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The relationship between mother's socioeconomic status and child health

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Abstract

Child health as one of the main indicators of economic development has been included directly in the millennium development goals. Due to the increased rate of mothers' employment and education along with children malnutrition, the effect of mothers' socioeconomic status on children's health was examined in this study. In case study, data on children at birth were gathered from health care records in 10 health centers of Tehran. The sample size of 400 was determined using the Cochran formula with an error margin of 5%. The cases were selected through random cluster sampling. The probit, probit with endogenous variable, and ordered probit models were employed. The mean mother's education was at the level of 3.76, representing higher than diploma and lower than associate degrees. The mean mothers' age, whose children were normal, stunting, and severe stunting, was 32.25, 32.92, and 34.20, respectively. The mothers' employment and education level increased the likelihood of stunting by 93 and 37 percent, respectively. Therefore, mother's employment had a negative effect on child health; i.e. mother's employment increases the possibility of stunting probably because of child malnutrition. In addition, rising education level among unemployed mothers increased the probability of children's health. The parents' education affected positively the health of children, and officeholder father, family size, and being twin had negative effects on children's health.

Keywords: Child Health, Educational status, Employment status

Introduction

Health is a multidimensional concept, which is influenced by natural, economic, social, political, and cultural factors [1]. According to the fact that human being is at the center of development and health is the most effective factor in development process, if the health indicator is not reformed especially with regard to children, the Millennium Development Goals (MDGs) seems unachievable. This is because among the MDGs, the four goals are directly related to children's health and nutritional status [2]. Childhood is a critical period in human life because important health events occur in this period. This course can be a source for inequality in personal life [3]. Many diseases and disorders have roots in childhood [4]. Therefore, health in early years of life and socioeconomic characteristics of household can determine the health level and lifestyle in next periods of life [5,6]. Especially, the first two years of life is vital for child's growth, so child's health plays a significant role in

physical, mental, and social performance of child in future. The share of socioeconomic factors on health is estimated more than 50% [1]. The impact of mothers' socioeconomic status on child health is undeniable. One way to affect children's health is to increase the chance of mother's participation in labor market; of course, this relationship is to some extent complex and ambiguous. The participation rate of labor force as a percentage of total population aged 15 to 64 has reached from 45.09 in 2008 to 48.79 percent in 2012 [7]. Since this participation is not men specific, it can be concluded that women's participation rate in labor market has increased in recent years. Accordingly, it has been reported that the women's participation rate as a percentage of total labor force has reached from 17.01 in 2008 to 18.50 percent in 2012 [7]. The statement that mother's employment can really improve children's health is vague. On one side, it is possible that the child suffers from the consequences of mother's work outside home, for example, deprivation from mother's love through hug and spending more hours lonely. On the other hand, the participation in labor market makes a higher income for household and can result in the higher medical information, so families can spend more money for improving children's health states [8]. In Iran, the proportion of children under 5 who are underweight to all the relevant population has reached from 13.8 during 1990-1995 to 4.1% during 2006-2012, while the corresponding proportions are 17.5 and 3.9% worldwide, respectively [9]. These figures suggest that while the underweight index in Iran during 1990-1995 was better than the world, it has been worse than the world index in recent years. In other words, the prevalence of underweight children due to malnutrition in Iran currently is more than the world. Wasting (weight for height) index is another indicator that is used to measure malnutrition. In Iran, the wasting index is 4 percent for the children under 5 in 2006-2012; while the world index is 2.8 percent [9]. Thus, the wasting index in Iran is poor compared to the mean of world. According to the increasing mothers' education level and employment in Iran along with the undesirable status of malnutrition, the main questions here are: "Is children's malnutrition affected by mothers' education and consequently employment?" and "Is mothers' employment- resulted from the increased level of education- improving children's stunting and wasting rate?" Also, "Which factors are effective in children malnutrition in Iran?" In this study, we are going to answer these questions.

The empirical studies show different results on the effect of mother's socioeconomic status on child health. Some studies show that the mothers' education has positive effects on child health [8,10-19] Althoughthe other studies show that the mothers' education has negative effects on child health [20,21]. Glewwe and Mostafavi concluded that mother's education has no effect on children's health [22,23]. Dwyer et al. and Morrill found a negative relationship between mothers' employment and children's health [24,25] and Mugo, Tulasidhar and Homaee Rad et al. found a positive relationship between mothers' employment and children's health. Gennetian et al. showed that mothers' employment has no effect on children's health status [26]. Golalipour at el. showed the mean weight and height of newborns were higher in caesarian born children and also higher in newborn with mothers aged above 18 [27]. Semba et al. showed that father's education was more important than the mother's for children's health in Bangladesh [28]. Rahman and Chowdhury in Bangladesh as well as Ricci and Becker in Philippines obtained similar results [29,30]. Nketiah-Amponsah et al. in Ghana showed that mother's age, number of children, and being daughter have positive effects on underweight prevalence among children. Also, mother's education has a negative effect on infant underweight at birth [31]. Amone-P'Olak et al. stated that family income, parents' education, and occupational status have significant relationships with children's health [32]. Many diseases and disorders have roots in childhood, so it is

important to recognize the effective factors in health status of child. In fact children will be human capital in future and their mental and physical health will increase the productivity and reduce healthcare cost. Therefore, this study was conducted to determine the effect of mothers' socioeconomic status on child health.

Method

The present study is a case study that performed for investigation of mother's socioeconomic status on child health in Tehran. Data were gathered from health care records (HCRs) related to children in 10 health centers of Tehran in 2013. All the centers asked the mothers to fill out HCRs for the newborns, when they had referred to receive vaccination and other health-related services. The forms prepared by Iranian Ministry of Health were employed to meet reliability and validity criteria.

Where n is the sample size, p and q (q=1-p) are the success and failure ratios, respectively, and d denotes the error margin. Since the statistical population is unknown, we set p=q=0.5. In addition, we supposed d=5% and z=1.96, as is customary for samples greater than 30 observations. Hence, a sample size of 384 was calculated and rounded to 400. After completing equally-distributed 400 questionnaires, i.e. 40 questionnaires for each health center, through direct survey, we calculated the HAZ index for all children. Then, we estimated Probit, Probit with endogenous variable, and ordered Probit models assuming HAZ index as dependent variable in the STATA software. The following short form was used to determine children's health status:

HAZ= f (empm, eduf, edum, officeholder, agef, size, agem, primf, twin, gender, jaundice) where HAZ is the height for age z-scores which is calculated using the below equation:

$$haz_i = \frac{h_{ij} - \bar{h}_j}{\sigma_j}$$

In this equation, hij is the child's height at birth and are the mean and standard deviation of children height at birth, respectively, according to the WHO standards. In the Probit method, the code of 1 was assigned to children whose HAZ was -2 standard deviations more than the WHO standards and code of 0 to the rest of children indicating low height at birth children. In the ordered Probit method, however, children were classified into three groups including: normal children whose HAZ was -2 standard deviations more than the WHO standards, low height at birth (Stunting) children whose HAZ was -2 standard deviations below the WHO standards, and extremely low height at birth (sever Stunting) children whose HAZ was -3 standard deviations below the WHO standards. The model variables and detailed explanations are presented in Table 1.

Table 1 *Variables and abbreviations of model parameters*

Variable	Abbreviation	Coding
Mother's Employment	Empm	Employed Mother=1, Otherwise= 0
Father's Education	Eduf	Primary and lower=1, Secondary=2, Diploma degree=3, Associate degree=4, Bachelor degree=5, MSc. degree= 6, Ph.D degree and higher=7
Mother's Education	Edum	Primary and lower=1, Secondary=2, Diploma degree=3, Associate degree=4, Bachelor degree=5, MSc. degree= 6, Ph.D degree or higher=7
Officeholder Father	Officeholder	Officeholder father=1, Otherwise= 0
Father's Age	Agef	Father's age in year
Family Size	Size	Number of family members
Mother's Age	Agem	Mother's age in year
Father's Primary Education	Primf	Lower or primary educated Father =1 , Otherwise= 0
Being Twin	Twin	Twin=1, Otherwise= 0
Child's Gender	Gender	Boy=1, Girl =0
Jaundice state	Jaundice	Newborn with Jaundice=0, Otherwise= 1

Source: Authors' findings

Results

The mean mothers' age in the studied sample was 32.32 and the mean mothers' age in normal, stunting, and severe stunting children was 32.25, 32.92, and 34.20, respectively. The mean level of mother's education was 3.76, which indicates higher than diploma degree and lower than associate degree. The mean for father's age was 36.63 and the mean for father's education level was 3.72; i.e. the mean father's education in the studied sample was higher than diploma degree and lower than associate degree.

Table 2 shows the mean of model variables for child's HAZ index at birth. The birth weight in children who were normal in terms of HAZ index was 3.24 kg; the weight in newborns with low birth weight (LBW) and extremely low birth-weight (ELBW) was 2.61 and 2.49 kg, respectively. So, the birth weight in the normal children in terms of HAZ index is higher than the others. Also, examining head size variable shows that the number of children with normal head size was more than the other children.

The education level in mothers whose children were severe stunting was less than the other mothers. In other words, it can be said that there is a negative relationship between the increase in mother's education and children's low height at birth. It is also observed that father's education in children with normal HAZ index was higher than the others; as the father's education level in normal, stunting, and severe stunting children was 3.77, 3.08, and 2.80, respectively. Hence it can be concluded that father's education in severe stunting children was lower than diploma degree; and higher than diploma degree in the other children. As Table 2 shows, the more inappropriate children's status in terms of HAZ, the more mother's age; i.e. increasing mothers' age can increase the likelihood of having severe stunting children. In terms of family size, Table 2 shows that the studied families consisted of averagely less than 4 members. It is also observed that increasing family members can lead to the increased newborn low height at birth.

Table 2. *The mean of model variables for HAZ Index*

		HAZ		
	Mean	Severe stunting	Stunting	Normal
Weight at birth	3.19	2.49	2.61	3.24
Height at birth	49.84	41.50	45.46	50.21
Head size at birth	34.61	34.50	33.35	34.66
Father's Education	3.72	2.80	3.08	3.77
Father's Age	36.63	36.40	37.15	36.62
Mother's Education	3.76	3.60	3.77	3.76
Mother's Age	32.32	34.20	32.92	32.25
Family Size	3.46	4.10	3.85	3.43

Source: Authors' findings

The results of Probit model with endogenous explanatory variables are shown in Table 3. Five models based on this method have been fitted to estimate the effects of mothers' socioeconomic status on children's health. According to a hypothesis stating that mothers' employment can be a function of education level, the Probit model with endogenous explanatory variable or Probit with instrumental variable were applied. Due to the exogenous possibility of mothers' employment variable, which is presented in Table 3, the possibility of exogenous about mothers' employment in all models will not be accepted at the level of 5 percent; but the possibility of endogenous about mothers' employment in their level of education will be accepted. Moreover, since coefficients in Probit models are not usually interpretable, their marginal effects are used to determine the effects of explanatory variables on the dependent variable. Since the coefficients of Probit model are complicated, these estimated coefficients are the product of a binary model which cannot be interpreted

as the final impact on the dependent variable. To this end, the marginal effects are employed which show the impact of independent variable on the probability level of dependent variable. Table 3 reports these marginal effects. Model 1 was tested as the base model and it was found that "mother's employment", "father's education", " officeholder father" (employed in a governmental organization), and "family size" had significant effects on children's health. "Being twin" in model 2, "gender" in model 3, and " jaundice state" in model 4 were controlled. Among these variables, "being twin" and "jaundice state" had significant effects on children's health. As can be seen in Table 3, mothers' employment had a negative effect on children's health; i.e. mothers' employment can increase the possibility of children's stunting probably due to child malnutrition. Father's education level had also a positive effect on the possibility of children's health so that if father's education raises one level, the possibility of having a healthy child will increase by 48 percent. On the other hand, "officeholder father" had a negative effect on the likelihood of children's health. parents' and mother's ages were not significant factors in this model statistically. The square effects of paternal and maternal age were also included in the Probit model; Since they were not statistically significant variables, they were omitted from the model. "Family size" had a negative effect on the possibility of children's health; it means that increasing the number of family members can reduce the possibility of newborn health. "Being twin" had also a negative effect on the possibility of children's health by 89 percent. Also, if children do not have jaundice, the probability of their health will increase as much as 72 percent.

Table 3 *Marginal effects of probit model (HAZ as dependent variable in normal and stunting groups)*

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Mother's employment	-0.89***	-0.852***	-0.924***	-0.998***	-0.937***
Father's education	0.46***	0.484***	0.510***	0.515***	0.488***
Officeholder father	-0.50**	-0.522**	-0.562**	-0.587**	-0.548**
Father's age	0.03	0.013	0.013	0.014	0.014
Family size	-0.74***	-0.673***	-0.700***	-0.743***	-0.718***
Mother's age	0.01	0.032	0.033	0.036	0.035
Primary educated father	0.08	-0.004	0.053	0.063	0.006
Being twin		-0.893**	-0.894**	-0.900**	-0.894**
Child's gender			0.237	0.223	
Jaundice state				0.724*	0.741**
Regression significance	Prob> chi2= 0.00	Prob> chi2= 0.00	Prob> chi2= 0.00	Prob> chi2= 0.00	
Possibility of exogenous	Prob> chi2= 0.0034	Prob> chi2= 0.0092	Prob> chi2= 0.0076	Prob> chi2= 0.0088	Prob> chi2= 0.0102

* Significance at 10%., ** Significance at 5%., *** Significance at 1%.

Table 4 summarizes the results of ordered Probit model. As above-mentioned, HAZ is dependent variable in this model, which was classified according to the WHO standards into three levels of normal, stunting, and severe stunting children. The marginal effects of independent variables at the three levels are presented in Table 4. Mothers' employment was not statistically significant in this model. However, mother's education had a positive effect on children's low height at birth; i.e. increasing mothers' education level will increase the possibility of children's stunting. With high significance level, father's education also had a negative effect on the possibility of stunting children. The coefficient for this variable is 0.56 and its marginal effects on normal, stunting, and severe stunting children are 0.028, -0.020, and -0.008, respectively. It means that if father's education is increased by one level, the possibility of having children

with normal HAZ will increase as much as 2.8 percent; accordingly, the possibility of having children with stunting and severe stunting will be 2 percent and 0.8 percent. The coefficient of " officeholder father" variable is 0.703, which shows that this variable positively affects the possibility of children's stunting. If father is an officeholder man, the possibility of having children with normal HAZ will be decreased by 3.9 percent; also the possibility of having children with stunting and severe stunting will increase by 2.7 and 1.2 percent, respectively. "Parental age" and " primary educated father" are not statistically significant variables, similar to the findings of Probit model. The coefficient of "Family size" is positive, which implies that an increase in family members will increase the possibility of stunting children. Adding a new member to the family will increase the possibility of normal HAZ, stunting, and severe stunting children by 0.1, 2.5, and 1.1 percent, respectively.

Table 4 *Marginal effects of ordered Probit model (HAZ as dependent variable in severe stunting, stunting, and normal children)*

	Severe stunting	Stunting	Normal	Coefficients
Father's education	-0.008**	-0.020***	0.028***	-0.566***
Officeholder father	0.012*	0.027**	-0.039**	0.703***
Father's age	0.000	-0.001	0.001	-0.023
Family size	0.011**	0.025***	-0.036***	0.725***
Mother's age	-0.001	-0.001	0.002	-0.038
Primary educated father	0.018	0.033	-0.051	0.588
Being twin	0.083	0.102*	-0.186	1.261***
Jaundice state	-0.033	-0.053	0.085	-0.822**
Mother's employment	0.008	0.018	-0.026	0.466
Mother's education	0.006*	0.013**	-0.019**	0.379**
Regression significance				Prob> chi2 = 0.00

*Significance at 10%., **Significance at 5%., ***Significance at 1%.

Discussion

In this study, mothers' employment in both probit and ordered probit models had a negative effect on child health. In fact mothers' employment increases the likelihood of children's stunting probably due to child malnutrition by 93 percent. This finding is consistent with the results of Amone-P'Olak et al., Gennetian, Dwyer et al., Anderson et al., Baker and Milligan [24,26,32-34]. On the contrary, Tulasidhar, Cutler et al., Hussain and Smith, Mugo and Aslam have found contrary results [8,17,20,35,36], indicating that mothers' employment has a positive effect on child health. Tulasidhar and Cutler et al. used mortality rate of children to measure child health [8,17]. They showed that mothers' employment reduces the mortality rate of children, whereas they did not consider that whether employed mothers will bear healthy child, thus their results are not comparable with our findings. In the studies indicating the positive effect of mothers' employment on child health, some authors paid attention to the socio-economic, religious, and ethnic status of parents [35,36]. It has been stated that parents' education, health knowledge, and income level could alleviate the negative effects of mothers' employment. Therefore, mothers' employment may carry benefits for children like purchasing healthy foods and entertainment tools, although it can reduce mothers' ability and time to care children; this can result in the decreasing children's health. We found that mothers' education has a negative effect on children's stunting, i.e. an increase in mothers' education can reduce the possibility of children's stunting and sever stunting. Strictly speaking, if mothers' education increases by one level, the possibility of child health will increase by 37 percent. This finding is similar to the findings of studies conducted by Behrman and Wolfe, Cutler et al., Maitra, Conley and Yeung, Nketiah-Amponsah, Chen et al. and Kazembe,

indicating mothers' education has positive effect on child health [12-14,17,18,31,37].

According to our findings, we can argue that 1) mothers' education increases the likelihood of mothers' employment; and 2) probability of having healthy children in unemployed mothers with higher education level is more than the other mothers. It may be due to spending more time for child healthcare and enough health knowledge by educated mothers. Fathers' education has a negative effect on children's stunting, i.e. the possibility of children's health increases by increasing fathers' education level. This result is analogous to the findings of Chen et al., Semba, Rahman, Ricci & Becker and Kazembe [14,18,28-30]. According to the ordered Probit model, an increase in the fathers' education can raise the probability of child health by 56 percent, whereas increasing mothers' education increases this probability by 37 percent. The more important role of father education in child health may be due to the fact that father usually makes crucial decisions in child health [36]. "Family size" has a negative effect on the possibility of children's health; it means that increasing the number of family members can reduce the possibility of healthy child born. This result is consistent with the findings of Nketiah-Amponsa [31].

Conclusion

According to the descriptive statistics, father's education in severe stunting children is lower than diploma degree and higher than diploma in other children. The average mother's education is higher than diploma. The education level in mothers with severe stunting child is lower than the other mothers. Generally, it can be said that an increase in mothers' education can reduce the risk of child stunting. Also, according to the results of econometric models, mothers' employment has a negative effect on the possibility of children's health; i.e. mothers' employment increases the possibility of stunting probably due to malnutrition in children. Mother's and Father's education also have positive effects on the possibility of children's health so that if mother's and father's education raises one level, the possibility of children's health will increase by 48 and 38 percent, respectively. However, "officeholder father" has a negative effect on the possibility of children's health. "Family size" and "being twin" have a negative effect on the possibility of children's health; it means that an increase in the number of family members and being twin can reduce the possibility of newborn health. This study tried to examine the effects of mother's socioeconomic status on child health; however some variables such as mother's age, upper diploma-educated mother, and officeholder mother showed no statistically significant effects. In addition, some variables such as income level and mother's work experience were not included in the models due to lack of data.

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Data collection and analysis: MSH, LA, AA, HS

Manuscript preparation: MSH, LA, SG

Conflict of Interest

"The authors declare that they have no competing interests."

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