact that other development projects, such as reducing child mortality and ensuring their primary education, depend upon it. These are mothers who care about their children's health and encourage them to go to school, though the reduction in maternal mortality rate is apparently a difficult task requiring prenatal care, a widespread reform of the health system in countries where their health care services are not desirable. It is worth mentioning that the "Maternal Mortality Rate" (MMR) can not be taken into account as only a health indicator. This indicator is of great significance so as the World Bank considers it as one of the "development indicators" (2), which is due to the fact that a decrease in MMR indicates the existence of an expanded medical system, advanced hospitals, extensive roads, existence of ambulances all over the country, etc. More importantly, it can imply that all people have access to these facilities. No country can improve this indicator by simply

[Downloaded from jebhpme.ssu.ac.ir on 2026-11-22]

upgrading a part of the health system (for instance, hospitals of several big cities hospitals).

MMR caused by pregnancy and delivery complications is regarded as one of the most important indicators of the development of countries. Undoubtedly, this index is a function of the literacy status, network of rural roads, access to medical emergencies, the cost of health services, the existence of telecommunication networks, household income, etc.

In Iran, MMR is 21 per 100,000 (this statistics is related to 2013), that is to say in every 100,000 pregnancies, 21 cases result in death of a pregnant woman. This figure is not an appropriate statistic compared to that of the European countries (4-6 per 100,000). However, it should be noted that even in the United States of America, MMR, like Iran, is 21 per 100,000 (10).

Despite the fact that MMR is declining in Iran, death in pregnancy remains a serious threat to the pregnant mothers in Iran. Reports of Ministry of Health demonstrate that the highest MMR was observed in the provinces of Sistan and Baluchestan and south of Kerman in such a way that it has been really hard to transfer mothers to the health centers or that the people of those regions had the culture of delivery at home, though, within last year, in some of the provinces, such as Kohgiluyeh and Boyer-Ahmad , even a single case of maternal mortality has not been reported. As a matter of fact, in such cities as Tehran, due to better access to health facilities, the mortality status of pregnant mothers has been demonstrated to be better compared to other cities of Iran (11).

Within the past few years, Iran has achieved significant gains in regard to reducing maternal mortality and currently, maternal mortality reduction programs are known as a global activity so as over the past 10 years, 80% of maternal mortality has been reduced (12), though this rate, particularly in such provinces as Sistan and Baluchestan, is still higher in comparison with the goals set by the World Health Organization (13). The different MMR reported in different regions has made health policymakers sensitive to factors affecting maternal mortality in different regions so as they seek to investigate the reasons in regard to creating these differences. Although the death of the pregnant mother is depicted as an unfortunate, unpleasant and preventable event, the share of social and economic factors leading to this event in the provinces of Iran has not been evaluated on macro levels. One of the best ways to reduce them is to examine the influential factors on maternal mortality. In this regard, the present study aimed to investigate the macro level of the most important social and economic factors affecting maternal mortality in the provinces of Iran through econometric method.

Materials and Methods

The present panel study is a descriptive-analytic one that was carried out using documentary and library data via the panel data econometric method. The statistical population of this study included all provinces of Iran within 2009-2013. Since the data in this study was collected at a macro level, sampling was not necessitated. The indicators applied in this study consisted of number of maternal mortalities, fertility rate, number of hospital beds, number of midwives, number of physicians, per capita income of the provinces, and urbanization rate. The data related to the maternal mortality and fertility rate were obtained by referring to the Mother's and Baby's Health Department of Ministry of Health and Medical Education; data regarding number of midwives, number of physicians and number of hospital beds were collected by referring to the Statistics and Information Technology center of Health Ministry, and information on the urbanization rate and per capita income of the provinces were extracted from the Statistical Yearbook of Statistics Center of Iran. It should be mentioned that in this study, to obtain the per capita income variable, the per capita GPD variable was used which shows the development rate of each province. Furthermore, the number of beds in this study refers to the number of active hospital beds in each province, which is equal to the total beds in public, private,

[Downloaded from jebhpme.ssu.ac.ir on 2026-11-22]

social security and military hospitals. The inclusion criteria consisted of being the subspecies of Iran's provinces whereas exclusion criteria involved non-availability of required data in the years under examination. In the case of Alborz Province (separated from Tehran province), in order to collect data related to the years before separation, data ratio were linearly used in the years after the separation.

In this study, maternal mortality was assessed as a dependent variable and mean household income, number of doctors, number of midwives, number of hospital beds, fertility rate, urbanization and population were considered as independent variables.

Regarding panel data, if the number of individual units is higher than the study period (N > T), as in the present study, a serial auto-correlation could be expected. Therefore, the Weldrige serial auto-correlation test was used in order to analyze the serial auto-correlation. The Weldrige test statistic was equal to 0.255 (significance of 0.6190), and therefore it can be concluded that no serial auto-correlation exist in the interfering components of study.

In order to determine the explanatory variables, the findings of previous studies were used to identify the most important factors contributing to maternal mortality in Iran. In the next step, the econometric model was specified.

The primary econometric model of the effective factors on maternal mortality is as follows:

MMR = f (pop, eco, h)

In this model, MMR symbol indicates the maternal mortalities in each province, pop expresses demographic factors, eco represents economic factors, and h refers to health and medical factors.

In the current study, the influential factors entailed number of people living in cities in a specific region and the fertility rate as demographic factors, per capita Gross domestic product (GDP) in each province as an economic factor as well as number of physicians, number of hospital beds and number of midwives as health and medical factors.

In general, maternal mortality is affected by the following factors on a macro level:

MMR = f(dev, urb, fer, phy, mw, pop, resid)

In this model, six variables of GDP, urbanization ratio, fertility rate, number of physicians, number of midwives were taken into account as independent variables and maternal mortality was evaluated as a dependent variable.

The below Table demonstrates the symbols used for the mentioned variables.

Statistical Function

If y is the dependent variable (maternal mortality) and x is the matrix of independent variables and Θ is the matrix of coefficients of independent variables, the Poisson form of study function is as follows:

$$\log(\mathrm{E}(Y|\mathbf{x})) = \boldsymbol{\theta}'\mathbf{x},$$

Having the Θ parameter as well as the x matrix, we can change the pattern after transforming the study function into a figure form**:**

$$\mathrm{E}(Y|\mathbf{x}) = e^{\boldsymbol{\theta}'\mathbf{x}}.$$

The above pattern has the same form as the maximum likelihood functions and, thus its estimator acts similar to that of the maximum likelihood functions. The pattern of the present study, according to the above formulas, is as follows, in which, the index “it” represents the panel pattern of this study:

$$E(Y|x)=e^{(B_0 + B_1 urb_{it} + B_2 fer_{it} + B_3 mw_{it} + B_4 phy_{it} + B_5 bed_{it} + B_6 income_{it})}$$

In this study, to develop a relationship between the variables, we first examined the existence of panel effects via Hausman test as well as the fixed or random effects via Breusch-Pagan test in the pattern. Model estimation was performed using random effects regression after determining the type of effect using linear regression of panel data.

The null hypothesis in the Breusch-Pagan Pagan test is the existence of the panel effects measured by χ^2 statistic. If this test demonstrates a significance level of higher than 0.05, it means that the study pattern has panel effects and the estimator has a panel form. Moreover, Hausman test was used to examine the fixed and random effects in the model. For this purpose, the model

[Downloaded from jebhpme.ssu.ac.ir on 2026-11-22]

was first estimated with random effects, and then, Hausman test was performed on the model. The null hypothesis in the Hausman test reflects the presence of random effects. If the null hypothesis is not rejected, then it can be stated that the model has random effects (14).

Finally, after determining the type of the estimator, the study pattern was estimated using the above mentioned tests. In addition, log-likelihood test was applied to assess the goodness of fit. Serial auto-correlation was also studied in the model.

Since the study data were panel-based, Watson's camera test could not be used to investigate the serial auto-correlation. As a result, the tests similar to serial auto-correlation analysis were used that were designed for the panel data. Waldridge test was considered as the proper test for this study. Null hypothesis of this test is absence of serial auto-correlation in interfering components), and if the null hypothesis is rejected, estimating the study pattern does not face the problem of auto-correlation (15).

Ultimtely, the model was estimated using the Poisson panel regression and random effects in the Stata software (version 13).

Further, in the current study all ethical issues were observed based on the Helsinki Declaration.

Results

Descriptive Findings

Table 2 shows the descriptive information regarding MMR within 2009-2013. As the data in this table demonstrates, the lowest MMR was reported in 2012 and its highest rate was observed in 2009.

As the data in this table 3 demonstrates, the lowest number of births was reported in 2009 and its highest rate was observed in 2013.

Investigating mean MMR in provinces of Iran reveals that within the studied years, the highest MMR occured in Sistan and Baluchestan province , whereas the lowest rate was respectively observed in the provinces of Ilam, Gilan, Mazandaran, Chaharmahal and Bakhtiari, Southern Khorasan, Semnan, Qazvin, and Markazi. The results show that in all the years, the highest number of births occurred in Tehran province whereas the lowest rate was observed in Semnan province.

As the data in this table 4 demonstrates, the lowest number of physicians was reported in 2009 and its highest rate was observed in 2013.

According to the study results in regard to the mean number of physicians in all provinces, the highest numbers of physicians were reported in Tehran and Khorasan Razavi provinces respectively and the lowest numbers were in the provinces of Ilam, Gilan, Qom, Zanjan, respectively. As shown in Table 3, there is a significant difference in regard to the number of physicians in the years under examination. For instance, the mean number of physicians has dramatically increased in 2011, which can be related to the increase in the number of physicians registered in the family physician plan. As a matter of fact, the Ministry of Health has reported the statistics on the number of physicians registered in the family physician plan, while before 2013, only number of physicians working in the medical universities had been reported.

Table 5 shows the mean rate of urbanization in the provinces of Iran within 2009 and 2013, according to the lowest Mean Rate of Urbanization was reported in 2009 and its highest rate was observed in 2012. So that, the highest mean belonged to Qom province and the lowest rate was in Hormozgan province.

Analytical Findings

First, the study pattern was estimated using Poisson panel regression. Then, using the Hausman and Breusch-Pagan tests, the fixed or random between-group effects as well as the panel effects were determined. Finally, using the proposed method, the pattern was estimated and goodness of fit coefficient was reported.

Determination of Panel between-group Effects

Breusch-Pagan test was used in this regard. Null hypothesis in the Breusch-Pagan test is the

[Downloaded from jebhpme.ssu.ac.ir on 2026-11-22]

existence of the panel effects measured by χ^2 statistic. If the significance level in this test is more than 0.05, it means that the study pattern has panel effects and the estimator has a panel form. χ^2 coefficient in the above pattern is 2.20 with a significant value of 0.1380. As a result, the pattern under investigation in this study has panel effects and should be estimated in panel form.

Determination of fixed and random between-group effects

The Hausman test was used to investigate the fixed and random effects in the model. For this purpose, first, the model was estimated via both fixed and random effects. Then the Hausman test was performed on the model. Null hypothesis in Hausman test is the presence of random effects and if null hypothesis is not rejected, it can be stated that the model has random effects. In this way, if the significance of the test is higher than 0.05, the study pattern will have random effects and estimator of fixed effects cannot be used. the computed statistic is smaller than the critical values (df = 4) and the significance of null hypothesis is high which is equal to 0.2539. Therefore, null hypothesis of random effects can not be rejected. The results of the above diagnostic tests indicated that the study pattern should be estimated using the panel method and Poisson regression estimator via random effects.

As shown in Table 6, fertility rate, population and income, and the number of midwives have a significant relationship with the number of maternal mortalities. However, there was no significant relationship between number of physicians, number of hospital beds and urbanization. In addition, the fixed coefficient (intercept of model) in the above pattern was not significant,.

Results of goodness of fit analysis of the pattern

In order to analyze goodness of fit in the panel data, that are estimated using Poisson estimator, the best test is the log-likelihood statistic (probability logarithm). The statistic is represented as a negative number and the closer it is to zero, the better the study pattern is. In the present study, the log likelihood was -216.85. Moreover, likelihood ratio statistic was 21.49.

Since the study data is panel-based, it is not possible to use the Watson Camera test. Therefore, the tests similar to serial auto-correlation analysis should be used that has been designed for the panel data. The appropriate test for this study is the Waldrige test. null hypothesis in this test is absence of serial auto-correlation, and if null hypothesis is rejected, the study pattern has serial auto-correlation model. In the present study, the Waldrige test statistic was 0.255 with a significance of 0.6910. Therefore, null hypothesis can not be rejected, and it can be said that there is no serial auto-correlation in the interfering components of the study.

Table 1. Demonstrating of the symbols of the maternal mortality variables.

Variable	Symbol
the development level of the studied provinces and its desired index is GDP	Dev
number of people living in cities across the country	Urb
Fertility rate in all provinces of Iran	Fer
number of physicians in all provinces of Iran	Phy
number of midwives in all provinces of Iran	Mw
The population of each province of Iran, which has entered the model as a control variable. Because the population of different provinces of Iran is different, there is a potential increase in the number of maternal moratalities in the most populated provinces.	Pop

[Downloaded from jebhpme.ssu.ac.ir on 2026-11-22]

Table 2. Descriptive information on MMR within 2009-2013

Year	Mean	Standard Deviation	Minimum	Maximum
2009	10.967	10.524	0	46
2010	9.741	9.953	1	45
2011	9.806	8.780	0	40
2012	9.096	10.270	0	44
2013	9.516	11.054	2	42

Table 3. Statistics on the total number of births within 2009-2013

Year	Mean	Standard Deviation	Minimum	Maximum
2009	43338.87	39641.6	8799	196112
2010	44951.53	41369.09	9366	204208
2011	43985.23	37540.93	9372	174857
2012	44588.03	38013.59	9574	177129
2013	45860.94	38822.41	9767	178832

Table 4. The mean number of physicians in provinces of Iran within 2009-2013

Year	Mean	Standard Deviation	Minimum	Maximum
2009	464.206	364.393	77	1535
2010	669.533	820.554	50	3909
2011	491	360.753	122	1690
2012	480.677	306.388	124	1248
2013	1103.839	1078.119	114	5704

Table 5. Mean Rate of Urbanization in Provinces of Iran within 2009-2013

Year	Mean	Standard Deviation	Minimum	Maximum
2009	0.6117	0.1224	0.4579	0.9259
2010	0.6263	0.1229	0.4711	0.9391
2011	0.6534	0.1217	0.4907	0.9512
2012	0.6613	0.1214	0.4964	0.9530
2013	0.6603	0.1687	0.0152	0.9775

Table 6. Estimation results of the study pattern using Poisson panel regression and random effects

Name of variable	Coefficient	Standard deviation	Z Statistic	significance	Lower limit	Upper limit
Urbanization	- 0.12650	0.89371	- 0.14	0.887	- 1.87816	1.62514
Fertility rate	0.00004	$6.95* 10^{06}$	6.29	0.000	0.00003	0.00005
Number of hospital beds	0.00011	0.00006	1.67	0.096	- 0.00002	0.00024
Number of midwives	-0.00046	0.0002558	-1.81	0.070	- 0.00096	0.00003
number of physicians	- 0.00006	0.00005	-1.18	0.239	- 0.00018	0.00004
income	- 0.000157	-0.0000545	2.76	0.006	0.0000437	0.000257
Population	0.00056	0.00019	2.91	0.004	0.00094	0.00018
Fixed component	$-1.57*10^{09}$	$1.80*10^{09}$	- 0.87	0.384	$- 5.10*10^{09}$	$1.97*10^{09}$

[Downloaded from jebhpme.ssu.ac.ir on 2026-11-22]

Discussion

The study results demonstrated a negative significant relationship (at level of 10%) between mean household income and maternal mortality. Household income level may have an impact on maternal mortality in regard to many aspects: For instance, increased household income will result in families' having more financial access to better delivery services using expensive and luxurious delivery services. More use of these services can lead to a reduction in maternal mortality in more affluent households (16).

Since the public health and environmental health indicators seem to benefit from better conditions in more developed regions, income can be considered as a criterion regarding the development of households. In regions where public and environmental health indicators are better, maternal mortality will be lower.

Various studies have shown that fertility rate in households with higher incomes are lower. Such families are less likely to have a baby, and as fertility decreases, maternal mortality is likely to decrease, as well. On the other hand, findings of different studies have revealed that in regions in which their economic system is more based on the agricultural economy, fertility rate also increases, because in these families, children are more considered as workforce and, accordingly, such families have more inclination to give birth to a baby. As a result, households' income rate in these economies is lower compared to industrial and service economies (17,18). The level of education in high-income families is generally higher (19). Due to their higher levels of literacy, these households have a better understanding of their health that is to say they better understand health messages, and thus, maternal mortality decreases in these families (20, 9). In an ecological study conducted in Columbia, Cardenas et al. (21), concluded that poverty can be regarded as one of the reasons for the increase in MMR. They used two variables of absolute poverty and household income in order to investigate the poverty index, both of which demonstrated a relationship with maternal mortality. Moreover, Anandelakshami (22) conducted a study in India in 1993, who reported a negative relationship between maternal mortality and income.

In the present study, no significant relationship was detected between urbanization ratio and maternal mortality. Results of various studies have indicated that increased urbanization can lead to decreased maternal mortality since access to services increases in regard to health and safe delivery (23).

Moreover, the income and education status of people living in cities is generally better than those in the rural regions, and thus, MMR in cities should be lower than that of the rural areas. However, the inverse relationship between urbanization and maternal mortality has not been confirmed in the present study, which can be related to that in this study pattern, household income rate as an income indicator and number of physicians, midwives, and hospital beds as access indicator to health services have been entered to the pattern, and thus, the mediating factors causing an inverse relationship between urbanization and maternal mortality have been practically eliminated. It is worth mentioning that the marginal effect should also be taken into account. As urbanization rate increases, migrations from villages to cities and marginalization will also increase, and health conditions may get extremely bad so as even MMR in cities get higher compared to that of the villages (24,25). In another study conducted in Ghana in relation to the impact of migration from villages to cities, Rokichi et al. (24), concluded that fertility rate in migrant households had risen leading to an increase in mortality rate of children. For instance, this issue should be given more prominence in Indonesia which has a more immigration rate from villages to cities (26). Sinq et al. (25), obtained similar findings in 2009 in the United States. Indeed, they concluded that rate of mortality causes in rural areas are higher than that of urban areas and it also increases in city margins compared to the villages which can be due to the poverty. Kumarzamen (27) in a study carried out among low-income countries, found similar outcomes as that the mortality of

[Downloaded from jebhpme.ssu.ac.ir on 2026-11-22]

children and mothers in rural and urban areas are not significantly different. Hosseini Chavoshi (23) showed that the rate of infant death was reported to be higher in rural areas of Iran in comparison with the urban areas. In line with these findings, Fink et al. (28), investigated children's mortality and health indicators in a demographic survey studying 74 developing countries, and found that both indicators were more reported in rural areas rather than urban areas (28).

The findings of the present study showed a negative relationship between the number of midwives and maternal mortality, whereas no significant relationship was demonstrated between number of physicians and maternal mortality. Furthermore, the relationship between number of hospital beds and maternal mortality was reported to be positive (at level of 10%). The World Health Report states that if any of the components of health system, such as physicians, and health costs, does not lead to an improvement of health indicators, it can be stated that that component of health system does not work efficiently in regard to improving health indicators (29). It can also be claimed that physicians and hospitals have been unable to work efficiently in reducing maternal mortality while midwives have been demonstrated to reduce the maternal mortality. It should be noted that an increase in the number of hospital beds has had a positive relationship with the maternal mortality. It can be argued that those mothers using hospitals for delivery have a high-risk pregnancy and require special care. Therefore, in this study, in areas where number of hospitals and hospital beds are higher, the effect of these variables on maternal delivery showed an increased risk of maternal mortality.

The results of the present study also indicated that the total fertility rate had a positive significant relationship with maternal mortality. In fact, increased fertility rate can result in increased likelihood of fertility complications, among which maternal mortality can be mentioned. Moreover, fertility rate is generally reported to be higher in rural households who need more labor for farming as well as in lower-income families. This factor may also have an exacerbating effect on maternal mortality. Stanton et al. (30), conducted a study in 13 countries and confirmed the findings of the present study. These findings were also confirmed in the McCarthy et al.'s study (31) in the United States in 1992. In addition, Rosenfield (32) and Terracell (33) detected a positive relationship between fertility rate and maternal mortality.

Conclusion

In general, the present study findings revealed that increased household income can lead to a reduction in maternal mortality. Moreover, increased fertility rate can result in increased maternal mortality. All the variables evaluated in this study are rather associated with the development level of the provinces. In the developed regions, per capita income rate, the proportion of physicians' number and urbanization is held to be higher and justice demonstrates more appropriate distribution in regard to access to health services. Hence, it can be concluded that if the country pursues its process of developmental level progress, maternal mortality will be reduced. Promoted development in the regions can be accompanied by an increase in the education level which this relationship is of particular significance. These changes are regarded apart from increased access to health services and improvement of families' health level. The World Health Report states health as an interdependent concept, on which the role of other influential factors other than health factors has been emphasized (29). In order to reduce maternal mortality, not only should the role of the Ministry of Health be emphasized responsible for the country's health system, but also the responsibility of other organizations and agencies needs to be taken into consideration in this regard.

Acknowledgements

The authors of this article consider necessary to thank and appreciate from The Ministry of Health and Medical Education for data gathering and Tehran University of Medical Science that help us in this research.

This article is a research thesis and it is the result of a thesis of Tehran University of Medical Science. The research code number is 9111119008.

[Downloaded from jebhpme.ssu.ac.ir on 2026-11-22]

Conflicts of interest

The author has no conflict interest.

Authors' contributions

Gholampoor H and pourreza A designed research; Pourreza A conducted research; Heydari H analyzed data; Gholampoor H and Pourreza A wrote the paper; Gholampoor H had primary responsibility for final content. All authores read and approved the final manuscript.

References

1) Sciences IUoM. Joint statement of UNICEF, WHO, UNFPA and world bank.Decrease of maternal mortality. 2001.
2) Shamshiri mH, H.Razavi,M.Eftekhar Ardabili,H.Majlesi,F. Public Health. 2, editor. Tehran: Arjmand pub; 2006.
3) valafar s. The national safe motherhood program: integration of maternal health care, especially midwives - GP. Tehran: Ministry of Health and Medical Education, 2009.
4) Ronsmans C, Graham WJ, group LMSSs. Maternal mortality: who, when, where, and why. The Lancet. 2006; 368(9542): 1189-200.
5) Organization WH. Maternal mortality in 2000: estimates developed by WHO, UNICEF and UNFPA: World Health Organization Geneva; 2004.
6) Say L, Chou D, Gemmill A, Tunçalp Ö, Moller A-B, Daniels J, et al. Global causes of maternal death: a WHO systematic analysis. The Lancet Global Health. 2014; 2(6): e323-e33.
7) Amani F, Kazemnejad A. Changing pattern of mortality trends in Iran, South, South-West Asia and World, 1970–2010. Iranian journal of public health. 2010; 39(3): 20-6.
8) Emamiafshar N, Jalilvand P ,Delavar B, Radpouyan L, Azemikhah A, Valafar S. National maternal surveillance system. Tehran: Tandis Publication. 2006.
9) Rad EH, Hadian M, Gholampoor H. Comparison the Effects of Health Indicators on Male and Fe-male Labor Supply, Evidence from Panel Data of Eastern Medi-terra¬ nean Countries 1995-2010. Iranian Journal of Public Health. 2014; 43(2): 221-8.
10) Organization WH. Global Health Observatory: (GHO): World Health Organization; 2013.
11) Yearbook IS. Statistical Center of Iran. Tehran, Iran. 2013.
12) health Dm. Performance and achievements of the country care for the death of mother. 2010.
13) Mohammadinia N, Rezaei M, Sameizadehtoosi T, Rostaei F. Investigating the frequency and effective factors on maternal mortality in Sistan and Baluchistan Province, Iran, 2002-2009. The Iranian Journal of Obstetrics, Gynecology and Infertility. 2013; 16(44): 28-34.
14) Arellano M. Panel data econometrics. OUP Catalogue. 2003.
15) Wooldridge JM. Econometric analysis of cross section and panel data: MIT press ; 2010.
16) Keohane LM, Grebla RC, Mor V, Trivedi AN. Medicare Advantage Members' Expected Out-Of-Pocket Spending For Inpatient And Skilled Nursing Facility Services. Health affairs (Project Hope). 2015; 34(6): 1019-27.
17) Herteliu C, Ileanu BV, Ausloos M ,Rotundo G. Effect of religious rules on time of conception in Romania from 1905 to 2001. Human reproduction (Oxford, England). 2015.
18) Fiori F, Graham E, Feng Z. Geographical variations in fertility and transition to second and third birth in Britain .Advances in life course research. 2014; 21(1): 149-67.
19) Saxton P. Education and income: New York: Viking; 1961.
20) Homaie Rad E, Vahedi S, Teimourizad A, Esmaeilzadeh F, Hadian M, Torabi Pour A. Comparison of the effects of public and private health expenditures on the health status: a panel data analysis in eastern mediterranean countries. International journal of health policy and management. 2013; 1(2): 163-7.

[Downloaded from jebhpme.ssu.ac.ir on 2026-11-22]

21) Cardenas-Cardenas LM, Cotes-Cantillo K, Chaparro-Narvaez PE, Fernandez-Nino JA, Paternina-Caicedo A, Castaneda-Orjuela C, et al. Maternal mortality in Colombia in 2011: a two level ecological study. PLoS One. 2015; 10(3): e0118944.
22) Anandalakshmy P, Talwar P, Buckshee K, Hingorani V. Demographic socio-economic and medical factors affecting maternal mortality-an Indian experience. Journal of Family Welfare. 1993; 39(3): 1-4.
23) Hosseini-Chavoshi M, Abbasi-Shavazi MJ, Bittles AH. Consanguineous marriage, reproductive behaviour and postnatal mortality in contemporary Iran. Human heredity. 2014; 77(1-4): 16-25.
24) Rokicki S, Montana L, Fink G. Impact of migration on fertility and abortion: evidence from the household and welfare study of Accra. Demography. 2014; 51(6): 2229-54.
25) Singh GK, Siahpush M. Widening rural-urban disparities in all-cause mortality and mortality from major causes of death in the USA, 1969-2009. Journal of urban health : bulletin of the New York Academy of Medicine. 2014; 91(2): 272-92.
26) Joint Committee on Reducing M, Neonatal Mortality in I, Development S, Cooperation, Policy, Global A, et al. Reducing Maternal and Neonatal Mortality in Indonesia: Saving Lives, Saving the Future. Washington (DC): National
27) Academies Press (US) Copyright 2013 by the National Academy of Sciences. All rights reserved; 2013.
28) Quamruzzaman A ,Mendoza Rodriguez JM, Heymann J, Kaufman JS, Nandi A. Are tuition-free primary education policies associated with lower infant and neonatal mortality in low- and middle-income countries? Social science & medicine (1982). 2014; 120(1): 153-9. PMID: 25243641.
29) Fink G, Gunther I, Hill K. Slum residence and child health in developing countries. Demography. 2014; 51(4): 1175-97.
30) Organization WH. The world health report 2000: health systems: improving performance: World Health Organization; 2000.
31) Stanton C, Abderrahim N ,Hill K. An assessment of DHS maternal mortality indicators. Studies in family planning. 2000; 31(2): 111-23.
32) McCarthy J, Maine D. A framework for analyzing the determinants of maternal mortality. Studies in family planning. 1992; 23(1): 23-33.
33) Rosenfield A ,Maine D. Maternal mortality-a neglected tragedy: Where is the M in MCH? The Lancet. 1985; 326(8446): 83-5.
34) Trussell J, Pebley AR. The potential impact of changes in fertility on infant, child and maternal mortality. Studies in family Planning. 1984; 15(6): 267-80.

[Downloaded from jebhpme.ssu.ac.ir on 2026-11-22]