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Socioeconomic inequality in health domains in Tehran: a population-based cross-sectional study

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ABSTRACT

Objective Reduction of socioeconomic inequality in health requires appropriate evidence on health and its distribution based on socioeconomic indicators. The objective of this study was to assess socioeconomic inequality in various health domains and self-rated health (SRH).

Methods This study was conducted using data collected in a survey in 2014 on a random sample of individuals aged 18 and above in the city of Tehran. The standardised World Health Survey Individual Questionnaire was used to assess different health domains. The age-adjusted prevalence of poor health was calculated for each health domain and SRH based on levels of education and wealth quintiles. Furthermore, the Slope Index of Inequality (SII) and the Relative Index of Inequality (RII) were applied to assess socioeconomic inequality in each of the health domains and SRH.

Results The age-adjusted prevalence of poor health was observed in a descending order from the lowest to the highest wealth quintiles, and from the lowest level of education to the highest. RII also showed varying values of inequality among different domains, favouring rich subgroups. The highest wealth-related RII was observed in the 'Mobility' domain with a value of 4.16 (95% CI 2.01 to 8.62), and the highest education-related RII was observed in the 'Interpersonal Activities' domain with a value of 6.40 (95% CI 1.91 to 21.36).

Conclusions Substantial socioeconomic inequalities were observed in different health domains in favour of groups of better socioeconomic status. Based on these results, policymaking aimed at tackling inequalities should pay attention to different health domains as well as to overall health.

Strengths and limitations of this study

- ► The study design is cross-sectional, hence can only describe associations between socioeconomic indicators and health domains.
- ► The health domains have been measured with self-rated information, and clinical examinations have not been performed to evaluate them.
- ► Inequality in health is multidimensional, and the magnitude of inequalities may change depending on the socioeconomic indicators used. The present study measured socioeconomic inequality by various indicators.
- ► To the best of our knowledge, this is the first study in Iran to investigate socioeconomic inequality in various health domains.

INTRODUCTION

Based on the WHO's recommendations, one of the main parts of assessing the performance of health systems is to measure health inequalities.[1] Many of these inequalities, which are a result of socioeconomic differences between different groups of people, are unfair.[2] Socioeconomic inequality in health is a major challenge in public health[3] and is seriously under consideration by policymakers and researchers.[4] All over the world, evidence suggests that people of poorer socioeconomic status (SES) suffer from lower levels of health.[5]

Based on the definition given by the WHO, health is a multidimensional concept.[6] Hence, to determine the status of health and to assess the impact of health interventions, we must first evaluate the health status of individuals from all its aspects. Self-rated health (SRH) is a health indicator that is usually employed in research on socioeconomic inequalities.[7] Studies indicate that SRH may predict outcomes such as disability, morbidity and morbidity, and cardiovascular diseases.[8 9] Although SRH has shown good reliability in indicating a society's health, its utilisation as a public health measure for inequality studies has led to underestimation of inequality among different socioeconomic groups.[10] The WHO has outlined eight main health domains for individuals in its World Health Survey (WHS) Individual Questionnaire, irrespective of their SES: mobility, self-care, cognition, interpersonal activities, vision, sleep and energy, pain and discomfort, and affect.[11]

In the WHS conducted between 2002 and 2004, different health domains were measured in different countries,[12] and using

the same data socioeconomic inequality was investigated as well.[11]

In Iran too, studies have been conducted in the field of socioeconomic inequality on different health outcomes including SRH.[13] However, to our knowledge, no study has been conducted on the socioeconomic inequality of different health domains. The current study therefore attempts to investigate the latter using the standardised WHO tool and to compare it with SRH socioeconomic inequality.

METHODS

This study used the data of the survey conducted in 2014 on Tehran's residents aged 18 and above. The individuals were selected using multistage sampling. The city of Tehran is divided into 22 municipal districts as strata. Proportional to the population size of each district, a number of blocks were randomly chosen. From each block, 10 households were systematically selected and only one person was interviewed from each household. The respondent was selected from all eligible individuals of the household through quota sampling for age and gender. Face-to-face interviews were held with the respondents at their doorsteps at times when all members of the household would most likely be at home, to maximise the possibility of including all age and gender groups. Overall, 2987 households were visited to collect data, of which, eventually, 1995 households (individuals) were interviewed (response rate=66.9%). Data were collected by 10 teams of questioners, each consisting of four trained questioners. All the questioners had a bachelor's or higher academic degree. For quality control purposes, the execution of the project was monitored by four teams. First, the objectives of the study were explained clearly, and then participants with informed consent were included in the study.

Data collection tool

To assess the different domains of health, we used the WHS Individual Questionnaire, which has been translated and standardised in Iran.[14] The intraclass correlation of the questionnaire was 0.89.[14] This questionnaire assesses an individual's health status in eight domains, namely mobility, self-care, cognition, interpersonal activities, vision, sleep and energy, pain and discomfort, and affect.

The respondents were asked to report the extent of their problems in each domain by selecting one of the five options of none, mild, moderate, severe and extreme/cannot do. The individuals fell into one of the groups of good health (if either option of none, mild or moderate was chosen) and/or poor health (if either severe or extreme was chosen).[11]

The individuals' SRH was measured with the standard question: 'In general, how would you rate your health today?' Those who rated their health as 'bad' or 'very bad' were assigned to the 'poor health' group, while those who rated their health as 'very good', 'good' or 'moderate' were classified as the 'good health' group.[13 15]

To assess the economic status of individuals, principal component analysis (PCA)[16 17] was applied to the net assets of each household, and the household wealth index was created. The PCA conducted on variables of assets and household data included owning a car (not for money-making purposes), motorcycle (not for money-making purposes), cellphone, freezer, dishwashing machine, microwave oven, personal computer, vacuum cleaner, washing machine, having a bath in the house, colour television, any type of video player (VHS, VCD, DVD and others), and per capita number of bedrooms and per capita area of residence. In PCA, the first component justifies the greatest share of total variance among the variables, hence is considered as the wealth index of each household.[18]

In this study, the first component justified 25.2% of the total variance. Based on the PCA results, individuals were classified into five groups of lowest to highest economic status.

From the standpoint of years of education received, the participants were grouped into no formal education, primary (1–5 years), intermediate (6–8 years), high school (9–12 years) and tertiary (13 years or more).

Moreover, data on age, sex and marital status (single, married, separated, widow) were also collected.

Statistical analysis

The age-adjusted prevalence of poor health was calculated for each of the health domains and SRH based on educational level and economic status. Moreover, the Slope Index of Inequality (SII) and the Relative Index of Inequality (RII) were used to assess the absolute and relative socioeconomic inequality, respectively, in each of the eight health domains and SRH. RII and SII are regression-based measures of socioeconomic inequality.[19]

To calculate the RII and SII on grounds of SES, the individuals were ranked (from the highest to the lowest wealth index or educational status); the highest and lowest values ranked 0 and 1, respectively.[20] RII represents the ratio of poor health among individuals at the highest relative inequality related to assets rank (ie, the lowest level of education or wealth) to those who are ranked at 0 (the highest level of education or wealth), taking into account the entire distribution of SES.[11] An RII greater than 1 indicates that the prevalence of poor health among people of low SES is greater. SII is a measure of the difference in health among individuals at the highest relative inequality related to assets rank to those who are ranked at 0, taking into account the entire distribution of SES.

In model 1, age-adjusted SII and RII were calculated. In model 2 we only calculated RII, and in this model, in addition to age, to estimate pure effect of each of wealth index or education variables, sex, marital status, and wealth index or education were also adjusted. To adjust for the population distribution, poststratification corrections were made to sampling weights. However, the design

Table 1 Age-adjusted prevalence of poor health across health domains and self-rated health among adults aged 18+, by wealth and education

	Self-rated health		Mobility		Self-care		Pain and discomfort		Cognition		Interpersonal activities		Vision		Sleep and energy		Affect	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Average	9.8	0.6	10.7	0.7	2.5	0.3	12.8	0.7	7.3	0.6	3.5	0.4	2.6	0.3	11.8	0.7	14.7	0.8
Wealth quintile 1	16.4	1.4	18.2	1.6	3.4	0.7	20.5	1.6	11.1	1.3	4.8	0.9	2.8	0.6	15.9	1.5	19.9	1.6
Wealth quintile 2	11.7	0.7	13.2	0.8	2.6	0.4	15.4	0.9	8.6	0.7	4.1	0.5	2.6	0.4	13.7	0.9	17.0	1.0
Wealth quintile 3	8.2	0.6	9.3	0.7	2.0	0.3	11.3	0.7	6.7	0.6	3.4	0.4	2.5	0.4	11.7	0.7	14.4	0.8
Wealth quintile 4	5.6	0.7	6.4	0.7	1.5	0.4	8.1	0.8	5.2	0.6	2.8	0.5	2.4	0.5	9.9	0.8	12.2	0.9
Wealth quintile 5	3.8	0.7	4.4	0.7	1.1	0.4	5.8	0.9	3.9	0.7	2.4	0.6	2.2	0.6	8.4	1.1	10.2	1.2
No formal education	23.1	2.9	23.9	3.1	4.2	1.0	35.1	3.7	17.2	3.0	8.6	2.3	2.3	0.8	17.4	2.7	22.5	3.0
Primary	16.4	1.5	17.7	1.7	3.2	0.5	24.4	2.1	12.5	1.6	6.2	1.1	2.4	0.6	15.1	1.7	19.4	1.8
Intermediate	11.3	0.8	12.7	0.8	2.5	0.3	16.1	1.0	8.9	0.8	4.4	0.6	2.5	0.4	13.1	0.9	16.7	1.1
High school	7.6	0.7	8.9	0.7	1.9	0.4	10.1	0.7	6.3	0.6	3.1	0.4	2.6	0.4	11.3	0.7	14.3	0.8
Tertiary	4.9	0.7	6.2	0.7	1.5	0.4	6.2	0.7	4.4	0.6	2.2	0.4	2.7	0.5	9.8	0.9	12.2	1.1

effects of health outcomes that were close to one[21] were not taken into account in the analysis.

Statistical analysis was done using Stata V.12.

RESULTS

The mean age of the participants was 41.8 years (range=18–90; SD=15.45). Thirty-six per cent of the participants had received tertiary education. Table 1 shows the age-adjusted prevalence of poor health in different health domains and SRH. The lowest age-adjusted prevalence of poor health was observed in the 'Self-Care' domain (2.5%), while the highest prevalence was seen in the 'Affect' domain (14.7%). Moreover, overall, the age-adjusted prevalence of poor health was higher in people with no formal education and the poorest wealth quintile (table 1).

Table 2 illustrates the wealth-related SII and RII in poor health for different health domains and SRH. In model 1, age-adjusted SIIs for most domains are statistically significant. Accordingly, the difference in the prevalence of poor health in the 'Mobility' domain between the lowest wealth quintile and the highest wealth quintile is 12%. In model 1, age-adjusted RII is greater than 1 and statistically significant in all domains but 'Vision'. The range of statistically significant RII was 2.35 for the sleep and energy domain, to 6.4 for the mobility domain. According to the results of this model, the prevalence of poor health in the 'Mobility' domain in the lowest wealth quintile was 6.4 times the prevalence of poor health in the highest wealth quintile (P<0.001). In addition SRH's RII was 6.83, which shows poor SRH was 6.83 as prevalent in the poorest compared with the richest people. Controlling

Table 2 Wealth-related inequality in poor health by health domains and self-rated health

	Model 1*	Model 1*	Model 2†
Health domains	**SII (95% CI)**	**RII (95% CI)**	**RII (95% CI)**
Self-rated health	**0.05 (0.01 to 0.10)**	**6.83 (3.83 to 12.17)**	**3.86 (1.83 to 8.15)**
Mobility	**0.12 (0.08 to 0.17)**	**6.40 (3.50 to 11.66)**	**4.16 (2.01 to 8.62)**
Self-care	0.01 (–0.01 to 0.02)	**5.17 (1.25 to 21.32)**	3.30 (0.55 to 19.59)
Pain and discomfort	**0.15 (0.10 to 0.21)**	**5.36 (3.29 to 8.70)**	**2.37 (1.32 to 4.24)**
Cognition	**0.07 (0.03 to 0.11)**	**3.84 (2.01 to 7.33)**	2.01 (0.96 to 4.24)
Interpersonal activities	0.02 (–0.01 to 0.05)	**2.56 (1.10 to 5.96)**	1.08 (0.38 to 3.08)
Vision	–0.001 (–0.03 to 0.03)	1.06 (0.54 to 3.57)	1.01 (0.48 to 3.80)
Sleep and energy	**0.09 (0.03 to 0.15)**	**2.35 (1.52 to 3.64)**	**2.20 (1.28 to 3.77)**
Affect	**0.13 (0.07 to 0.19)**	**2.44 (1.62 to 3.61)**	**2.22 (1.37 to 3.54)**

Bold indicates P<0.05.
*Model 1 adjusted for age.
†Model 2 adjusted for age, sex, education and marital status.
RII, Relative Index of Inequality; SII, Slope Index of Inequality.

Table 3 Education-related inequality in poor health by health domains and self-rated health

Health domains	Model 1* SII (95% CI)	Model 1* RII (95% CI)	Model 2† RII (95% CI)
Self-rated health	**0.07 (0.02 to 0.13)**	**5.48 (2.89 to 10.39)**	**2.98 (1.36 to 6.51)**
Mobility	**0.12 (0.06 to 0.17)**	**4.45 (2.55 to 7.75)**	**2.01 (1.04 to 3.89)**
Self-care	0.02 (–0.01 to 0.04)	**3.94 (1.02 to 15.19)**	1.67 (0.29 to 9.54)
Pain and discomfort	**0.17 (0.11 to 0.23)**	**8.08 (4.28 to 15.23)**	**4.57 (2.18 to 9.49)**
Cognition	**0.08 (0.04 to 0.13)**	**4.64 (1.89 to 11.32)**	**2.84 (1.04 to 7.71)**
Interpersonal activities	**0.06 (0.02 to 0.09)**	**5.59 (2.15 to 14.59)**	**6.40 (1.91 to 21.36)**
Vision	**–0.02 (–0.04 to –0.01)**	0.63 (0.19 to 2.06)	1.09 (0.75 to 1.63)
Sleep and energy	0.04 (–0.02 to 0.10)	1.50 (0.88 to 2.55)	0.90 (0.50 to 1.61)
Affect	**0.08 (0.02 to 0.14)**	**1.80 (1.07 to 3.02)**	1.12 (0.64 to 1.97)

Bold indicates P<0.05.
*Model 1 adjusted for age.
†Model 2 adjusted for age, sex, wealth and marital status.
RII, Relative Index of Inequality; SII, Slope Index of Inequality.

for age, sex, marital status and educational status in model 2 led to the weakening of inequality. Furthermore, in model 2, RII was statistically significant only for SRH and the domains of mobility, pain and discomfort, affect, and sleep and energy. Based on the results of this model, the prevalence of poor SRH in the lowest wealth quintile was 3.8 times that of the highest wealth quintile.

Table 3 shows the education-related SII and RII in poor health for different health domains and SRH. In model 1, age-adjusted SII is statistically significant in all domains but 'Self-Care' and 'Sleep and Energy'. According to the results of this model, the difference in the prevalence of poor health in the 'Pain and Discomfort' domain between individuals with no formal education and those in tertiary education level is 17%. In model 1, age-adjusted RIIs for all domains except for vision and sleep and energy were greater than 1 and statistically significant. The range of statistically significant RIIs was 1.80 for the affect domain, to 8.08 for the pain and discomfort domain. Based on these results, the prevalence of poor health in the pain and discomfort domain in individuals with no formal education was 8.08 times those with tertiary education level. Also, SRH's RII was 5.49, which shows poor SRH was 5.48 as prevalent in individuals with no formal education, compared with those in tertiary education level. In model 2, in addition to the effect of age, the effects of sex, marital status and wealth quintile were also adjusted. RII was greater than 1 and statistically significant for SRH and the domains of mobility, pain and discomfort, interpersonal activities, and cognition. Based on the results of this model, the prevalence of poor health in the interpersonal activities domain in people with no formal education was 6.40 as high in people with tertiary education level (0.003). There were no significant differences in sex distribution on the association between wealth index or education variables across all health domains and SRH (P>0.05).

DISCUSSION

To our best knowledge, this is the first study in Iran to examine and compare socioeconomic inequality in various health domains with that of overall SRH.

Based on our findings, the prevalence of poor health in the domains of mobility, pain and discomfort, cognition, sleep and energy, and affect was relatively higher in comparison with those in lower income countries from Hosseinpoor *et al*'s study.[11] However, the prevalence of poor SRH was lower in comparison with lower income countries.[11] When compared with high-income countries, a higher prevalence of poor health in all domains and SRH was seen.[11]

Based on our results, different health domains have been unequally distributed among the residents of Tehran. For all health domains and SRH, the prevalence of poor health fell in a descending order, moving from the poorest to the richest wealth quintiles and from the lowest to the highest levels of education. The RII for SRH and all health domains (except for vision) was greater than 1 according to both wealth and education. For wealth-related RII, after controlling for the effects of age, sex, marital status and education, it remained greater than 1 and statistically significant for SRH and the sleep and energy, affect, pain and discomfort, and mobility domains only. Education-related RII was greater than 1 and statistically significant for SRH, interpersonal activities, cognition, pain and discomfort, and mobility.

Although it is difficult to compare our results with those of other studies because of the lack of similar such studies, they are consistent with the few that are available.

In a similar study, Hosseinpoor *et al* used the WHS of 2002–2004 to investigate the socioeconomic inequality of different health domains. On analysis, they too observed similar inequality results among low-income countries for most health domains.[11] Inverse associations between poor SRH and education and wealth have been observed

in other studies conducted in the city of Tehran as well.[13 22] Furthermore, our results are consistent with those of studies between SRH and SES conducted elsewhere in the world.[23 24] The association between SES and the cognitive aspect of health has been examined in a couple of studies, which indicate a better cognitive performance among individuals of higher educational levels.[25 26] Although the results of the latter studies are consistent with ours, we must keep in mind that most of these studies have been conducted on specific population, such as the elderly. Research on individuals' functional capacity indicates that people of lower educational level have lower functional capacity too, another finding similar to ours.[27 28]

Like other similar studies conducted in the past, our findings indicate that sleep disorders are more common among individuals living in poorer households (wealth-wise).[29 30] However, unlike other studies, we found no association between sleep disorders and educational level. The reason behind this conflicting finding may be attributed to the method with which sleep disorders have been evaluated in previous studies compared with ours.

Unlike the current study, which indicated that socioeconomic inequality does not significantly exist in the vision domain, earlier studies show that visual disorders are less prevalent among groups of higher SES.[11 31] A possible explanation behind this difference may be differences in the measurement of this variable (objective vs self-reported assessments).[31]

One of the principles recommended by the WHO Social Determinants of Health Commission to reduce inequalities is to understand and measure the problems and to assess the impact of the measures taken.[32] The prerequisite of this task is to have appropriate evidence on different aspects of health and its distribution.[32] SRH integrates many health-related factors, so it may not show the differences in various health domains.[33] Therefore, understanding the key components of health can provide policymakers with more indepth information to improve the different aspects of health and health as a whole.

The results of this study show that although inequality is seen in overall SRH, the inequality seen in some health domains is different from the inequality seen in overall SRH, and that inequality does not exist in some domains. For example, although the prevalence of poor SRH in individuals with no formal education is almost three times that in individuals with academic education, the prevalence of interpersonal activities in individuals with no formal education is 6.4 times those with academic learning.

Having improved the total health indices in Iran, the Primary Health Care network and the recently implemented Health System Reform and Universal Health Coverage (UHC) have had a substantial role in decreasing inequality in the country. These policies, however, are being implemented at the population level. On the other hand, evidence has shown that interventions targeting disadvantaged populations could decrease the inequity on a great deal. Due to multidimensionality of the inequity, the results of the present study could be incorporated in the determination of educationally and economically disadvantaged populations, as well as in gauging future interventions. Consistent with the objectives of UHC, identification of the disadvantaged populations could also lead to better protection of these people against catastrophic health costs.

As one of the limitations, the health domains have been measured with self-rated data and clinical examinations have not been performed to evaluate them. The data came from a cross-sectional study; hence, a causal interpretation of the associations between socioeconomic factors and health should be done with caution. The distribution of households that refrained from responding was not equal across the different districts of Tehran. Nevertheless, the age and sex distribution of the participants did not significantly differ from those who participated in the survey (P=0.30). Since it is difficult to assess the income and costs of households in low-income and middle-income countries,[34] their assets were used as a proxy of economic status. Because of lack of convergence in the SII full models (adjusted for age, sex, marital status, and wealth or education level), we have not reported the results of these models.

CONCLUSIONS

A considerable socioeconomic inequality was observed in different health domains in favour of groups of better SES. This inequality differed in different domains. Subsequently, the results suggest that policymaking aimed at attacking inequalities should pay attention to different health domains as well as to overall health. Since the magnitude of inequalities may change depending on the socioeconomic indicators used, it is essential that both education-related and wealth-related indices be measured to reflect socioeconomic inequality in order to plan effective interventions, and for this purpose it is necessary to conduct further quantitative and qualitative studies.

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and revised the manuscript critically. ARH and YS participated in statistical analysis, interpretation of data and revising the manuscript critically for important intellectual content. All authors agreed on the final manuscript prior to submission. All authors agreed to be accountable for all aspects of this work.

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