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The Effect of Mothers' Education and Employment on Children's Health

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Abstract

Background: Children's health in the first years of life plays a significant role in their physical, mental, and social performance in the future. One factor that can affect children's health is increasing mother's education and participation in the job market. Due to an increase in mothers' employment as well as children's malnutrition, the effects of mothers' education and employment on children's health were analyzed in this paper

Objectives: The aim of this study was to investigate the effect of mothers' employment and education on children's health at birth.

Methods: Research data were gathered from health care records (HCRs) of children at 10 health centers of Tehran in 2013. These children were randomly selected by the multi-stage sampling method. According to the Cochran formula, sample size at error level of 5% was 382, yet 400 questionnaires were completed. In order to estimate the regression model, Probit and Ordered Probit methods were used by applying the endogenous explanatory variable in the Stata software.

Results: The Probit model results indicated that mothers' employment increases the possibility of children's low birth weight due to malnutrition by 65% and father's education increases the possibility of children being healthy by 35%. However, "family size" and "being twins" decrease the possibility of children being healthy by 35 and 97%, respectively. The Ordered Probit model results showed that mothers' employment decreases the possibility of children having normal weight for age Z score (WAZ) by 23% and increases the possibility of children having a low birth weight and extremely low birth weight by 13 and 10%, respectively. However, increasing mothers' education will decrease the possibility of children's low birth weight.

Conclusions: In both models, mothers' employment had a negative effect on children's health at birth; i.e. mothers' employment increased the possibility of low birth weight due to malnutrition in children. However, mother's education had a positive effect on children's health at birth; i.e. an increase mothers' education will decrease the possibility of children's low birth weight. "Family size" and "being twins" have negative effects on the children's health at birth.

Keywords: Child Health, Employment, Education, Non-Professional

1. Background

According to the fact that human beings are at the center of developmental issues and health is the most effective factor in promoting development, if necessary reforms in health status of the society, especially children, are not done, achieving developmental goals including millennium development goals (MDGs) seems inconceivable; because four objectives of MDG directly refer to children's health and nutritional status (1). 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 one's life (2). Many diseases and disorders have roots in childhood (3). Therefore, health in early years of life and socioeconomic characteristics of the household determine the health model and lifestyle in future years of life (4). The first two years of life is especially the most important period for children's growth and development, thus children's health in this period plays a significant role in their physical, mental and social performance in the future. One factor that can affect children's health is the increased chance of mother's participation in the job market. It is possible that mother's participation in the job market is a function of their level of education. Whether mother's employment can really improve children's health is vague. On one side, it is possible for the child to suffer from mother's work outside the home, for example, deprivation from mother's love through a hug and less time spent on the child. On the other hand, participation in the job market provides a higher income for the household and it results in an increase in medical information, so families

spend more money for their children's health (5). As mentioned above, the effect of mothers' employment on children's health is vague in theory. One of the simplest mechanisms is that mothers' employment has a positive effect on children's health because of the increase in household income and consequently household expenditure on health (3, 6). On the other hand, if children's health is defined as the time that mothers devote for preparing healthy foods, a healthy environment at home, and care for their children, it can be said that mother's employment can limit these activities (7); thus, mothers' employment may negatively affect children's health. Sometimes mothers are forced to work in order to provide health care services for their children; indeed, health status is an important factor in mothers' decision to participate in the job market. Therefore, not only mothers' employment can affect children's health status, children's health can also affect mothers' decision to participate in the job market. Therefore, this relationship is mutual (5). Moreover, the mothers' decision to participate in the job market is related to their skills, preferences, and abilities; mothers may decide to participate in the job market to use their capacities and skills, for self-satisfaction, due to their aversion to work at home, and so on. Also mothers' employment may have benefits for children like allowing the purchase of healthy foods and providing health care for the family. However, it can reduce mothers' ability and time to care for children; this results in a decrease in children's healthy and useful activities; for example, children may be malnourished or tend towards sedentary entertainments (such as video games). Although children in low-income families may benefit from mothers' employment because of increasing household income, dependency on non-maternal care services may make them sensitive and vulnerable. Some harmful effects of mothers' employment on children's health emerge as respiratory and gastrointestinal diseases, ear pain, distress, etc. (8).

According to the UNICEF report in 2014, one third of deaths in under-five-year-old children occur as a result of malnutrition. One of the indexes used to assess malnutrition is Height for Age Z-scores (HAZ) that is also known the Stunting Index. Approximately one in every four under-five-year-old child, i.e. 165 million or 26% in 2011, suffered from stunting around the world (9). In Iran, stunting decreased from 8.1 in 1995 to 4.8 in 2004. Also, the proportion of under-five-year-old children, who are underweight, to all under-five-year-old children has decreased from 13.8 in 1990-1995 to 4.1 in 2006 - 2012 (10). However, these proportions are 17.5 and 3.9 for the whole world, respectively (9). These statistics suggest that although Iran's underweight index in 1990 - 1995 was better than the whole world, it is more than the world's statistics in 2006 - 2012. In other words, the prevalence of being underweight due to malnutrition in Iran is more than the whole world. In Iran, wasting index is 4% for children under-five-year-old while this index is 2.8% for the whole world (9). Thus wasting index in Iran, was lower than the desirable level in 2006-2012. Also, job force participation rate as a percentage of total population of 15 to 64 year-olds increased in Iran from 45.09 in 2008 to 48.79 in 2012. This participation is not specific to males; but female's participation rate in the job market has increased. Women's participation rate as a percentage of total job force has increased from 17.01 in 2008 to 18.50 in 2012 (11). According to official data, the prevalence of underweight and wasting due to malnutrition in Iran is more than the whole world while the participation rate of females has increased.

Empirical studies give different and conflicting results on the effect of mothers' employment and education on children's health. Mirzaee showed that parents' education has positive effects on children's health (12). Homaee Rad et al. found that there is a negative relationship between mortality rate of children and per capita income, participation rate of women and women's education (13). Mostafavi indicated reported that the correlation between mothers' education and mortality rate of children is weak, but it is greater in urban than rural areas (14). Golalipour et al. showed the average weight and height of all newborns was higher in caesarian operations and these parameters were higher in newborns with mothers aged above 18 (15). However, the direct effect of mothers' education on reducing infant mortality was much higher than the effect of mothers' participation in the job market. Some researches obtained contrary findings, i.e., the mother's education level had no effect on children's health (16). There is a negative relationship between mothers' participation and children's health; i.e. mothers' employment does not result in improvement of children's health status (17). Mothers' employment can increase the possibility of children's obesity in societies with high economic and social standards (18). The regression of parents' employment on under-five-year-old children's health in China using the Ordered Probit model showed that parents' education had a strong significant effect on children's health status, and the impact of mother's education on child's health was stronger than father's (19). Moreover, boys' health status was better than girls' status. A reduction in parents' education may significantly be related to a reduction in children's health, abilities and school years (20). According to Ruhm, the mothers' employment on a group of children, who were 10-11 years old, had no effect on those with poor socioeconomic status (21). In Bangladesh, father's education proved more importance than mother's education for children's health (22). The effect of parents' education in ad-

dition to economic factors on children's health may be statistically significant (23). In America, the parents' education and household income had positive relationships with reducing the rate of ten-year-old children's mortality (24). Father's education is much more effective than mother's on children's health in developing countries (2). In Korea, a significant relationship was reported between mothers' education and children being overweight at low-income level (25). The mother's age, number of children, and being a daughter had positive effects on children being underweight in Ghana, however mother's education had a negative effect on being underweight at birth (26). Amone-P'Olak et al. stated that family income, parents' education, and occupational status might significantly be related with children's health (27). The effect of mothers' employment on the health of 7 - 17 year-old children has been affirmed (7). The mothers at work in Kenya had healthier children, but mothers with higher education level did not have healthier children because mothers' education negatively affected children's health status (28). In Malawi, a higher socioeconomic status caused improvement in children's health; also, family's education level had a positive impact on children's health (29). Better economic situation, higher education, prenatal care and living environment had significant effects on children being underweight at birth in Ghana (30). A case study on Vietnamese children showed that no reduction occurred in health level of under 15-year-old children, yet family's income was an essential factor for children's health (31).

2. Objectives

Due to the increase in mothers' education level and employment in Iran and undesirable status of children malnutrition, the purpose of this study was to investigate the effect of mothers' employment and education on children's health. Thus this study was set to answer these questions:

Is mothers' employment and education a beneficial factor for children's health?

Which factors are involved in children's health?

3. Methods

Data were gathered from health care records (HCRs) of children at 10 health centers of Tehran in 2013. All health centers asked mothers to fill the HCRs for the newborns, when they offered vaccination and other health services. The records were designed by the Iranian ministry of health and met the reliability and validity criteria. The sample size was determined by the following formula:

$$n = \frac{Z^2 \mathrm{Pq}}{d^2} \quad (1)$$

Where n is sample size, p and q are success and failure ratios with q = 1 - P, and d denotes error percentage. Since the statistical population was 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, and we obtained a sample with n=384 and rounded it to n = 400. After completion 400 equally distributed questionnaires, i.e. 40 questionnaires for each health center, through direct survey, we calculated the WAZ (Weight for age z-scores) index for all children. The WAZ is weight for age z-scores at birth, which is calculated according to this formula:

$$\mathrm{waz}_i = \frac{w_{\mathrm{ij}} - \overline{w}_j}{\sigma_j} \quad (2)$$

Where wij is child's weight at birth; $\overline{w}_j, \sigma_j$ are the mean and standard deviations of children's birth weight, respectively, according to the world health organization (WHO) standards. Then we assigned number 1 for children with WAZ index between -2 and 2 standard deviations ($-2\sigma < \mathrm{WAZ} < 2\sigma$) and number 0 for the rest of the children with low birth weight (LBW), according to the world health organization (WHO) standards. Finally we estimated regression models using Probit method with WAZ index as dependent variables by the Stata software.

Also we estimated models using the Ordered Probit method. In this method, children were classified to three groups: normal, low birth weight (LBW), and extremely low birth weight (ELBW). In the Ordered Probit method, the WAZ index as a dependent variable had three values. Value 0 was assigned to normal children who had WAZ between -2 and 2 standard deviations, according to the WHO standards ($-2\sigma < \mathrm{WAZ} < 2\sigma$). Value 1 was assigned to low birth weight (LBW) children with WAZ between -3 and -2 standard deviations and value 2 was assigned to Extremely Low Birth Weight (ELBW) children with WAZ below -3 standard deviations. The following summarized form was used to determine children's health status and variables, and abbreviations of model variables are shown in Table 1.

WAZ = f (empm, eduf, edum, staff, agef, size, agem, twin, genderce)

4. Results

4.1. Probit Model Results

The results of the Probit model with endogenous explanatory variables are shown in Table 2. Three models have been fitted to estimate the effects of mothers' employment on children's health. According to theoretical basis that mothers' employment can be a function of their

Table 1. Variables and Abbreviation of Model Variables[a]

Variable	Abbreviation	Coding
Mother's employment	empm	Mother's Employment = 1, Otherwise = 0
Father's education	eduf	Primary and less = 1, Secondary = 2, Diploma = 3, Associates = 4, Bachelor = 5, Master = 6, Ph.D = 7
Mother's education	edum	Primary and less = 1, Secondary = 2, Diploma = 3, Associates = 4, Bachelor = 5, Master = 6, Ph.D = 7
Father's employment	staff	Employment = 1, Otherwise = 0
Father's age	agef	Father's Age in year
Family size	size	Number of family
Mother's age	agem	Mother's Age(years)
Father's primary education	primf	Father's Primary Education = 1, Otherwise = 0
Being twins	twin	Twin = 1, Otherwise = 0
Child's gender	gender	Boy = 1, girl = 0
Lack of Jaundice	jaundice	Jaundice = 1, Otherwise = 0

[a] Source: Authors' findings.

education level, the Probit model by endogenous explanatory variable or Probit with instrumental variable was applied. Due to the possibility of exogenous about mothers' employment, which is presented in Table 2, the possibility of exogenous about mothers' employment in all models (models 1,2 and 3) was not be accepted at the level of 5%; but the possibility of endogenous about mothers' employment in their level of education will be accepted. Moreover, because the coefficients in Probit models are not usually interpretable, their marginal effects were used to determine the effects of explanatory variables on the dependent variable; these marginal effects are reported in Table 2.

Model 1 was tested as the base model and it was found that "mother's employment", "father's education" and "family size" had a significant effect on children's health. "Being twins" in model 2 and "gender" in model 3 were controlled. Among these variables, "being twins" had a significant effect on children's health, thus model 2 was selected as the best model. As it can be seen in Table 2, mothers' employment had a negative effect on children's health at 1% significance level; i.e. mothers' employment can increase the possibility of children's low birth weight due to malnutrition by 65%. Father's education level also had a positive effect on children's health so that if father's education was raised one level, the possibility of children being healthy was increased by 35%. Father's and mother's age were not statistically significant in this model. The second squares of father's and mother's age were also included in the model; but they were not statistically significant and were deleted from the model. "Family size" had a negative effect on the possibility of children being healthy; this means that increasing the number of family members can reduce the possibility of children being healthy by 35%. "Being twins" had a negative effect on the possibility of children being healthy; it decreases this possibility as 97%.

4.2. Ordered Probit Model Results

Table 3 shows the results of the model based on the Ordered Probit method. As it was mentioned before, WAZ is the dependent variable, which is classified by WHO to three levels of normal, low birth weight and extremely low birth weight children. Marginal effects of independent variables for every three levels are presented in Table 3. Mothers' employment has a positive effect on the possibility of low birth weight in children at 1% significance level. The coefficient for this variable is 0.75 and its marginal effects on normal, low birth weight, and extremely low birth weight children are 0.23, 0.13, and 0.10, respectively. This means that mothers' employment decreases the possibility for children to have normal WAZ by 23% and increases the possibility for children to have low birth weight and extremely low birth weight by 13 and 10%, respectively. However, mother's education had a negative effect on children's low birth weight; i.e. increasing mothers' education will decrease the possibility of children's low birth weight. With high significance level, father's education had a negative effect on the possibility of low birth weight in children. The coefficient for this variable was - 0.47 and its marginal effects on normal, low birth weight, and extremely low birth weight children were 0.03, - 0.02, and -0.01, respectively. This means that if father's education increases by one level, the possibility that children have normal WAZ will increase as much as 3%; also the possibility for children to have low birth weight and extremely low birth weight will be 2% and

Table 2. Marginal Effects of the Probit Model with Endogenous Variable for Children at Birth (WAZ is the dependent variable)[a]

Independent Variable	Model 1	Model 2	Model 3
Mother's employment	- 0.4844[b]	- 0.6590[b]	- 0.6399[b]
Father's education	0.3484[b]	0.3595[b]	0.4026[b]
Father being employed	- 0.3856	- 0.5014	- 0.6349
Father's age	0.0502	0.0237	0.0251
Family size	- 0.4392[c]	- 0.3059[c]	- 0.1047
Mother's age	- 0.0553	- 0.0230	- 0.0616
Being twins		- 0.9786[d]	- 1.1371[d]
Gender			0.1777
Regression significance	Prob > chi2 = 0.00	Prob > chi2 = 0.00	Prob > chi2 = 0.00
Possibility of exogenous	Prob > chi2 = 0.0002	Prob > chi2 = 0.0011	Prob > chi2 = 0.0008

[a] Source: Authors' findings.
[b] Significance at 1 %.
[c] Significance at 5%.
[d] Significance at 10%.

1%. The coefficient for "father's employment" variable was 0.68, which shows that this variable has a positive effect on the possibility of children's low birth weight. If the father is employed, the possibility that children have normal WAZ will decrease by 5%; also the possibility for children to have low birth weight and extremely low birth weight will increase by 3 and 1%. "Parents' age" and "father's primary education" are not statistically significant, like the Probit model. "Family size" has a positive coefficient in this model and shows that increase in family members will increase the possibility of low birth weight children. Addition of a new member into the family will decrease the possibility of normal children, and increase low birth weight, and extremely low birth weight children by 4, 3, and 1%, respectively. "Being Twins" also has a positive coefficient and shows that Being Twins increases the possibility of low birth weight children.

5. Discussion

In this study, mothers' employment in both models (Probit and Ordered Probit) had a negative effect on children's health. In fact mothers' employment increases the probability of children's low birth weight due to malnutrition by 65 and 23% in the Probit and Ordered Probit models, respectively. These findings are consistent with the results obtained by Amone-P'Olak et al., Gennetian, Gordon et al., Baker and Milligan (8, 17, 27, 32) but Kazemb, Cutler et al., Mugo and Aslam found opposite results (5, 24, 28, 29). These authors indicated that mothers' employment has a positive effect on children's health. Kazembe and Cutler et al. used mortality rate of children to measure child health (24, 29). They showed that mothers' employment reduces mortality rate of children, but they did not consider whether employed mothers had healthy children. In studies on the positive effect of mothers' employment on children's health, some authors paid attention to the socio-economic, religious and ethnic status of parents (5, 28). For example, parents' education, health knowledge and income level could neutralize the negative effects of mothers' employment. Therefore, mothers' employment may have benefits for children like purchasing healthy foods and entertainment tools but it can reduce mothers' ability to care for the child and decrease their time spent with the child; this in turn results in a decrease in children's health. Mothers' education has a negative effect on children's low birth weight, i.e., increased mothers' education reduces the possibility of children's low birth weight. Thus, if mothers' education increases by one level, then the possibility of children being healthy will increase by 23%. This effect is similar to the findings of Cutler et al., Maitra, Conley and Yeung, Nketiah-Amponsah, Cohen et al. and Kazembe (2, 19, 24, 26, 29, 33). In the Probit model, if father's education raises by one level, the possibility of children being healthy increases by 35%; and in the Ordered Probit model if father's education increases by one level, the possibility that children to have normal WAZ increases as much as 3%; also the possibility that children have low birth weight and extremely low birth weight will be 2 and 1%. Thus, father's education level has a positive effect on children's health in Iran. This result is analogous to the findings of Cohen et al., Semba, Rahman, Beker et

Table 3. Marginal Effects of Ordered Probit model (HAZ is the Dependent Variable for Normal, Low Birth Weight and Extremely Low Birth Weight Children)[a]

Independent Variable	Coefficients	Normal	Low Birth Weight (LBW)	Extremely Low Birth Weight (ELBW)
Father's education	- 0.47[b]	0.03[b]	-0.02[b]	-0.01[b]
Father's employment	0.68[b]	-0.05[b]	0.03[b]	0.01[b]
Father's age	-0.03	0.00	0.00	0.00
Family size	0.59[b]	-0.04[b]	0.03[b]	0.01[b]
Mother's age	-0.02	0.00	0.00	0.00
Father's primary education	0.68	-0.08	0.05	0.03
Being twins	1.21[b]	-0.21[b]	0.12[b]	0.09[b]
Jaundice	-0.87[c]	0.12[c]	-0.07[c]	-0.04[c]
Mother's employment	0.75[b]	-0.23[b]	0.13[b]	0.10[b]
Mother's education	-0.23[b]	–	–	–
Regression significance	Prob > chi2 = 0.00			

[a]Source: Authors' findings.
[b]Significance at 1 %.
[c]Significance at 5%.

al. and Kazembe (2, 22, 29, 32, 34). "Family size" has a negative effect on the possibility of children being healthy; this means that increasing the number of family members can reduce the health of new members of the family. This result is consistent with the study of Nketiah-Amponsah (26).

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Footnotes

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