

## Original Article

## Equality in Safe Delivery and Its Determinants in Iran

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**Background/Objective:** To determine the equality in safe delivery indices, i.e., appropriate place of delivery, type of delivery and skilled attendant for delivery, and their determinants in Iran.

**Methods:** This study was performed using the data of Iran demographic and health survey, performed in 2000. Our sample was nationally representative and included 17,991 Iranian married women aged 10 – 49 years who had delivered during two years before the survey. The equality status was assessed by concentration index. The relationship between different factors and safe delivery was investigated by logistic regression. These factors included age, occupation, resident place (urban vs. rural), mother's educational level and household economic status (weighted asset index).

**Results:** Concentration index (95% CI) for appropriate place of delivery, normal vaginal delivery and skilled attendant for delivery, were 0.111 (0.107 to 0.115), -0.100 (-0.105 to -0.095) and 0.095 (0.091 to 0.099), respectively. In other words, the opportunity of delivery in appropriate place and by skilled attendant were more common in those with higher economic levels; while normal vaginal delivery was less common. Also, mother's age and educational level had significant correlation with safe delivery indices; in all cases mother's education was the most important factor.

**Conclusion:** In spite of the improvement in delivery care in Iran during the past decades, there are significant differences between the current situations of safe delivery in people with different socioeconomic states.

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**Keywords:** Equality • Iran • safe delivery • socioeconomic status

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## Introduction

In addition to indices indicating average level of health, determinants describing the distribution of health among people are very important.

Mother's health has been emphasized in the Millennium Development Goals.<sup>1</sup> Although, the average indices are pointing to a great improvement in many countries (including Iran), there are other aspects of this phenomenon such as equality and equity in individuals and groups

which should be monitored.

A systematic review performed in United Kingdom in 2003 showed that women from manual classes, in comparison with other women, received fewer and delayed prenatal cares. Furthermore, they found that women of Asian origin, were registered later than white British women for prenatal care.<sup>2</sup> The research evidence from 42 demographic and health surveys in developing countries showed that in the poorest countries, large proportions of the population, have no access to potentially life-saving cesarean section (below 1% for all sections for the poorest 20% of population in 20 countries).<sup>3</sup>

Iran could obtain brilliant results in prenatal cares at country level over the past two decades. For instance, delivery by attendance of an unskilled person was reduced from 27% in 1993 to 9.3% in 2003; however changes in indices are not equal among all provinces.<sup>4</sup>

Given the importance of the issue—especially, for health policymakers—and lack of enough

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evidence on the distribution of health in Iran,<sup>5</sup> the present study was performed to assess the equality of safe delivery and its determinants.

## Materials and Methods

### Setting and sampling

In this study, the data from Iran demographic and health survey (DHS) performed in 2000 were used. The sample size of DHS was supposed to be 4,000 households (2,000 urban and 2,000 rural) selected from each of the 28 provinces of the country (totally 112,000 households). In addition, 2,000 households were also selected from Tehran, the Capital of Iran. We could finally have 113,957 households for our study.<sup>5</sup> The sampling method used was multistage (cluster and systematic sampling); 4,000 households from each province consisted from 400 clusters of ten.

In the 113,957 households, there were 17,991 Iranian married women aged 10 – 49 years who delivered during the two years before DHS. To increase the representativeness of our sample, the data were weighted proportional to size of rural and urban population of each province.

### Variables

Safe delivery indices included appropriate place of delivery, type of delivery and skilled attendance for delivery. Place of delivery in the DHS questionnaire was a variable with six different strata. For the current study, it was changed into a binary variable with two states: “appropriate place” (i.e., governmental hospital or maternity, delivery facilities center, private hospital or maternity and clinic of physician or registered midwife) and “inappropriate place” (i.e., house/on the way). The type of delivery was a dichotomous variable: “normal vaginal delivery” (NVD) and “cesarean section.” Attendance for delivery included “skilled attendant” (i.e., physician, educated midwife or nurse and trained traditional midwife) and “inappropriate person” (i.e., untrained midwife, relatives or nobody). Independent variables were mother’s age, education, occupation (including income-producing occupation or unearned income), residence (urban vs. rural) and a weighted asset index which was a surrogate variable of household economic status.<sup>6, 7</sup> The index was calculated based on having refrigerator, radio, television, telephone, private car, hygienic toilet, hygienic solid garbage disposal, number of rooms per capita, appropriate heating system, appro-

priate source of energy for cooking and safe drinking water, using principle component analysis (PCA). Then, the households were ranked and divided into quintiles with the first and fifth quintiles representing the poorest and richest group, respectively.

### Analysis

The variables have been described by percentages and 95% confidence intervals (95% CI). Concentration index, its 95% CI and concentration curve were used to measure the level of inequality. The concentration curve shows the degree of inequality due to income or other socioeconomic variables in the distribution of a health variable. The 45° line running from the bottom-left corner to the top-right is the line of equality. Concentration index shows the area between the concentration curve and the line of equality. Its value, therefore, lies between -1 and +1 and there is a statistically significant inequality when its confidence interval does not include zero. When the curve lies above the line of equality, the index takes a negative value and shows that health variable is higher amongst poorer people. By contrast, the curve under the line of equality has an inverse interpretation. Analyses were performed using Stata 8.0 statistical software. To calculate the concentration index and draw the concentration curve, GLCURVE.ado was used.<sup>7-9</sup> Newey-West regression method was used to estimate the 95% CI for concentration index.<sup>10</sup> Factors related to safe delivery indices were assessed by logistic regression.

### Ethics

Since the DHS data belong to the Deputy of Health in Ministry of Health and Medical Education (MOHME), this study was approved by and performed under the supervision of the Secretariat for Applied Research.

## Results

In this study, 17,991 Iranian married women aged 10 – 49 years who delivered during the two years before DHS were assessed. The mean (95% CI) age of participants was 26.9 (26.8 – 27.1) years. Table 1 illustrates occupation, education and resident place of these women. Table 2 describes safe delivery indices in Iran according to DHS data.

**Table 1.** Description of Iranian married women aged 10 – 49 years who delivered during two years before DHS (\*=weighted).

Independent variables	Number (%*)
<b>Occupation</b>	
Jobless	224 (1.4%)
Student	101 (0.6%)
Housewife	14,456 (81.3%)
Practitioner	3,002 (16.7%)
<b>Education</b>	
Illiterate	4,712 (23.4%)
Primary	6,481 (34.3%)
Secondary	2,942 (17.7%)
High school	2,879 (19.4%)
Academic	819 (5.2%)
<b>Residence</b>	
Rural	9,786 (50.1%)
Urban	8,205 (49.9%)

Figure 1 displays the proportion of appropriate place of delivery in different economic quintiles which was significantly higher in richer quintiles ( $P<0.05$ ). There was a similar trend for appropriate attendance for delivery, with improved care in the higher economic quintiles in comparison to the lower ones (Figure 2).

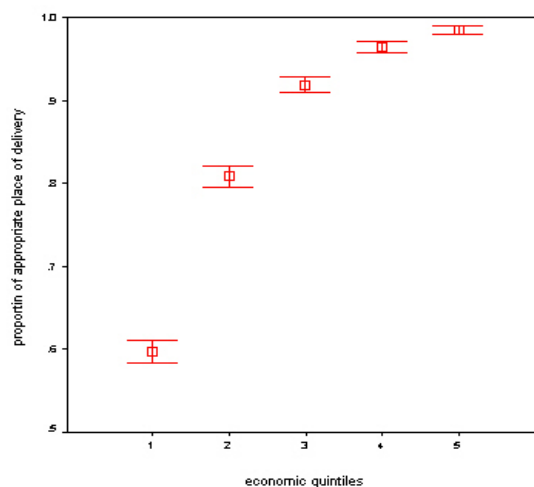
Proportion of NVD was higher amongst the poorest quintile, and was significantly ( $P<0.05$ ) decreased with improvement of economic status (Figure 3).

The concentration index (95% CI) of the appropriate place of delivery was 0.111 (0.107 – 0.115), which pointed to a rising opportunity of delivery in appropriate places, among higher economic groups, significantly (Figure 4)—the concentration curve lies under the line of equality. Only 15% of the appropriate places of delivery belonged to the poorest 20% of the women. The concentration index (95% CI) of skilled attendance for delivery was 0.095 (0.091 – 0.099) (Figure 5). The concentration index (95% CI) of NVD was -0.100 (-0.105 to -0.095), which showed increasing proportions of NVD among poorer quintiles (Figure 6).

Results of logistic regression analysis on the

**Table 2.** Description of safe delivery indices in Iran (DHS)(\*=weighted).

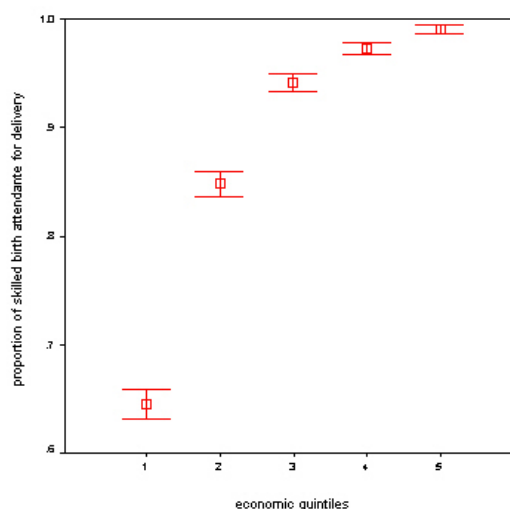
Safe delivery indices	Number (%*)
<b>Place of delivery</b>	
Appropriate	14,310 (83.5%)
Inappropriate	3,681 (16.5%)
<b>Delivery attendant</b>	
Appropriate	14,827 (86.1%)
Inappropriate	3,164 (13.9%)
<b>Type of delivery</b>	
Normal vaginal delivery	13,109 (68.4%)
Cesarean section	4,882 (31.6%)

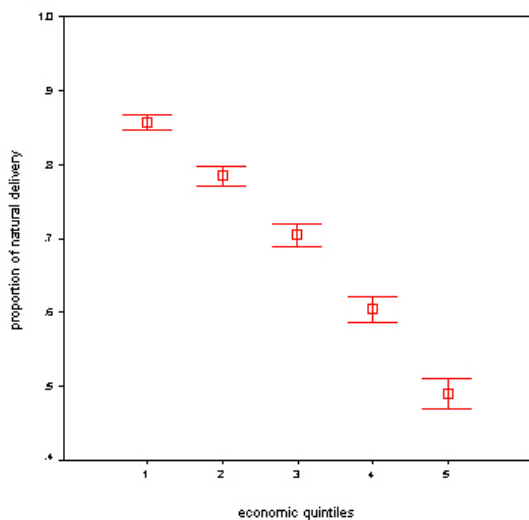
**Figure 1.** Proportion of appropriate place of delivery in economic quintiles. Error bars indicate 95% confidence interval. Iran (Demographic and health survey [DHS]).

factors related to safe delivery are shown in Table 3. There were significant correlations between mother's age, education and economic quintile with appropriate place of delivery. Residence in urban or rural regions and occupation did not have any significant influences on the place of delivery.

Odds of delivery with skilled attendance increased with the mother's age. It was 150 folds higher amongst women with academic education compared to illiterates. In the richest quintile, it was over 20 folds more compared to the poorest.

Also, odds of NVD in younger mothers and in the women with academic education was lower than 1/5 of illiterate women. Among the richest

**Figure 2.** Proportion of skilled attendance for delivery in economic quintiles. Error bars indicate 95% confidence interval. Iran (DHS).



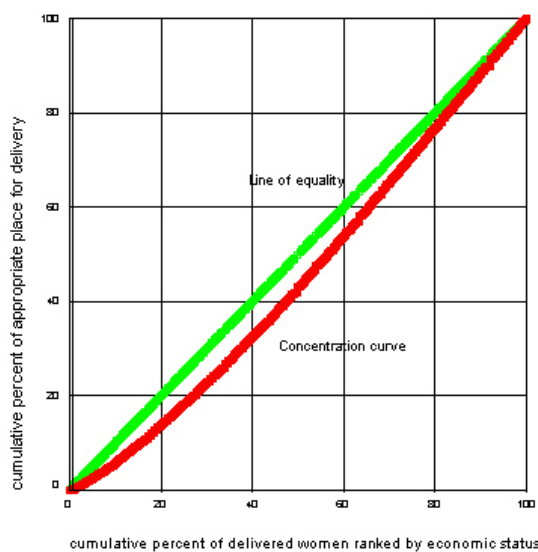
**Figure 3.** Proportion of normal delivery in economic quintiles. Error bars indicate 95% confidence interval. Iran (DHS).

quintiles, it was less than 1/3 of the poorest one.

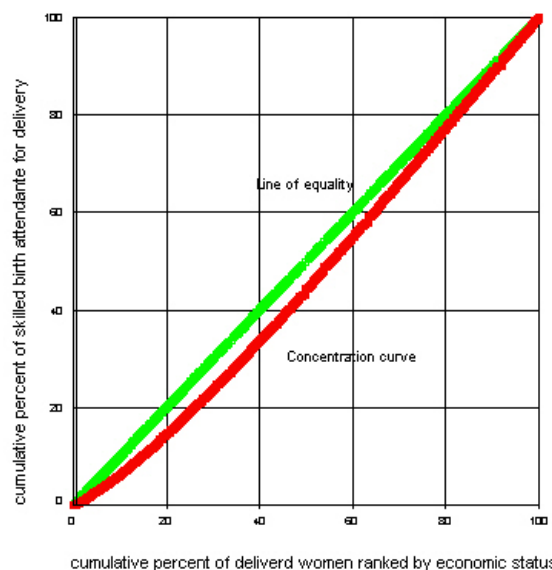
There were no obvious differences between rural and urban regions and among different occupations.

### Discussion

This study showed that there were inequalities in variables of safe delivery in Iran. Women of higher economic and educational levels had more opportunity of utilizing an appropriate place of delivery and skilled attendance (concentration indices in both conditions were significantly higher



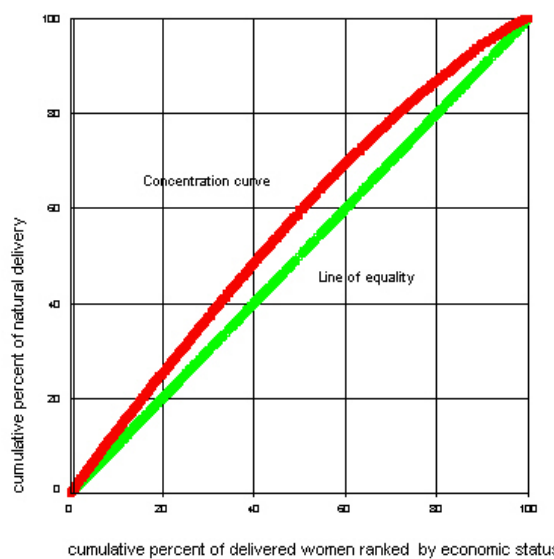
**Figure 4.** Concentration curve of appropriate place of delivery vs economic status. Iran (DHS).



**Figure 5.** Concentration curve of skilled attendant for delivery by economic status, Iran (DHS).

than zero). The proportion of NVDs decreased by improving the economic and educational levels (concentration indices was significantly lower than zero).

Regarding determinants of safe delivery, of the three variables (i.e., place, type and person who helps to delivery), mother's education was the most important factor followed by household economic status and mother's age. The residence in urban or rural region or mother's occupation did not have any impact. Maybe the good performance of health networks in rural areas has compensated the effects of underdevelopment in some rural areas.



**Figure 6.** Concentration curve of normal vaginal delivery vs economic status. Iran (DHS).

**Table 3.** Logistic regression for investigation of mother's age, job, residency and education and household economic status and their effects on the safe delivery indices.

Independent variables	OR(95% confidence interval)		
	Place of delivery	Attendant of delivery	Kind of delivery
Age	1.018(1.007-1.028)	1.021(1.010-1.032)	0.964(0.955-0.973)
Occupation			
Practitioner	1.705(0.733-3.969)	1.721(0.671-4.412)	0.990(0.653-1.499)
Housewife	1.723(0.744-3.993)	1.822(0.713-4.652)	0.891(0.598-1.328)
Student	3.433(0.709-16.623)	4.275(0.644-28.370)	1.177(0.560-2.476)
Jobless	(reference)	(reference)	(reference)
Residency			
Urban	1.145(0.957-1.370)	0.971(0.812-1.161)	1.025(0.912-1.153)
Rural	(reference)	(reference)	(reference)
Education			
Academic	51.583(15.431-172.429)	154.273(20.955-135.736)	0.165(0.123-0.221)
High school	13.32(9.564-18.567)	17.940(11.718-27.456)	0.280(0.229-0.342)
Secondary	8.722(6.119-11.156)	9.525(7.160-12.672)	0.394(0.325-0.479)
Primary	3.422(2.992-3.914)	3.926(3.404-4.528)	0.583(0.499-0.681)
Illiterate	(reference)	(reference)	(reference)
Economic quintile*			
Fifth (richest)	15.59(9.048-26.890)	21.560(11.487-0.469)	0.289(0.235-0.365)
Forth	9.342(6.888-12.669)	11.322(8.212-15.609)	0.415(0.347-0.496)
Third	4.465(3.575-5.577)	5.188(4.079-6.599)	0.537(0.458-0.631)
Second	2.155(1.867-2.487)	2.404(2.069-2.792)	0.728(0.629-0.843)
First (poorest)	(reference)	(reference)	(reference)
Coefficient of determination (R <sup>2</sup> )	28.5%	29.5%	10.5%

\*A proxy for household economic status

Coefficients of determination of the logistic models were relatively low (<30% for all three dependent variables). However, it should be noticed that under equal conditions, it is expected that socioeconomic factors would not have any correlations with health variables.

In a study done by the Deputy for Health (MOHME, Iran), the data of rural regions vital horoscopes were collected from all the country (1993 – 2003) and analyzed in 2005.<sup>4</sup> This study showed that high risk reproductive behaviors such as low marital age, unmet need for contraception, delivery in high risk ages and repeated deliveries, were related to illiteracy and unemployment among women. In that study, delivery in inappropriate places with unskilled attendants was used as proxies for poverty.<sup>4</sup>

The correlation of safe delivery with economic and educational status has been shown in some other studies conducted in other countries. In one study done in Nigeria in 2006, the researchers studied the factors affecting the choice of a place of delivery by pregnant women. Results showed a mixed influence of socioeconomic- and health service-related factors which included promptness of care, competency of midwife/doctor, affordability, health education, round-the-clock presence of doctors, team work among doctors and the

presence of an obstetrician, sociodemographic/economic factors such as place of residence (urban/rural), religion, educational status, tribe, marital status, occupational level, husband's occupational and educational levels, age and parity ( $P < 0.05$ ). That study also reported a significant correlation between the mother's education and delivery in an appropriate place ( $r = 0.45$ ,  $P = 0.0001$ ).<sup>11</sup>

In a descriptive population-based study done in southern Malawi in 2003, there were significant correlations between mother's education and distance from the health center with parity, perinatal care and delivery by a trained healthcare worker; these dependent variables improved with increased education and reduced distance to health center.<sup>12</sup>

Another report from Kenya based on the 1993 Kenya Demographic and Health Survey data showed that cultural and socioeconomic factors in addition to demographic status of women and their families affect reproductive behavior and availability and accessibility of health services within the community. All these studies, however, emphasized that there are some unobserved factors within families and communities, which have significant effects on delivery cares.<sup>13</sup>

One study in rural areas of Bangladesh, conducted in 2006, demonstrated that only a very

small proportion of deliveries took place in a hospital/clinic. However, this proportion was higher among women with secondary or higher education, those who desired the pregnancy, and those who made regular visits for antenatal care.<sup>14</sup>

In the US, one study measured cesarean delivery rates and trend for the US Department of Defense healthcare beneficiary population from 1996 to 2002. Results showed that the rate of cesarean section increased with the rising mother's age and cesarean sections were more common among racial minorities in comparison with white women. The trend also indicated a decrease in the women with higher education.<sup>15</sup>

Since the present study was based on the DHS data, only available variables were used, and other variables such as household expenditure or income, utilization of health center services and other determinates of safe delivery were not accessible.

This study showed that differences in the mother's educational level are the most important factor contributing to safe delivery inequality. Enabling women through education would be one of the most fundamental strategies to promote health and reduce inequalities. Having access to appropriate place, skilled attendance and life-saving cesarean sections are basic needs of any pregnant woman. These basic needs should not be influenced by any social or economic factor. It should also be noticed that cesarean section is either "life-saving" for mother and/or newborn or "unnecessary and risk-producing". The observed correlation between socioeconomic factors and NVD showed the absence of appropriate use of evidence-based guidelines for delivery which should be implemented in the health system.

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