Original Article

Socioeconomic Inequalities in Poor Health-Related Quality of Life in Kermanshah, Western Iran: A Decomposition Analysis

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ABSTRACT

Background: Socioeconomic status (SES) is an important determinant of health-related quality of life (HRQoL). We aimed to quantify socioeconomic-related inequality in poor-HRQoL among adults in Kermanshah, western Iran.

Methods: Overall, 1730 adults (18-65 yr) were selected using convenience sampling from Kermanshah, Iran. A self-administered questionnaire was used to collect data on socio-demographic characteristics, SES, lifestyle factors and HRQoL of participants over the period between May and Aug 2017. The concentration curve and concentration index (C) were used to illustrate and measure wealth-related inequality in poor-HRQoL. Additionally, we decomposed the C index to identify factors explaining wealth-related inequality in poor-HRQoL.

Results: The overall prevalence of poor-HRQoL was 35.3% (95% confidence interval[CI]: 33.1%, 37.6%). The poor-HRQoL was mainly concentrated among the poor adults (C=-0.256, 95% CI: -0.325, -0.187). Poor-HRQoL was concentrated among men (C=-0.256, 95% CI: -0.345, -0.177) and women (C=-0.261, 95% CI: -0.310, -0.204). Wealth, physical inactivity, the presence of chronic health condition(s), lack of health insurance coverage were the main factors contributing to the concentration of poor-HRQoL among socioeconomically disadvantaged adults.

Conclusions: Socioeconomic-related inequalities in poor-HRQoL among adult should warrant more attention. Policies should be designed to not only improve HRQoL among adults but also reduce the pro-rich distribution of HRQoL among adults in Kermanshah.

Introduction

Inequalities in health among different social groups are a major public health problem 1. Inequalities in health exist for a wide range of health measures and for many indicators of the social position including, wealth, income and education 2. Social inequalities in health can result from differences in healthy behaviors and/or inequalities in access to healthcare services across different groups. However, social determinants of health play an important role in explaining unequal distribution of poor health outcomes across the population 1,3.5.

Extent work has documented systematic differences in health by socioeconomic status (SES) in different countries 6. A statistically significant relationship between SES (e.g., wealth, income, education, education level, and employment status) and health-related quality of life (HRQoL) has been observed in several countries 7,12. The unequal distribution of HRQoL across different social groups is an important policy objective. Measuring and identifying factors affecting the distribution of HRQoL is essential for the design and implementation of the effective policies to reduce social inequalities in health 11,13.

Income level, years of education, marital status, physical activity, smoking behavior, health insurance coverage and having chronic health condition(s) were identified as main determinants of HRQoL among adults in the western region of Iran 14.

Although the main determinants of HRQoL across different social groups are well documented, to the best our knowledge, there is no study in Iran that measures socioeconomic-related inequalities in HRQoL in Iran. We used the concentration index (C) approach to quantify wealth-related inequalities in poor-HRQoL in Kermanshah city, western Iran. Further, we decomposed the C index to identify factors explaining wealth-related inequality in poor-HRQoL. The results of this study enable health-policymakers to design and implement interventions to reduce inequalities in health among Iranian adults.
Methods

Study setting

This study was carried out in Kermanshah city, the capital of Kermanshah Province, western Iran. This province consists of fourteen counties. It is bordered by Kurdistan Province to the north, Ilam Province to the south, Hamadan and Lorestan Provinces to the east and Iraq to the west. The total population of Kermanshah city was estimated to be approximately one million in 2016.

Study population, sample size, and sampling method

This cross-sectional study was conducted from May to Aug 2017. We collected information on the socio-demographic, socioeconomic, behavioral risk factors and poor-HRQoL of adults (18-65 yr old) in Kermanshah city. The following formula was used to calculate the sample size:

\[ n = \frac{Z^2 \cdot p(1-p)}{d^2} \]  

Where \( n \) shows the required sample size at the 95% level of significance, \( p \) indicates the prevalence of poor-HRQoL among the general population (set to a value of 0.5) and \( d \) is the degree of precision (set at 0.05). We added 30% to the required sample size of 1537 and collected information from 1983 adults. To select our participants, we first divided the Kermanshah city into five areas of central, western, eastern, southern and northern. Then, equal samples were drawn from each study area by using convenience sampling technique.

Data collection and variables

A self-administrated questionnaire, developed and validated in a previous study, was used for data collection. The questionnaire was divided into two parts. The first part included questions about age, gender, marital status, years of education, employment status, health insurance coverage, the presence of chronic health condition(s), physical activity, smoking behavior and household durable assets (e.g., number of rooms per capita, type of house ownership, house size per square meter, ownership of car, computer/laptop, freezer, dishwasher, TV, access to internet, etc.). The second part consisted of a validated Iranian version EuroQol 5-dimensions-3-level (EQ-5D-3L) questionnaire. It collects information on five dimensions of HRQoL viz. mobility, self-care, usual activity, pain/discomfort, and anxiety/depression, with three response levels for each dimension (no problem, some problem and extreme problem). The Iranian value set for EQ-5D-3L health states, extracted by visual analog scale (VAS), was used to calculate HRQoL of participants. More detailed information on this value set can be found elsewhere. The performance of this value set was compared against the UK VAS-based value set and the mean EQ-5D-3L scores were similar for the two value sets.

We used poor-HRQoL as the outcome variable. We calculated the average HRQoL scores of participants. The participants scoring at least 0.1 points lower than the mean scores of the total sample were considered individuals with “poor-HRQoL”. This cut-off point is commonly used to detect moderate but clinically relevant differences. Participants with equal or more than the average HRQoL scores were considered individuals with “good-HRQoL”. To consider clinically moderate difference, we excluded 253 participants with the HRQoL scores between the average HRQoL scores and less than 0.1 below the average HRQoL scores. The dependent variable for the analysis was a binary variable of whether or not the participant had poor-HRQoL. Similar to previous studies, we included age, sex, marital status, SES, employment status, health insurance coverage, physical activity, smoking behavior, the presence of chronic health condition(s) as explanatory variables of poor-HRQoL in the decomposition analysis. We used detailed guidelines set out in the literature to construct a wealth index (WI), as a measure of SES, using a principal component analysis (PCA). We entered those assets and housing characteristics expected to be highly associated with households’ wealth (e.g., number of rooms per capita, type of house ownership, house size per square meter, ownership of car, TV, computer/laptop, freezer, dishwasher, microwave, vacuum cleaner, etc.) in the PCA. Based on the WI values, participants were divided into five SES groups (quintiles), from poorest to richest.

Statistical analysis

We used the concentration index (C) approach to quantify socioeconomic-related inequalities in poor-HRQoL among the general population in Kermanshah, Iran. The C is based on the concentration curve. The concentration curve plots the cumulative percentage of participants ranked by SES (e.g., WI) in the x-axis and the cumulative percentage of a health variable of interest (poor-HRQoL) in the y-axis. The C is considered as twice the area between line indicating perfect equality and concentration curve. The values of the index vary between -1 and +1. The negative (positive) sign of the C indicates that the concentration curve lies above (under) the line of perfect equality and poor-HRQoL is more concentrated among the poor (wealthy). The zero value suggests, “perfect equality”.

The following formula was used to calculate the C:

\[ C = \frac{\mu \cdot \text{cov}(y_i, r_i)}{\mu} \]  

where \( \mu \) indicates the mean of the health variable interest (i.e., poor-HRQoL) for the total sample, \( y_i \) denotes the outcome variable for individual \( i \), \( r_i \) is the fractional rank in the SES distribution for the individual \( i \). As the outcome variable in the study is binary, the minimum and maximum of the C are not between -1 and +1 and depend on \( \mu \). As per Wagstaff, we normalized the C by multiplying by \( \frac{1}{1-\mu} \) (i.e., \( C_n = \frac{C}{1-\mu} \)).

We decomposed the C to identify the contribution of each determinant (explanatory) variable to the wealth-related inequality in poor-HRQoL. If we have the following linear regression model linking our poor-HRQoL variable, \( y \), to a set of \( k \) explanatory factors, \( x_k \) :

\[ y = \alpha + \sum_k \beta_k x_k + \epsilon \]  

The C for poor-HRQoL, \( y \), can be decomposed as follows:

\[ C = \sum_k \left( \frac{\beta_k x_k}{\mu} \right) C_k + \frac{\epsilon C}{\mu} \]  

Where \( C \) shows the concentration index for health outcome (i.e., poor-HRQoL), \( x_k \) is the mean of explanatory variable \( x_k \), \( C_k \) is the C for \( x_k \), defined analogously to the C and \( \frac{\beta_k x_k}{\mu} \) is the elasticity of poor-HRQoL with respect to the explanatory variable \( x_k \). The \( \sum_k \left( \frac{\beta_k x_k}{\mu} \right) C_k \) indicates the contribution of explanatory factor \( x_k \) to the C. A negative (positive) contribution of an explanatory factor to the C demonstrates...
that the wealth-related distribution of the factor and the association between the relevant factor and poor-HRQoL contributes to a lower likelihood of poor-HRQoL among the poor (rich). The last term, \( \frac{\beta_k x_k}{1 - \mu} \), is the residuals component and reflects the socioeconomic-related inequality in health outcome that cannot be explained by systematic variation in \( x_k \) across wealth groups.

The normalized \( C \) can be decomposed using the following formula:

\[
C_n = \frac{c}{1 - \mu} = \frac{\sum (\beta_k x_k)}{1 - \mu} + \frac{\beta_k x_k}{1 - \mu}
\]  

(5)

Since poor-HRQoL is a binary variable, we used marginal effects obtained from a logit model in the decomposition analysis. All analyses were performed in Stata ver. 14.2.

**Ethical statement**

The verbal consent was obtained from each participant after explaining the purpose of the study. Each participant was also informed that s/he has the right to terminate the data collection process at any point. Those who did not provide consent to participate were excluded from the study. Data were collected anonymously and was only used for research. The Ethics Committee of the Deputy of Research at Kermanshah University of Medical Sciences (KUMS.REC.1396.458) approved the study.

**Results**

Overall, 1730 adults aged 18-65 yr were included in the study, of which 1058 (61.2%) were men. The mean age ± (SD) of the respondents was 36.7 ± (12.6) yr. The majority of the study population was married (60.2%). Approximately, 18.4% of participants were current smokers and 14.3% of the study population had at least one chronic health condition. The average HRQoL scores ± (SD) was 0.65 ± (0.25) and the overall prevalence of poor-HRQoL was 35.3% (95% confidence interval [CI]; 33.1 to 37.6%) (Table 1).

The \( C_n \) for poor-HRQoL among males and females were -0.275 and -0.271, respectively. This figure for total samples was estimated to be -0.274. The poor-HRQoL is more concentrated among participants with lower SES (\( P < 0.001 \)). The concentration curves for poor-HRQoL lie above the line of perfect equality for males, females and total samples; suggesting that poor-HRQoL was more prevalent among the poor adults (Table 2 and Figure 1).

Figure 1: Concentration curve for poor-HRQoL among males, females and both sexes

Table 3 reports the contribution of explanatory variables to the wealth-related inequality in poor-HRQoL in Kermanshah city, Iran. The table presents 1) 1) marginal effect of each explanatory variable, 2) the elasticity of each explanatory variable, 3) the \( C_k \) for each independent variable, and 4) absolute and percentage contribution of each explanatory variable to the observed wealth-related inequality in poor-HRQoL.

**Table 1: Descriptive statistics of variables included in the study (n = 1730)**

| Explanatory variables | Total | Poor-HRQoL. |
|-----------------------|-------|-------------|
| **Age groups (yr)**   |       |             |
| 18-30                 | 894   | 51.7        |
| 31-45                 | 396   | 22.9        |
| 46-65                 | 440   | 25.4        |
| **Gender**            |       |             |
| Male                  | 1058  | 61.2        |
| Female                | 672   | 38.8        |
| **Marital status**    |       |             |
| Single                | 592   | 34.2        |
| Married               | 1041  | 60.2        |
| **Employment status** |       |             |
| Unemployed            | 664   | 38.4        |
| Self-employed         | 619   | 35.8        |
| Employed              | 370   | 21.4        |
| Retired               | 77    | 4.4         |
| **Health insurance coverage** | | |
| Yes                   | 1384  | 80          |
| No                    | 346   | 20          |
| **Smoking status**    |       |             |
| Never                 | 1330  | 76.9        |
| Former                | 82    | 4.7         |
| Current               | 318   | 18.4        |
| **Physical activity** |       |             |
| Inactive              | 254   | 14.6        |
| Moderately active     | 527   | 30.5        |
| Active                | 949   | 54.9        |
| **Chronic health condition(s)** | | |
| Yes                   | 248   | 14.3        |
| No                    | 1482  | 85.7        |

* Poor-HRQoL: Poor health-related quality of life

| Sample | \( C_n \) (95% Confidence Interval) |
|--------|-------------------------------------|
| Male   | -0.274 (-0.328, -0.219)            |
| Female | -0.275 (-0.345, -0.205)            |
| Total  | -0.271 (-0.358, -0.184)            |

**Table 2: Normalized concentration index in poor-HRQoL.**
Older age was associated with higher probability of poor-HRQoL (the positive and significant sign of marginal effects for older adults). Compared with women, men had 0.1 percentage point higher probability of having poor-HRQoL. Lack of health insurance was associated with 20.2 percentage point higher probability of having poor-HRQoL. Among adults in Kermanshah, the presence of chronic health condition(s) and being uninsured were found to be main determinants of socioeconomic-related inequality in poor-HRQoL. The negative contributions of physical activity, the presence of chronic health condition(s) and being uninsured to wealth-related inequalities in poor-HRQoL indicated that the wealth-related distribution of these variables among adults in the sampled population and the association between these factors and poor-HRQoL led to the concentration of poor-HRQoL among less-wealthy adults. The results suggested 8.9% of wealth-related inequality in poor-HRQoL were not explained by the explanatory variables included in the model.

Discussion

To date, some studies (e.g., 8,14) examined factors affecting HRQoL across different population groups in Iran. However, there is no study that quantifies and decomposes socioeconomic-related inequality in HRQoL in Iran. We measured and identified factors affecting wealth-related inequality in poor-HRQoL in the west of Iran.

The descriptive statistics results indicated that 35.3% of adults in Kermanshah city have poor-HRQoL. The findings from the concentration index and curve revealed that there were statistically significant pro-rich inequalities in poor-HRQoL among men, women and both sexes combined. Poor-HRQoL is more prevalent among the poor men and women.
While the prevalence of poor-HRQoL among poorest SES group (lowest wealth quintile) was 56.6%, this figure was 24.6% for the richest group (highest wealth quintile). Studies in other countries also showed positive gradient between SES and poor-HRQoL. For example, there was an inverse association between SES and poor-HRQoL among adults aged 25 yr and older 10. Similarly, using a cross-sectional survey from Swedish population, the prevalence of poor-HRQoL among individuals with lower educational attainment (9 yr and under) was 43%, while the corresponding figure was 26% for higher educational attainment (more than 12 yr) individuals 11. Lower HRQoL score was associated with lower SES in Ilam City in Iran 12.

We found statistically significant positive associations between poor-HRQoL and older age, smoking behavior, physical inactivity, lack of health insurance, the presence of chronic health condition(s) and lower SES. These findings are consistent with the results reported by other studies. For example, smoking and physical inactivity led to the lower HRQoL among Iranian adults 8. Another study observed negative impact of smoking on HRQoL in Iran 10. An inverse association between having a chronic health condition(s) and HRQoL is well-documented in the current literature 13-15. Similar to our findings, having health insurance coverage was significantly associated with lower poor-HRQoL 2. This association can be explained by the fact that individuals with health insurance coverage may have appropriate and timely access to healthcare services, which, in turn, may improve HRQoL of insured individuals.

The decomposition analysis of wealth-related inequality in poor-HRQoL revealed that wealth was the main contributor to the observed inequality. There are many reasons for the negative association between SES (as measured by household wealth) and poor-HRQoL. Wealth inequality can be translated into inequality in health through inequalities in resources and material opportunities such as nutrition, housing, and healthcare utilization 34-36. Income-related inequality in health was measured and decomposed in Shiraz, Iran 13. Similar to our study, the latter study reported income (SES) as the most important factor contributing to pro-rich inequality in health (39.92% for general health and 39.82% for mental health). Lower SES (income, occupational status, and education level) is significantly related to the lower HRQoL in Germany 37. Moreover, individuals with lower SES had lower HRQoL 38. Differences in the financial barriers to access healthcare services across different socioeconomic groups might have contributed to the observed association.

The decomposition analysis recommended that, besides SES, physical inactivity, the presence of chronic health condition(s) and absence of health insurance were the main drivers of the concentration of poor-HRQoL among the poor in Kermanshah, Iran. Using a sample of 5537 adults, aged between 40 to 60 yr, low level of physical activity was related to poor-HRQoL in England 39. Similarly, having a higher level of physical activity was negatively associated with having poor-HRQoL for men and women and for both sexes combined 40.

Our study was subject to several limitations and the results should be interpreted with caution. Firstly, the study used convenience sampling method to select study participants in Kermanshah city; thus, the generalizability of the study findings is limited. Secondly, this study was cross-sectional and therefore we were unable to establish causal relationships between the explanatory variables and poor-HRQoL. Third, information on HRQoL and its determinants were self-reported and subject to recall bias.

**Conclusions**

Our study showed a pro-rich inequality in poor-HRQoL in Kermanshah, Iran. Wealth, physical inactivity, the presence of chronic health condition(s) and lack of health insurance were the four main factors contributing to inequality in poor-HRQoL. Therefore, effectiveness programs that aim to address social determinants of health and increase physical activity, reduce smoking prevalence, increase health insurance coverage for the poor may reduce socioeconomic-related inequality in poor-HRQoL in Iran.

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**Conflict of interest statement**

The authors have no conflicts of interest to declare for this study.

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**Highlights**

- The prevalence of poor-HRQoL among men and women was 34.8 and 36.2, respectively.
- The poor-HRQoL is more concentrated among lower SES adults.
- The prevalence of poor-HRQoL among the poorest quintile groups was 56.6%.
- The prevalence of poor-HRQoL among the wealthiest quintile group was 24.6%.

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