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Factors Explaining the Change in Socioeconomic Inequality of Disability in Iran: A Repeated Cross-sectional Study

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Abstract

Background: More than 15% of the world's population live with some form of disability. Assessing socioeconomic inequalities in disability and monitoring its change over time can help policymakers to design and implement targeted interventions to reduce these inequalities. This study aimed to assess the change in socioeconomic inequality in disability in Iran from 2000 to 2010.

Methods: Data for this cross-sectional study were obtained from 2 waves of Iran's demographic and health surveys (2000 and 2010). The Wagstaff normalized concentration index was used to measure the socioeconomic inequality of disability. Contributing factors to the inequality in 2000 and 2010 were investigated by concentration index decomposition. The Blinder-Oaxaca decomposition method was used to determine contributing factors of change in disability inequality. All analyses were conducted in Stata14.

Results: The negative and statistically significant concentration indices (–0.132 in 2000 and –0.165 in 2010, $P < 0.001$) suggested more concentration of disability among poor people. The absolute value of inequality was increased by 0.034 between the 2 points of time ($P = 0.025$). Level of education (123.5%), household size (12.9%), age (–35.1%), and residency (in terms of Iran's provinces) (–19.3%) were the contributing factors to the measured disability inequality in 2000. In 2010, level of education (105.8%), household size (30.5%), and urban residency (–46.3%) explained the measured inequality. Change in disability inequality was explained by household size (99.4%), province of residence (54.8%), education (36.9%), socioeconomic status (20%), urban residency (–90.3%), and age (–47.7%).

Conclusion: Iran suffers from significant socioeconomic inequality in disability, and it significantly increased over time. Interventions such as increasing health literacy and providing suitable job opportunities for people with low education level, improving the socioeconomic status of extended households, and paying more attention to the balanced development in the provinces and urban and rural areas, and attending to prevention, treatment, and mitigation of disability adversities among poor young and elderly people could be recommended to tackle increased socioeconomic inequality in disability and its unfavorable consequences in Iran.

Keywords: Disability, Socioeconomic Inequality, Socioeconomic Factors, Iran

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Introduction

More than 15% of the world's population live with some form of disability, many of whom are subject to significant difficulties in performing their daily tasks (1, 2). Disability refers to a condition that prevents people from participating in social activities compared to others (3). Disability is de-

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↑What is "already known" in this topic:
Evidence in Iran and other countries shows more prevalence of disability among people with low socioeconomic levels. However, none of the previous studies in Iran have monitored disability inequality over time to inform policymakers for designing and implementing targeted interventions to reduce these inequalities.

→What this article adds:
During a 10-year period, socioeconomic inequality in disability has increased in Iran. Policymakers need to track the policy outcomes among different socioeconomic groups to ensure that there is no inequality with respect to disability and its unfavorable consequences among the Iranian population.

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fined as a severely impaired condition or function compared to normal individual or group standards. The International Classification of Functioning, Disability and Health lists 3 major problems for people with disabilities: disorders, activity limitation, and participation restriction (4). Disorders are defined as any type of problem or change in body function, such as paralysis or blindness. Activity limitation refers to any type of difficulty in performing daily activities such as eating or walking. Participation restriction refers to participation problems of all kinds in all areas of life that lead to discrimination at work and the concomitant restrictions on the participation of persons with disabilities in social life (4). The high prevalence of disability and its unpredictable onset and duration make it difficult to act on its unfavorable consequences that reduce living standards (5).

People with disabilities experience more adverse socioeconomic outcomes than those without disabilities (6). Disability is linked to socioeconomic harms in ways that can lead to or be influenced by these harms (2, 6). There is strong evidence in different countries about the correlation between disability and various indicators of socioeconomic status (SES), such as low education level, inadequate income, and poor housing conditions (6, 7). Poverty and disability operate in a continuous cycle that reinforce each other. People living in low- and middle-income countries face poverty such as lack of health services, lack of water and sanitation, and malnutrition, which can increase the risk of disability (8). There is a positive relationship between adverse SES in childhood and disability in old age, and this will become a major concern in low-income countries (9). Disability is not uniformly distributed and there is strong evidence of heterogeneous distribution of this outcome in different socioeconomic groups, which indicates the existence of socioeconomic inequity in this health problem (6). The increasing prevalence of disability and chronic conditions in the world (10) and increasing its inequality (11) poses financial challenges for governments and health care systems (12). On the other hand, these clinical conditions make people prone to experience financial hardships such as catastrophic health expenditures and medical impoverishment (13, 14).

Much attention has been paid to measuring socioeconomic inequality in disability in international studies. In the study conducted by Hosseinpoor et al (6), using survey data from a large number of countries in the world, it was found that disability was more prevalent among low and lower middle-income countries, and also pro-rich inequalities in disability was found in 43 out of 49 studied countries, indicating its more concentration among poor people. Strong evidence of socioeconomic inequalities in disability and impairment has been reported in countries such as China (15, 16), India (17), and South Africa (18). Some studies have shown that the size of inequality is increasing. For example, in studies conducted in China (15) and other parts of the world (19, 20), the extent of inequality in distribution of disability among socioeconomic groups has increased over time. The increased incidence of disability in low socioeconomic groups can be costly for global health.

According to some estimates, 1.3% of Iran's population has a disability, which is a decrease compared to previous decades (21). However, the increase in the aging population in the coming decades can cause an increase in disability in Iran (22). In addition, traffic and non-traffic accidents in Iran are significant, the result of which is an increase in disability year by year (23). More than 1 million people in Iran live with at least one type of disability, including congenital or genetic disabilities, disabilities caused by traffic and non-traffic accidents, and disabilities caused by other clinical conditions (4). Based on previous findings (4), significant socioeconomic inequalities were found in different types of disabilities, including leprosy disability (24) and accident-related disability (23). Assessing socioeconomic inequalities in disability and monitoring its change over time can help policymakers to design and implement targeted interventions to reduce these inequalities. However, none of the previous studies have examined the changes in disability inequality and its contributing factors. In this study, we used data from the last 2 national demographic and health surveys (DHSs) in Iran in 2000 and 2010 to clarify the existing gap by addressing 2 questions: (1) What are the change in socioeconomic inequality in disability in Iran? (2) What sociodemographic factors have potentially contributed to the change in disability inequality? By assessing the change in inequality over 10 years, we identified its contributing demographic and socioeconomic factors. The results of this study may help policy makers to predict the impact of changes in these factors on inequalities in the distribution of disability and its unfavorable consequences, and to design targeted interventions in the health system and other parts of the welfare system to protect vulnerable people from disability and its unfavorable consequences.

Methods

Data

Data for this cross-sectional study were obtained from the Iran's Demographic and Health Survey (DHS) in 2000 and the Iran's Multiple Indicator Demographic and Health Survey (IrMIDHS) in 2010. The sampling design of the DHS 2000 was single-stage cluster sampling (equal size) with unequal probability. The sample population in this survey consisted of 2000 urban households and 2000 rural households in all 28 provinces of Iran and an additional 2000 households in the most populated province, Tehran. The sampling method in the IrMIDHS 2010 was a multistage cluster sampling (equal size), with a minimum sample size of 400 households for each province. The total sample in this survey was 31,300 households. Face validity of the questionnaires was evaluated before the pilot study by asking potential responders for clarification, and the content validity was evaluated and confirmed by the experts from the relevant departments in the Ministry of Health and Education and international partners (25).

In the present study, for assessing the change in inequality between the 2 periods, it was necessary to have the same profile of the provincial distribution of disability. Thus, although the geographical division of the country's provinces in 2010 was slightly different from that of 2000, the same division of 2000, including 28 provinces, was

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applied to 2010, as well.

Definition of Variables

In this study, the presence of disability was considered as an outcome. This outcome was a binary variable and defined based on the following question: "Is there a member of the family with a physical disability, mobility, or mental retardation?" Various sociodemographic variables, including gender (male or female), age (<15, 15-29, 30-44, 45-59, and ≥65), place of residence (urban or rural), level of education (illiterate, non-school aged children, primary school, junior school, high school, and academic education), household size (1-3, 4-6, and ≥7), employment status (employed, unemployed, having income with no job, housekeeper, student, and other), SES (First [poorest], second, third, fourth, and fifth [wealthiest]), and province of residence, were included as independent variables in the analyses. Since none of the surveys had any data on household income or expenditure, Principal Component Analysis (PCA) was used to construct the SES of the studied people. This statistical technique is widely used in countries where reliable data on the economic status is not available (26). Variables related to the possession of household's assets and housing characteristics were included in PCA for construction of the wealth index.

Inequality Analysis

The concentration index (C) was used to measure the socioeconomic inequality of disability, as follows:

$$C = \frac{2}{n\mu}\sum_{i=1}^{n} y_i r_i - 1 \qquad (1)$$

where n is the sample size, y the outcome (disability), r the fractional rank of individuals in the distribution of SES, and μ the mean of the outcome (27). Since disability is measured as a binary variable, the concentration index was normalized using the Wagstaff approach (28). The following formula shows the normalization:

$$C_W = \frac{C}{1-\mu} \qquad (2)$$

In the above equation, C_W is the Wagstaff normalized concentration index. The range of C is between –1 and +1. A value of zero indicates no inequality, while negative (positive) values indicate pro-rich (pro-poor) inequality in disability.

Decomposition of Inequality

According to Wagstaff's approach, a regression-based decomposition of concentration index was used to measure the contributing factors of disability inequality (29). In this regard, by considering a linear association between disability and its determinants, the C for the outcome variable could be written as follows:

$$C = \sum_k \left(\frac{\beta_k \bar{X}_k}{\mu}\right) C_k + \frac{C_e}{\mu} = \sum_k x_k C_k + \frac{C_e}{\mu} = C_y + \bar{\in} \qquad 3)$$

Considering the above equation, inequality in disability (C) can be decomposed into 2 deterministic (C_y) and unexplainable ($\bar{\in}$) components. The deterministic component consists of 2 elements: (1) elasticity (x_k) as a unitless measure of association that shows the percentage of change in disability associated with a percent change in the explanatory variable. (2) C_k is the normalized CI of explanatory variable k. On the other hand, the unexplainable component includes a part of inequality that is not explained by the explanatory variables. To perform the decomposition analysis, a suitable regression model should be estimated to obtain the marginal effects. In this study, as disability was a binary variable, a logit regression model was estimated to obtain regression coefficients, and then the marginal effects (β_k). The elasticity of each explanatory variable was obtained by multiplying the marginal effect by the mean of that variable ($\bar{X}$) divided by the mean of disability (μ). Finally, the absolute contribution of each explanatory variable to the measured inequality in disability was calculated by multiplying the elasticity of that variable by its C.

Decomposition of Change in Inequality

The Blinder-Oaxaca decomposition approach (30) was used to measure the contribution of changes in explanatory variables to disability inequality during 2000-2010. This kind of decomposition analysis could be written as follows:

$$\Delta C = \sum_k x_{kt}(C_{kt} - C_{kt-1}) + \sum_k C_{kt-1}(x_{kt} - x_{kt-1}) + \Delta\left(\frac{C_{\varepsilon t}}{\mu_t}\right) \qquad 4)$$

This decomposition alternatively can be estimated by the following equation:

$$\Delta C = \sum_k x_{kt-1}(C_{kt} - C_{kt-1}) + \sum_k C_{kt}(x_{kt} - x_{kt-1}) + \Delta\left(\frac{C_{\varepsilon t}}{\mu_t}\right) \qquad (5)$$

Where x_{kt} and x_{kt-1} represent the elasticities of explanatory variables in terms of disability in 2010 and 2000, respectively. Also, C_{kt} and C_{kt-1} show the normalized CIs of explanatory variables in 2010 and 2000, respectively. All analyses were conducted in Stata14.

Results

Table 1 shows the prevalence and socioeconomic inequalities in disability in 2000 and 2010, and their changes between 2000 and 2010. We obtained data from 537,108 and 111,415 people in 2000 and 2010, respectively. However, by removing the missing observations (4.3% in 2000 and 0.6% in 2010), data from 514,155 and 110,708 people were used in the study analyses in 2000 and 2010, respectively. The prevalence of disability was increased from 7315 (1.4%) in 2000 to 1952 (1.7%) in 2010 ($P < 0.001$). The negative and statistically significant concentration indices (–0.132 in 2000 and –0.165 in 2010, $P < 0.001$) and the concentration curves above the line of equality (Figure 1) suggested more concentration of disability among the poor people. The absolute value of the measured inequality in people's disability was increased by 0.034 between the 2 points of

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Table 1. Prevalence and socioeconomic inequalities of disability in Iran, 2000-2010

Year	n (N)	Prevalence (95% CI)	Concentration Index (95% CI)
2000	7,315 (514,155)	1.41 (1.37, 1.44)	-0.132 (-0.138, -0.125)
2010	1,934 (110,708)	1.72 (1.65, 1.80)	-0.165 (-0.152, -0.178)
Change	-	0.32 (0.25, 0.41)	-0.034 (-0.049, -0.019)

† CI: Confidence Interval

Table 2. Prevalence of Disability by Individuals' Characteristics and Provinces of Iran, 2000-2010

Characteristics	Total N (%)		Disability N (%)		*P*-value
	2000	2010	2000	2010	
Gender					
Female	255,182 (49.51)	54,233 (48.97)	2,823 (1.11)	654 (1.19)	0.170
Male	258,973 (50.49)	56,475 (51.03)	4,492 (1.70)	1,280 (2.23)	<0.001
P-value	-	-	<0.001	<0.001	-
Age					
<15 years	174,639 (32.21)	26,208 (23.59)	1,733 (0.96)	285 (1.06)	0.132
15-29	163,761 (31.90)	35,655 (32.22)	2,212 (1.34)	554 (1.53)	0.001
30-44	88,835 (18.32)	24,611 (22.22)	1,353 (1.51)	444 (1.79)	0.007
45-59	46,937 (9.78)	15,270 (13.86)	678 (1.41)	280 (1.82)	0.003
≥ 60 years	39,983 (7.79)	8,964 (8.10)	1,339 (3.30)	371 (4.05)	0.002
P-value	-	-	<0.001	<0.001	-
Residency					
Rural	257,776 (37.74)	34,869 (30.70)	4,073 (1.61)	674 (1.89)	<0.001
Urban	256,379 (62.26)	75,839 (69.30)	3,242 (1.28)	1,260 (1.65)	<0.001
P-value	-	-	<0.001	0.003	-
Level of education					
Illiterate	99,102 (17.11)	14,548 (13.03)	3,785 (4.03)	753 (5.15)	<0.001
Non-school aged children	52,218 (9.72)	10,920 (9.83)	321 (0.57)	74 (0.66)	0.315
Primary school	159,868 (29.52)	27,445 (24.75)	1,806 (1.19)	503 (1.81)	<0.001
Junior school	90,611 (18.24)	18,423 (16.68)	716 (0.78)	245 (1.30)	<0.001
High school	90,201 (19.99)	26,024 (23.62)	554 (0.65)	256 (0.97)	<0.001
Academic	22,155 (5.42)	13,348 (12.08)	133 (0.64)	103 (0.76)	0.303
P-value	-	-	<0.001	<0.001	-
Household size					
1-2	30,597 (6.50)	10,789 (9.83)	887 (2.80)	302 (2.77)	0.886
3-6	296,416 (60.49)	87,242 (78.85)	3,800 (1.24)	1351 (1.53)	<0.001
≥7	187,142 (31.01)	12,677 (11.32)	2,628 (1.45)	281 (2.17)	<0.001
P-value	-	-	<0.001	<0.001	-
Employment status					
Employed	144,960 (28.98)	30,844 (27.86)	1,519 (1.06)	389 (1.24)	0.014
Unemployed	31,997 (6.09)	9,391 (8.50)	1,455 (4.52)	482 (5.15)	0.028
Having income with no job	11,189 (2.38)	6,188 (5.62)	707 (5.79)	303 (4.81)	0.020
Housekeeper	112,655 (22.21)	26,932 (24.38)	1,239 (1.08)	254 (0.93)	0.045
Student and <15 years	207,071 (36.16)	36,474 (32.84)	1,574 (0.73)	394 (1.05)	<0.001
Other	6,283 (1.19)	879 (0.80)	821 (13.32)	112 (12.22)	0.395
P-value	-	-	<0.001	<0.001	-
Socioeconomic status					
1st quintile	125,744 (18.82)	21,617 (19.19)	2,436 (1.99)	526 (2.41)	<0.001
2nd quintile	139,655 (23.58)	22,488 (20.05)	2,101 (1.49)	447 (1.98)	<0.001
3rd quintile	90,943 (17.63)	22,544 (20.31)	1,131 (1.36)	375 (1.63)	0.008
4th quintile	82,180 (19.35)	21,693 (19.79)	939 (1.27)	364 (1.66)	<0.001
5th quintile	75,633 (20.62)	22,366 (20.66)	708 (0.95)	222 (0.98)	0.731
P-value	-	-	<0.001	<0.001	-

time ($P = 0.025$).

Table 2 shows prevalence of disability by individuals' characteristics in the 2 points of time. In 2000, most of the study participants were male (50.5%), in the age groups of <15 and 15-29 years (32.2% and 31.9%, respectively), urban (62.3%), with education levels of primary school (29.5%), and household size of 3 to 6 (60.5%), student and <15 years old (36.2%), employed (29%), and living in the provinces of Tehran (17.6%) and Khorasan (10.5%). The characteristics of participants in 2010 were almost the same as in 2000.

The prevalence of disability was increased among females from 1.7 in 2000 to 2.2 in 2010 ($P < 0.001$). Similarly, the prevalence of disability was increased in age groups of 15-29, 30-44, 45-59, and ≥60 years among rural and urban residents, illiterate people, and those with primary, junior, and high school education, with the household size of 3 to 6 and ≥7, employed and unemployed, and those who were students and <15 years, in the first to fourth socioeconomic quintiles, and were residents of East Azerbaijan, Fars, Kerman, Hamadan, Lorestan, Ilam, Zanjan, Semnan, Hormozgan, Tehran, and Ghazvin provinces ($P < 0.01$). It also decreased among those who had income with no job, housekeepers, and residents of Khuzestan and Chaharmahal and Bakhtiari provinces ($P < 0.05$) (Table 3).

The results of Blinder-Oaxaca decomposition for the change in socioeconomic inequality of disability are shown in Table 4. Household size had the most positive contribution (99.4%) to the change in disability inequality, followed by the province of residence, education, and SES with the contributions of 54.8%, 36.9%, and 20%, respectively. In contrast, urban residency and age had the negative contributions of 90.3% and 47.7%, respectively.

The change in disability inequality between the 2 time points are mostly due to the change in its elasticity with respect to the named factors ($\Delta\eta^*C_{2000}$ or $\Delta\eta^*C_{2010}$) rather than the change in their socioeconomic inequality

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Table 2. *Prevalence of Disability by Individuals' Characteristics and Provinces of Iran, 2000-2010*

Characteristics	Total N (%)		Disability N (%)		*P*-value
	2000	2010	2000	2010	
Province					
Markazi	16,255 (2.04)	5,489 (1.93)	265 (1.62)	74 (1.36)	0.172
Gilan	15,867 (3.77)	4,403 (3.28)	227 (1.43)	72 (1.62)	0.361
Mazandaran	16,626 (4.38)	1,811 (4.12)	281 (1.70)	33 (1.82)	0.723
East Azerbaijan	18,057 (5.78)	7,753 (5.17)	161 (0.85)	157 (2.01)	<0.001
West Azerbaijan	19,095 (4.13)	1,636 (4.17)	225 (1.17)	26 (1.58)	0.145
Kermanshah	18,875 (2.96)	1,580 (2.58)	284 (1.48)	31 (1.98)	0.121
Khuzestan	21,443 (6.23)	19,862 (5.94)	337 (1.51)	247 (1.24)	0.022
Fars	18,450 (6.28)	1,524 (6.13)	280 (1.49)	39 (2.56)	0.001
Kerman	18,175 (3.25)	11,387 (3.59)	250 (1.37)	223 (1.91)	<0.001
Khorasan	17,511 (10.45)	6,391 (10.12)	334 (1.85)	132 (2.07)	0.282
Isfahan	16,417 (6.73)	1,365 (6.70)	285 (1.68)	18 (1.32)	0.316
Sistan and Baluchestan	21,179 (2.81)	1,386 (3.06)	210 (1.00)	16 (1.16)	0.563
Kurdistan	18,988 (2.25)	3,254 (1.93)	279 (1.44)	42 (1.29)	0.497
Hamadan	18,168 (2.87)	6,626 (2.37)	279 (1.53)	131 (1.97)	0.016
Chaharmahal and Bakhtiari	19,490 (1.29)	1,758 (1.15)	334 (1.73)	14 (0.77)	0.002
Lorestan	9,464 (1.42)	1,553 (2.42)	97 (1.02)	38 (2.45)	<0.001
Ilam	22,192 (0.82)	2,095 (0.70)	296 (1.34)	40 (1.90)	0.035
Kohgiluyeh and Boyer-Ahmad	20,924 (0.89)	3,798 (0.91)	318 (1.57)	70 (1.84)	0.229
Bushehr	20,238 (1.23)	2,827 (1.20)	387 (1.89)	55 (1.95)	0.831
Zanjan	18,129 (1.71)	1,787 (1.30)	223 (1.23)	45 (2.51)	<0.001
Semnan	15,232 (0.81)	2,521 (0.87)	228 (1.36)	65 (2.56)	<0.001
Yazd	15,692 (1.27)	3,526 (1.44)	253 (1.50)	66 (1.88)	0.110
Hormozgan	20,069 (1.81)	2,571 (2.07)	247 (1.27)	52 (2.01)	0.002
Tehran	24,718 (17.64)	5,284 (19.64)	278 (1.18)	108 (2.00)	<0.001
Ardabil	19,546 (1.94)	2,103 (1.70)	231 (1.81)	29 (1.38)	0.435
Ghom	17,032 (1.45)	2,248 (1.49)	218 (1.21)	31 (1.38)	0.533
Ghazvin	17,342 (1.37)	2,585 (1.69)	229 (1.26)	51 (1.95)	0.003
Golestan	18,981 (2.41)	1,585 (2.34)	279 (1.46)	29 (1.83)	0.232
P-value	-	-	<0.001	<0.001	-

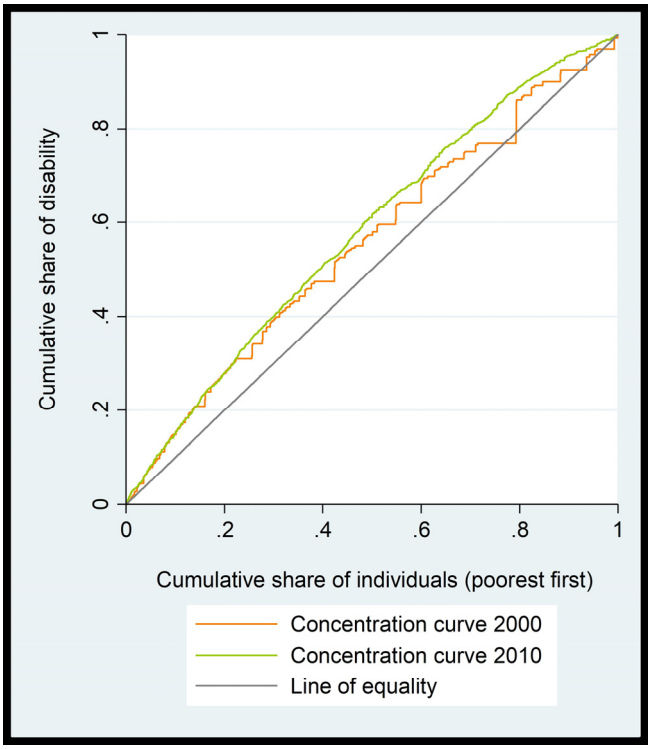


Figure 1. Concentration curves of individuals' disability in Iran, 2000-2010

($\Delta C^* \eta_{2010}$ or $\Delta C^* \eta_{2000}$) (Table 4).

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Table 3. Decomposition of socioeconomic inequalities of disability in Iran, 2000 and 2010

Characteristics	Marginal Effect		Elasticity		Concentration Index		Absolute Contribution		Percentage Contribution	
	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010
Male gender	0.007	0.009	0.248	0.266	0.019	0.013	0.005	0.003	-3.61	-2.02
Age (RC*: <15 years)										
15-29	0.003	0.011	0.044	0.196	0.008	-0.011	$0.338*10^{-3}$	-0.002	-0.26	1.36
30-44	-0.001	0.015	-0.014	0.173	0.104	0.068	-0.001	0.012	1.13	-7.14
45-59	-0.010	0.002	-0.075	0.017	0.131	0.149	-0.010	0.003	7.42	-1.54
≥ 60 years	-0.012	-0.003	-0.079	-0.017	-0.123	-0.160	0.010	0.003	-7.40	-1.68
Sum							-0.001	0.015	0.90	-9.00
Urban residency	0.001	0.003	0.069	0.138	0.670	0.554	0.046	0.077	-35.07	-46.33
Level of education (RC: Illiterate)										
Non-school aged children	-0.048	-0.059	-0.194	-0.193	-0.155	-0.141	0.030	0.027	-22.86	-16.40
Primary school	-0.041	-0.047	-0.415	-0.294	-0.120	-0.155	0.050	0.046	-37.90	-27.61
Junior school	-0.048	-0.056	-0.374	-0.288	0.077	-0.037	-0.029	0.011	21.94	-6.40
High school	-0.050	-0.061	-0.471	-0.512	0.333	0.210	-0.157	-0.108	119.31	65.09
Academic	-0.049	-0.062	-0.123	-0.288	0.458	0.522	-0.057	-0.151	42.98	91.14
Sum							-0.162	-0.175	123.46	105.82
Household size (RC: 1-2)										
3-6	-0.004	-0.005	-0.174	-0.215	0.203	0.271	-0.035	-0.058	26.86	35.36
≥7	-0.005	-0.005	-0.109	-0.028	-0.169	-0.287	0.018	0.008	-13.94	-4.82
Sum							-0.017	-0.050	12.92	30.54
Employment status (RC: Employed)										
Unemployed	0.029	0.033	0.087	0.124	-0.066	-0.143	-0.006	-0.018	4.33	10.75
Having income with no job	0.035	0.026	0.037	0.071	0.015	0.072	0.001	0.005	-0.42	-3.12
Housekeeper	0.001	-0.002	0.015	-0.048	-0.014	-0.052	$-0.219*10^{-3}$	0.002	0.17	-1.50
Student and <15 years	0.001	0.010	0.044	0.220	0.040	0.029	0.002	0.006	-1.34	-3.91
Other	0.093	0.077	0.029	0.018	-0.078	-0.152	-0.002	-0.003	1.74	1.63
Sum							-0.006	-0.006	4.48	3.85
Socioeconomic status (RC: 1st quintile)										
2nd quintile	$0.215*10^{-3}$	$0.099*10^{-3}$	0.001	0.001	-0.507	-0.520	-0.001	-0.001	0.45	0.37
3rd quintile	0.001	$0.108*10^{-3}$	0.011	0.001	0.030	-0.015	$0.322*10^{-3}$	$-0.020*10^{-3}$	-0.24	0.01
4th quintile	0.001	0.003	0.017	0.031	0.489	0.485	0.008	0.015	-6.22	-9.20
5th quintile	$-0.449*10^{-3}$	-0.001	-0.004	-0.017	1.000	1.000	-0.004	-0.017	2.79	10.32
Sum							0.004	-0.002	-3.22	1.51

* RC: Reference Category

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Table 3 .Continued

Characteristics	Marginal Effect		Elasticity		Concentration Index		Absolute Contribution		Percentage Contribution	
	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010
Province (RC: Markazi)										
Gilan	-0.002	0.001	-0.004	0.003	-0.142	-0.101	0.001	$-0.275*10^{-3}$	-0.42	0.17
Mazandaran	0.001	0.004	0.003	0.004	-0.048	-0.155	$-0.137*10^{-3}$	-0.001	0.10	0.41
East Azerbaijan	-0.008	0.006	-0.035	0.024	-0.029	0.270	0.001	0.007	-0.77	-4.01
West Azerbaijan	-0.006	0.002	-0.019	0.001	-0.195	-0.174	0.004	$-0.139*10^{-3}$	-2.77	0.08
Kermanshah	-0.003	0.007	-0.006	0.005	-0.197	-0.182	0.001	-0.001	-0.83	0.53
Khuzestan	-0.003	0.001	-0.012	0.009	-0.007	0.369	$0.087*10^{-3}$	0.003	-0.07	-2.01
Fars	$-0.261*10^{-3}$	0.015	-0.001	0.008	0.033	$-0.060*10^{-3}$	$-0.030*10^{-3}$	$-0.005*10^{-4}$	0.02	0.00
Kerman	-0.005	0.005	-0.011	0.032	-0.195	-0.051	0.002	-0.002	-1.61	1.00
Khorasan	0.001	0.003	0.008	0.013	-0.084	-0.262	-0.001	-0.003	0.51	2.01
Isfahan	0.002	-0.001	0.006	-0.001	0.335	-0.071	0.002	$0.038*10^{-3}$	-1.60	-0.02
Sistan and Baluchestan	-0.011	$-0.242*10^{-3}$	-0.030	$-0.149*10^{-3}$	-0.589	0.201	0.018	$-0.030*10^{-3}$	-13.39	0.02
Kurdistan	-0.005	-0.005	-0.007	-0.015	-0.238	-0.648	0.002	0.009	-1.26	-5.73
Hamadan	-0.001	0.005	-0.001	0.019	-0.123	-0.010	$0.129*10^{-3}$	$-0.194*10^{-3}$	-0.10	0.12
Chaharmahal and Bakhtiari	0.001	-0.006	$0.461*10^{-3}$	-0.009	-0.049	0.018	$-0.023*10^{-3}$	$-0.166*10^{-3}$	0.02	0.10
Lorestan	-0.006	0.010	-0.006	0.008	-0.002	0.109	$0.010*10^{-3}$	0.001	-0.01	-0.52
Ilam	-0.004	0.004	-0.002	0.005	-0.230	-0.131	0.001	-0.001	-0.43	0.37
Kohgiluyeh and Boyer-Ahmad	-0.003	0.003	-0.002	0.008	-0.313	-0.211	0.001	-0.002	-0.41	1.01
Bushehr	0.003	0.003	0.002	0.006	-0.041	-0.165	$-0.094*10^{-3}$	-0.001	0.07	0.56
Zanjan	-0.004	0.014	-0.005	0.006	-0.106	-0.247	0.001	-0.002	-0.40	0.93
Semnan	-0.002	0.011	-0.001	0.013	0.139	-0.151	$-0.122*10^{-3}$	-0.002	0.09	1.21
Yazd	$0.091*10^{-3}$	0.004	$-0.013*10^{-3}$	0.009	0.221	-0.045	$-0.003*10^{-3}$	$-0.392*10^{-3}$	0.00	0.24
Hormozgan	-0.006	0.004	-0.008	0.006	-0.449	-0.263	0.004	-0.002	-2.76	0.94
Tehran	-0.005	0.009	-0.028	0.021	0.381	0.068	-0.011	0.001	8.10	-0.86
Ardabil	-0.005	0.001	-0.007	0.001	-0.257	0.102	0.002	$0.119*10^{-3}$	-1.45	-0.07
Ghom	-0.005	-0.001	-0.005	-0.001	0.131	-0.521	-0.001	0.001	0.47	-0.37
Ghazvin	-0.003	0.004	-0.003	0.006	0.004	-0.033	$-0.009*10^{-3}$	$-0.208*10^{-3}$	0.01	0.13
Golestan	$-0.360*10^{-3}$	0.004	-0.004	0.004	-0.119	0.158	0.001	0.001	-0.39	-0.38
Sum							0.025	0.007	-19.27	-4.17
Total observed							-0.181	-0.132	137.51	80.20
Residual							0.049	-0.033	-37.51	19.80
Total							-0.132	-0.165	100	100

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Table 4. Blinder-Oaxaca decomposition of change in socioeconomic inequality of disability in Iran, 2000-2010

Characteristic	Equation 1		Equation 2		Total	
	$\Delta C^* \eta_{2010}$	$\Delta\eta^* C_{2000}$	$\Delta C^* \eta_{2000}$	$\Delta \eta^* C_{2010}$	Absolute Contribution	Percentage Contribution
Male gender	-0.002	$0.345*10^{-3}$	-0.002	$0.226*10^{-3}$	-0.001	4.17
Age (RC*: <15 years)						
15-29	-0.004	0.001	-0.001	-0.002	-0.003	7.67
30-44	-0.006	0.019	0.001	0.013	0.013	-39.43
45-59	$0.317*10^{-3}$	0.012	-0.001	0.014	0.012	-36.56
≥ 60 years	0.001	-0.008	0.003	-0.010	-0.007	20.65
Sum	-0.009	0.025	0.001	0.015	0.016	-47.67
Urban residency	-0.016	0.046	-0.008	0.038	0.030	-90.34
Level of education (RC: Illiterate)						
Non-school aged children	-0.003	$-0.171*10^{-3}$	-0.003	$-0.155*10^{-3}$	-0.003	8.85
Primary school	0.010	-0.015	0.015	-0.019	-0.004	12.59
Junior school	0.033	0.007	0.043	-0.003	0.039	-117.14
High school	0.063	-0.014	0.058	-0.009	0.049	-146.72
Academic	-0.018	-0.076	-0.008	-0.086	-0.094	279.33
Sum	0.085	-0.098	0.105	-0.117	-0.012	36.90
Household size (RC: 1-2)						
3-6	-0.015	-0.009	-0.012	-0.011	-0.023	68.60
≥7	0.003	-0.014	0.013	-0.023	-0.010	30.81
Sum	-0.011	-0.022	0.001	-0.035	-0.033	99.40
Employment status (RC: Employed)						
Unemployed	-0.010	-0.002	-0.007	-0.005	-0.012	35.86
Having income with no job	0.004	0.001	0.002	0.002	0.005	-13.67
Housekeeper	0.002	0.001	-0.001	0.003	0.003	-8.00
Student and <15 years	-0.002	0.007	$-0.455*10^{-3}$	0.005	0.005	-13.97
Other	-0.001	0.001	-0.002	0.002	$-0.398*10^{-3}$	1.18
Sum	-0.007	0.007	-0.008	0.007	$-0.472*10^{-3}$	1.40
Socioeconomic status (RC: 1st quintile)						
2nd quintile	$-0.015*10^{-3}$	$-0.002*10^{-3}$	$-0.015*10^{-3}$	$-0.002*10^{-3}$	$-0.017*10^{-3}$	0.05
3rd quintile	$-0.058*10^{-3}$	$-0.283*10^{-3}$	$-0.487*10^{-3}$	$0.145*10^{-3}$	$-0.341*10^{-3}$	1.01
4th quintile	$-0.119*10^{-3}$	0.007	$-0.064*10^{-3}$	0.007	0.007	-20.83
5th quintile	0.000	-0.013	0.000	-0.013	-0.013	39.75
Sum	$-0.192*10^{-3}$	-0.007	-0.001	-0.006	-0.007	19.98

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Table 4. Continued

Characteristic	Equation 1		Equation 2		Total	
	$\Delta C^* \eta_{2010}$	$\Delta \eta^* C_{2000}$	$\Delta C^* \eta_{2000}$	$\Delta \eta^* C_{2010}$	Absolute Contribution	Percentage Contribution
Province (RC: Markazi)						
Gilan	$0.112*10^{-3}$	-0.001	$-0.160*10^{-3}$	-0.001	-0.001	2.46
Mazandaran	$-0.469*10^{-3}$	$-0.075*10^{-3}$	$-0.303*10^{-3}$	$-0.241*10^{-3}$	-0.001	1.62
East Azerbaijan	0.007	-0.002	-0.011	0.016	0.006	-16.64
West Azerbaijan	$0.017*10^{-3}$	-0.004	$-0.391*10^{-3}$	-0.003	-0.004	11.24
Kermanshah	$0.074*10^{-3}$	-0.002	$-0.085*10^{-3}$	-0.002	-0.002	5.83
Khuzestan	0.003	$-0.152*10^{-3}$	-0.005	0.008	0.003	-9.61
Fars	$-0.273*10^{-3}$	$0.303*10^{-3}$	$0.030*10^{-3}$	$-0.005*10^{-4}$	$0.030*10^{-3}$	-0.09
Kerman	0.005	-0.008	-0.002	-0.002	-0.004	11.19
Khorasan	-0.002	$-0.398*10^{-3}$	-0.001	-0.001	-0.003	7.86
Isfahan	$0.217*10^{-3}$	-0.002	-0.003	$0.480*10^{-3}$	-0.002	6.12
Sistan and Baluchestan	$-0.118*10^{-3}$	-0.018	-0.024	0.006	-0.018	52.41
Kurdistan	0.006	0.002	0.003	0.005	0.008	-23.17
Hamadan	0.002	-0.002	$-0.118*10^{-3}$	$-0.204*10^{-3}$	$-0.322*10^{-3}$	0.96
Chaharmahal and Bakhtiari	-0.001	$0.470*10^{-3}$	$0.031*10^{-3}$	$-0.175*10^{-3}$	$-0.143*10^{-3}$	0.43
Lorestan	0.001	$-0.023*10^{-3}$	-0.001	0.002	0.001	-2.52
Ilam	$0.455*10^{-3}$	-0.002	$-0.244*10^{-3}$	-0.001	-0.001	3.48
Kohgiluyeh and Boyer-Ahmad	0.001	-0.003	$-0.176*10^{-3}$	-0.002	-0.002	6.54
Bushehr	-0.001	$-0.133*10^{-3}$	$-0.289*10^{-3}$	-0.001	-0.001	2.47
Zanjan	-0.001	-0.001	0.001	-0.003	-0.002	6.11
Semnan	-0.004	0.002	$0.254*10^{-3}$	-0.002	-0.002	5.58
Yazd	-0.002	0.002	$0.003*10^{-3}$	$-0.392*10^{-3}$	$-0.389*10^{-3}$	1.16
Hormozgan	0.001	-0.006	-0.002	-0.004	-0.005	15.37
Tehran	-0.007	0.019	0.009	0.003	0.012	-35.89
Ardabil	$0.417*10^{-3}$	-0.002	-0.003	0.001	-0.002	5.33
Ghom	0.001	$0.459*10^{-3}$	0.003	-0.002	0.001	-3.65
Ghazvin	$-0.230*10^{-3}$	$0.031*10^{-3}$	$0.096*10^{-3}$	$-0.294*10^{-3}$	$-0.198*10^{-3}$	0.59
Golestan	0.001	-0.001	-0.001	0.001	$0.111*10^{-3}$	-0.33
Sum	0.011	-0.030	-0.036	0.018	-0.018	54.82
Total observed					-0.026	78.68
Residual					-0.007	21.32
Total					-0.034	100

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Discussion

To our knowledge, this study is the first to measure the change in socioeconomic inequality in disability and explain this change over time in Iran. During the study period, it was found that the prevalence of disability has increased in Iran. Considering Iran's young population, the prevalence of this health problem may increase with the change of generations in Iran, which will cause many challenges in the health system. In both studied periods, the disability concentration index was negative and significant, indicating the more concentration of disability among poor Iranian people. This study confirmed previous findings in national (4, 23, 24) and international studies (11, 15-17, 31, 32) regarding the concentration of disability among low socioeconomic groups. Our results were in contrast with a study from Afghanistan (33). In that study, researchers had reported more disability among those with high socioeconomic groups. The degree of inequality in Iran during the study period was high compared to other countries. Therefore, disadvantaged people in Iran are struggling more with adversities related to disability and need much more attention from policymakers. It is believed that people with disabilities may use less health services (34). This confirmed the finding of a study in Iran where it showed that the use of rehabilitation services has been concentrated among privileged Iranians (35). This requires the attention of the healthcare authorities for an equitable distribution of these services.

During the study period, the absolute value of the disability concentration index increased significantly, indicating that disability inequality in Iran worsened over time. During these years, socioeconomic inequalities in health outcomes (36, 37) and the use of health services (38) have been reduced to some extent in Iran. This is a negative score and of course an important challenge for Iran's health system, which will impose a large financial burden to the health sector. The situation of socioeconomic inequality in disability is not very favorable for other parts of the world either. For example, we can refer to China (15) and other countries (19, 20), where these socioeconomic inequalities have worsened over time. Considering the increase in global aging and its positive impact on disability (39), it seems that socioeconomic inequality in disability will become a global concern in the coming decedaes. Therefore, it is recommended that health officials in all settings focus on dealing with socioeconomic inequality regarding disability and its unfavorable consequences.

Our most interesting finding was in the decomposition analysis where the level of education explained the major part of socioeconomic inequality in disability in the studied surveys. In 2000, 123.5% of inequality was explained by education, which declined to 105.8% in 2010, however, education remained the most important contributor to the increased socioeconomic inequality in disability. This finding is consistent with a previous study in India (17) that reported education as a key contributor to socioeconomic inequality in functional disability and impairments. Another study in Africa (18) also showed that disability inequalities are largely explained by socioeconomic inequalities related to racial groups and educational attainment. Education is strongly related to income level, working conditions, and awareness of health status (40). Therefore, providing high-quality education services or promoting health literacy can largely eliminate socioeconomic inequalities in disability in Iran and can also help disabled people to cope with their clinical condition. In addition, decision makers should provide suitable job opportunities for people with low education level so that they can earn enough income.

The Oaxaca decomposition also revealed that household size explains a large proportion of increased inequality in disability. As the household size increases, the per capita income decreases, and the possibility of disability may also increase (41). It seems that this applies to Iran; in the current status of the Iranian economy, there are few job opportunities for the labor force, and extended families will have less income and more expenses. Therefore, it is recommended to use policies to increase the welfare of extended households to reduce this increased inequality in disability. Also, it seems that these policies can be effective for families with disabled members in order to better cope with the burden of disability (42).

The province of residence is another important contributing factor to the change in disability inequality in Iran. This finding implicitly confirms the spatial disparity in Iran. In previous studies, it has been shown that the health status (43) is not evenly distributed among the provinces of Iran, and some provinces do not necessarily have optimal access to health services (44). Under such circumstances, we should expect an increase in socioeconomic inequality in disability. Hence, moving toward balanced development will largely prevent the increase of socioeconomic inequality in disability. We strongly recommend that health authorities in Iran pay special attention to the provinces that have higher burden of disability. In the context of the increased inequality in disability in Iran, the contribution of the economic status should not be neglected. In a previous study, the role of economic status in increasing disability inequality in China was significant (15). Due to international sanctions and economic stagnation, the economy of Iran has faced serious challenges (45), which can be a good justification for increasing health inequalities.

Residence played a negative role in increasing inequality. Contrary to other studies (46, 47), our findings show that disability was more concentrated among high-SES urban residents compared to the low-SES rural population. Our results also suggested that an increase in urban residency over a 10-year period decreased the measured inequality in disability by 90%. These findings show that better socioeconomic conditions and access to health services in urban areas (47) could not prevent disability among urban residents; however, its unfavorable consequences may be managed better among high-SES urban residents. On the other hand, these findings suggest that the concentration of disability reduced among low-SES rural residents, implying that an improvement in living conditions in rural areas can have a protective effect against disability inequality over time.

Increasing the age of the studied population was the next factor that decreased the measured inequality in disability over time. In the study conducted by Soltani et al in Iran, a

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positive association was observed between disability and age (48). In our study, the concentration of disability shifted from low-SES young and elderly people to the high-SES middle aged population, suggesting that government policies focused on prevention of disability among young and old people may be able to address socioeconomic inequalities of disability in Iran.

In this study, it was shown how socioeconomic inequality in disability has changed over time in Iran. Although this study provides valuable guidance on how to address disability inequalities, some of the study's limitations should be considered in its application. First, although change in inequality over time was studied, this study cannot show the changes as well as peer group studies. Therefore, in this context, it is encouraged to conduct cohort studies that show better causal relationships. Second, in this study, only the self-reported disability of the studied population was used as the outcome variable, which can be somewhat misleading. Future studies should rely on more objective indicators to measure disability.

Conclusion

Iran suffers from significant socioeconomic inequality in disability. This socioeconomic inequality is predominantly attributed to education. On the other hand, disability inequality significantly increased over time. The enlarged inequality in disability was attributed to education, household size, province of residence, and SES. In addition, we observed that urban living and population aging had negative impacts on rising inequality. Interventions such as increasing health literacy and providing suitable job opportunities for people with low education level, improving the SES of extended households, and paying more attention to the balanced development in the provinces and urban and rural areas, and attending to prevention, treatment, and mitigation of disability adversities among poor young and elderly people could be recommended to tackle increased socioeconomic inequality in disability and its unfavorable consequences in Iran.

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Authors' Contribution

P.H., M.Kh., and A.R. contributed to conceiving the original idea of the manuscript, M.Kh. and P.H. performed the statistical analyses. All authors contributed to the interpretation of the results and preparing the first draft of the manuscript, and have read and approved its final version.

Ethical Considerations

Ethical approval was granted by the board members of ethical committee at Iran University of Medical Sciences (Ethical code: IR.IUMS.REC.1397.536).

Conflict of Interests

The authors declare that they have no competing interests.

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