Decomposing socioeconomic inequality in poor mental health among Iranian adult population: results from the PERSIAN cohort study

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Abstract

Background: Socioeconomic inequality in mental health in Iran is poorly understood. This study aimed to assess socioeconomic inequality in poor mental health among Iranian adults.

Methods: The study used the baseline data of PERSIAN cohort study including 131,813 participants from 17 geographically distinct areas of Iran. The Erreygers Concentration index (E) was used to quantify the socioeconomic inequalities in poor mental health. Moreover, we decomposed the E to identify factors contributing to the observed socioeconomic inequality in poor mental health in Iran.

Results: The estimated E for poor mental health was −0.012 (95% CI: −0.0144, −0.0089), indicating slightly higher concentration of mental health problem among socioeconomically disadvantaged adults in Iran. Socioeconomic inequality in poor mental health was mainly explained by gender (19.93%) and age (12.70%). Region, SES itself, and physical activity were other important factors that contributed to the concentration of poor mental health among adults with low socioeconomic status.

Conclusion: There exists nearly equitable distribution in poor mental health among Iranian adults, but with important variations by gender, SES, and geography. These results suggested that interventional programs in Iran should focus on should focus more on socioeconomically disadvantaged people as a whole, with particular attention to the needs of women and those living in more socially disadvantaged regions.

Keywords: Mental health, Socioeconomic inequality, Concentration index, Decomposition
Background
Mental health disorders are one of the global leading causes of morbidity and mortality influence on several aspects of life including quality of life, physical well-being, social cohesion, and productivity [1]. One systematic review by Steel et al. reported that the global prevalence of most common mental health disorders including anxiety and substance use disorders ranged between 16 and 19% [2]. Based on the 2017 Global Burden of Disease report, mental health disorders are responsible for 14% of age-standardized years lived with disabilities in the last three decades [3]. The prevalence of the mental health disorders in Iran has been shown an increase from 21% in 1999 to 24% in 2011 [4].

It is increasingly known that poor mental health has been disproportionately distributed across socioeconomic groups in a population [5, 6]. Several studies indicated that the distribution of good mental health is heavily skewed towards the higher socioeconomic groups [5, 7, 8]. A systematic review of literature by Lund et al. (2010) showed that there is a convincing evidence of association between poverty and poor mental health [5].

As many structural, social, and environmental factors have attributed to the socioeconomic inequality in poor mental health, underlying mechanisms of association between SES and poor mental health seems to be complex [9]. The poor mental health can be one of the determinants and also consequences of the socioeconomic inequality [9]. However, evidence on socioeconomic inequality in mental health from low- and middle-income countries including Iran is scarce. A context-based study for enhancing the current knowledge of socioeconomic inequalities in poor mental health is greatly warranted. Given the preventable nature of the socioeconomic inequality, providing related information on the poor mental health distribution would be useful for understanding the burden of the problem, guiding policy makers and developing practical preventive interventions. Thus, the aim of present study is to quantify the extent of socioeconomic-related inequality in poor mental health among Iranian adults and to understand determinants of socioeconomic inequality in poor mental health.

Methods
Data
We used the baseline data of Prospective Epidemiological Research in IrAN (PERSIAN) that included the data on 131,813 Iranians aged 35 years and older, from 14 provinces of Iran, in 17 geographically distinct cohort sites. These cohort sites include Kermanshah, Guilan, Fasa, Tabriz, Khomeh, Mazandaran, Zahedan, Yazd, Rafsanjan, Ahvaz, Shahrekurd, Bandar Abbas, Uromieh, Ardabil, Sabzevar, Mashhad, Yasuj, Kavar. As data of Fasa, Kavar and Kharameh sites came from Fars province, and Sabzevar and Mashhad from Razavi Khorasan province; therefore, the data in from the same sites of these provinces were merged. Because the process of recruitment has not been completed in time of data analysis, the Yasuj cohort was excluded from this study. In each site, men and women aged 35–70 years, residing within the PERSIAN Cohort sites are invited to participate in the study. Other inclusion criteria included: being of Iranian descent and living in the designated areas for at least 9 months of the year. Anyone with physical or psychological disabilities, that unable to complete the enrollment process was excluded from the study. This yielded a total final sample size of 130,078 adults aged 35–70 years old. More details about PERSIAN Cohort study were presented elsewhere [10, 11]. The characteristics of included cohort sites are described in Appendix 1.

Measures
Poor mental health was defined as a binary variable based on self-report of related treatments for at least 3 month during the past year which recorded by a general physician: Citalopram, Escitalopram, Sertraline, Paroxetine, Clozapine, Quetiapine, Risperidone, Haloperidol, Chlorpromazine, Olanzapine, Aripiprazole, Fluphenazine, Perphenazine, Trifluoperazine, Fluoxetine, Valproate sodium, Lamotrigine, Alprazolam, Clonazepam, Lorazepam, Flurazepam, Buspirone, Zolpidem, Lithium, Carbamazepine, Tranylcypromine, Venlafaxine, Fluvoxamine, Trazodone, Duloxetine, Oxcarbazepine, Doxepin, Maprotiline, Trimipramine, Clomipramine, Nortriptyline, Desipramine, Amitriptyline. Although, we had access to self-reported past history of depression and any other mental health problems, diagnosed by physician, we did not include such variables in our definition as we aimed to investigate about inequality in mental health problems under the treatment. Using principal component analysis, the socioeconomic status (SES) variable was constructed by assessing ownership of household assets, and educational level of individuals. Twenty six items i.e. having car, motorcycle, bicycle, refrigerator, freezer, radio, stove, vacuum machine, personal computer, CD/DVD player, sewing machine, cooler, washing mashing, microwave, central heating, having kitchen, bathroom, use of natural gas for cooking, per capita house area per capita rooms, access to piped drinking water, electricity, telephone, internet, sewage network, and educational level were used in the construction of SES indicator. The SES index was grouped into five quintiles, where the 1st quintile represents the poorest group and the 5th quintile represents the richest one. Dummy variables for the age group, marital status,
body mass index (BMI), smoking status, SES quantiles, and 14 sites of PERSIAN cohort were included in the analysis as determinants of poor mental health.

Statistical analysis

**Measuring and decomposing poor mental health inequality**

The concentration index (C) approach [12, 13] was used to measure socioeconomic inequality in poor-mental health outcome. The C is based on the Concentration curve which plots cumulative proportion of population ranked in ascending order of SES in x-axis and cumulative proportion of poor mental health in y-axis. The C is defined as twice the area between the concentration curve and line of perfect equality (i.e., 45-degree line). Formally, the C can be calculated as:

\[ C = \frac{2}{\mu} \text{cov}(Y_i, R_i) \] (1)

Where \( \mu \) is the mean of poor mental health disorder, \( y_i \) is the mental health disorder status of the \( i \)th individual and \( R_i \) is the fractional rank that individual \( i \) represents in total population ranked by SES. The C is bounded between the values of \(-1 \) and \(+1 \). Negative values imply that poor mental health is more concentrated among the poor people and positive values imply that poor mental health is more concentrated among rich people. If the C is equal to zero it suggests that there is no socioeconomic inequality in mental health disorder. If health outcome variable in bounded, the estimated value of the C is not between \(-1 \) and \(+1 \). Thus, we used Erreygers Concentration index (E) [14] to account for the bounded nature of binary health outcome variables. The formula for the E is as follows:

\[ E = \frac{4\mu}{y_{\text{max}} - y_{\text{min}}} C. \] (2)

Where \( y_{\text{max}} \) and \( y_{\text{max}} \) are the minimum and maximum value of the bounded variable (i.e., one and zero for binary variable).

The E can be decomposed to identify the contributions of relevant factors to socioeconomic inequality in mental health disorder. Assuming a linear relationship between relevant factors to socioeconomic inequality, the E can be expressed as a weighted sum of the partial Concentration index for the explanatory factors of socioeconomic inequality, \( C_k \) as:

\[ E = 4 \left[ \sum_k (\beta_k \bar{x}_k) C_k + GC_0 \right] \] (3)

Where \( \bar{x}_k \) is the means of explanatory variables, \( \beta_k \) is the coefficient on explanatory variable \( k \) obtained from the generalized linear model of the binomial family with a logit link function linking mental health disorder to the explanatory variables, and \( GC_0 \) is the generalized C for the error term. If the value of the contribution of variable \( k \) is \( \theta \), for both positive (negative) signs, then the inequality in poor mental health would decrease (increase) by \( \theta \) percent if the variable was to become equally distributed across the socioeconomic groups. Normal-based 95% bootstrap confidence intervals with 1000 replication were calculated. The level of significance (alpha level) in all analyses was set at 0.05. Records with missing data were excluded because the amount of missing data was small less than 1% and assumed to be missing at random. Statistical analysis procedures were conducted using STATA 11 [15] and the Es were calculated using Stata’s “conindex” command [16].

**Results**

**Descriptive results**

As shown in Table 1, from total of 131,813 participants, nearly 45% of the study sample were male; most participants were 35–40 years (20.83%) and belonged to the overweight category (40.76%). The majority of participants were married (90.94%), non-smoker (86%) and non-alcohol user (90.96%). 11% of the participants were water-pipe user.

Age-adjusted proportion of poor mental health was 6.23% (95% Confidence Interval [CI]: 6.09, 6.36). The proportion of poor mental health among the females (8.14%) was higher compared to the males (4.29%). The cohort sites of Sistan and Balouchestan (11.77), and Razavi Khorasan (1.52) had higher and lower proportion of poor mental health among PERSIAN cohort sites (see Fig. 1a).

**Socioeconomic inequality in poor mental health**

Table 2 and Fig. 1b show the Erreygers concentration indices (\( C_k \)) for poor mental health for all separate sites of the PERSIAN cohort. The result shows that the overall E was \(-0.012\) (95% CI: \(-0.0144\) to \(-0.0089\)), indicating the slightly higher concentration of poor mental health among less-advantaged people (\( P < 0.001 \)). The values of \( C_k \) were not statistically significant for the Fars, Kermanshah, and Khuzestan sites. All the \( C_k \) values had negative signs, except for the Mazandaran site (\( C_k = 0.0392, P < 0.001 \)).

**Determinants of socioeconomic inequality in poor mental health**

The results of the decomposition analysis are presented in Tables 3. The table presents elasticity, coefficient estimates, the \( C_k \) absolute contributions, and percentage contribution for each explanatory factor to poor mental health. A positive coefficient indicates that the participants
Table 1 Characteristics of study participants by mental health disorders (n = 130,078)

| Characteristics                  | All participants | Poor mental health | Good mental health |
|----------------------------------|------------------|--------------------|--------------------|
|                                  | N (%)            | N (%)              | N (%)              |
| **Age groups**                   |                  |                    |                    |
| 35–40                            | 27,094 (20.83)   | 1094 (4.04)        | 26,000 (95.96)     |
| 40–45                            | 24,195 (18.60)   | 1189 (4.91)        | 23,006 (95.09)     |
| 45–50                            | 22,489 (17.29)   | 1468 (6.53)        | 21,021 (93.47)     |
| 50–55                            | 20,160 (15.50)   | 1601 (7.94)        | 18,559 (92.06)     |
| 55–60                            | 17,442 (13.41)   | 1431 (8.20)        | 16,011 (91.80)     |
| 60–65                            | 12,154 (9.34)    | 984 (8.10)         | 11,170 (91.90)     |
| 65 >                             | 6544 (5.03)      | 581 (8.88)         | 5963 (91.12)       |
| **Gender**                       |                  |                    |                    |
| Male                             | 58,251 (44.78)   | 2499 (4.29)        | 55,752 (95.71)     |
| Female                           | 71,827 (55.22)   | 5849 (8.14)        | 65,978 (91.86)     |
| **Marital status**               |                  |                    |                    |
| Single                           | 2953 (2.27)      | 176 (5.96)         | 2777 (94.04)       |
| Married                          | 118,290 (90.94)  | 7239 (6.12)        | 111,051 (93.88)    |
| Divorced                         | 1447 (1.11)      | 125 (8.64)         | 1322 (91.36)       |
| widowed                          | 7305 (5.62)      | 802 (10.98)        | 6503 (89.02)       |
| other                            | 83 (0.06)        | 6 (7.23)           | 77 (92.77)         |
| **Water-pipe use**               |                  |                    |                    |
| No                               | 114,594 (88.92)  | 7395 (6.45)        | 107,199 (93.55)    |
| Yes                              | 14,284 (11.08)   | 949 (6.47)         | 13,335 (93.53)     |
| **Alcohol Use**                  |                  |                    |                    |
| No                               | 117,225 (90.96)  | 7737 (6.60)        | 109,488 (93.40)    |
| Yes                              | 11,652 (9.04)    | 606 (5.20)         | 11,046 (94.80)     |
| **Drug use**                     |                  |                    |                    |
| No                               | 113,514 (88.08)  | 7143 (6.29)        | 106,371 (93.71)    |
| Yes                              | 15,363 (11.92)   | 1201 (7.82)        | 14,162 (92.18)     |
| **Smoking status**               |                  |                    |                    |
| Non-smoker                       | 91,174 (77.81)   | 6636 (7.28)        | 84,538 (92.72)     |
| Ex-smoker                        | 9166 (7.82)      | 589 (6.43)         | 8577 (93.57)       |
| Smoker                           | 16,831 (14.36)   | 1112 (6.61)        | 15,719 (93.39)     |
| **Physical activity (Daily METs)**|                  |                    |                    |
| Inactive (24–36.5)               | 44,075 (33.89)   | 3673 (8.33)        | 40,402 (91.67)     |
| Middle (36.6–44.9)               | 60,585 (46.59)   | 3699 (6.11)        | 56,886 (93.89)     |
| Active (≥45)                     | 25,388 (19.52)   | 975 (3.84)         | 24,413 (96.16)     |
| **BMI**                          |                  |                    |                    |
| Underweight                      | 2558 (1.98)      | 155 (6.06)         | 2403 (93.94)       |
| Normal                           | 34,808 (26.90)   | 1933 (5.55)        | 32,875 (94.45)     |
| Overweight                       | 52,731 (40.76)   | 3291 (6.24)        | 49,440 (93.76)     |
| Obese                            | 39,279 (30.36)   | 2938 (7.48)        | 36,341 (92.52)     |
| **Socioeconomic status**         |                  |                    |                    |
| 1st SES quintile (Poorest)       | 26,095 (20.06)   | 1813 (6.95)        | 24,282 (93.05)     |
| 2nd SES quintile                 | 26,035 (20.01)   | 1777 (6.83)        | 24,258 (93.17)     |
| 3rd SES quintile                 | 26,007 (19.99)   | 1766 (6.79)        | 24,241 (93.21)     |
with the explanatory variable were more likely to have poor mental health status and vice-versa.

The $C_k$ was estimated for each explanatory factor of poor mental health. A negative (positive) sign shows that the explanatory variable has a pro-poor (pro-rich) distribution. Variables such as age categories of 50–55, 55–60, 60–65, and > 65, marital status categories of divorced, widows, and others, drug users, non-smokers, physically active and living in Cohort sites of Kerman-shah, Guilan, East Azerbaijan, Khuzestan, Hormozgan, and West Azerbaijan had negative concentration indices, indicating that these predictors were concentrated among the pro-poor population. A negative (positive) absolute contribution of predictors means that socioeconomic inequality in poor mental health would, the value of $C_k$, increase (decrease) if that predictor would be equally distributed across the SES distribution. All predictors included in the decomposition analysis explained 27.1% of overall inequality in poor mental health.

Table 1 Characteristics of study participants by mental health disorders ($n = 130,078$) (Continued)

| Region of cohort (province) | All participants | Poor mental health | Good mental health |
|-----------------------------|------------------|--------------------|--------------------|
| 4th SES quintile            | 25,940 (19.94)   | 1566 (6.04)        | 24,374 (93.96)     |
| 5th SES quintile (Richest)  | 26,001 (19.99)   | 1426 (5.48)        | 24,575 (94.52)     |
| Fars (FA)                   | 22,767 (17.50)   | 1471 (6.46)        | 21,296 (93.54)     |
| Kermanshah (KSH)           | 10,036 (7.72)    | 257 (2.56)         | 9779 (97.44)       |
| Guilan (GU)                 | 10,433 (8.02)    | 903 (8.66)         | 9530 (91.34)       |
| East Azerbaijan (EA)        | 14,775 (11.36)   | 1072 (7.26)        | 13,703 (92.74)     |
| Mazandaran (MA)             | 10,103 (7.77)    | 964 (9.54)         | 9139 (90.46)       |
| Sistan and Balouchestan (SB)| 8199 (6.30)      | 965 (11.77)        | 7234 (88.23)       |
| Yazd (YA)                   | 9723 (7.47)      | 577 (5.93)         | 9146 (94.07)       |
| Kerman (KE)                 | 9788 (7.52)      | 857 (8.76)         | 8931 (91.24)       |
| Khuzestan (KH)              | 9139 (7.03)      | 148 (1.62)         | 8991 (98.38)       |
| Chaharmahal and Bakhtiari (CB)| 6730 (5.17)    | 450 (6.69)         | 6280 (93.31)       |
| Hormozgan (HO)              | 3557 (2.73)      | 110 (3.09)         | 3447 (96.91)       |
| West Azerbaijan (WA)        | 3660 (2.81)      | 157 (4.29)         | 3503 (95.71)       |
| Ardabil (AR)                | 8214 (6.31)      | 372 (4.53)         | 7842 (95.47)       |
| Razavi Khorasan (RK)        | 2954 (2.27)      | 45 (1.52)          | 2909 (98.48)       |

Gender explains the most of observed inequality in poor mental health. Figure 2 illustrates the results of decomposition analysis by gender. The contribution to $C_k$...
of poor mental health of predictors such as, age groups, BMI and marital status, SES and province were varying between females and males. The contribution of SES to poor mental health inequality for female was negative (−12.11%), while for the male was positive (17.78%). The contribution of province for both of the gender was negative (−138.4% for female vs. -5.37% for male). The SES inequality in poor mental health for female and male are mainly explained by age (185.90%), and SES (17.78%), respectively.

Discussion
The overall prevalence of poor mental health among Iranian adult was 6.2%. This is slightly lower than the result of previous studies conducted on general population in Iran [4, 17]. The observed inconsistency might be related to the different scale or approaches employed for mental health measurements. Our findings highlighted a substantial gender, and provincial heterogeneities in poor mental health distribution. The largest prevalence of poor mental health (11.7%) was observed in the cohort site of Sistan and Balouchestan province. This may be explained by a higher frequency of illicit drug use [18] and higher unemployment rate in this province [19]. Noorbala et al. [20] showed a decreased prevalence of mental disorders from 24.6% (1999) to 15.1% (2015) in Sistan and Balouchestan province [20]. They also found a higher prevalence in females (17.2%) as compared to males (13%). Consistent with literature, the prevalence of mental disorders in was more found to be more common in females and in older age group adults [20–23]. There was not a substantial difference in the poor mental health prevalence among 14 cohort sites.

Except for the Mazandaran site, the E for all sites had negative sign, suggesting a higher concentration of poor mental health in socioeconomically disadvantaged people. This is in line with the previous reports around the world [24–26]. However, the different methods employed for inequality measurement in various studies made the comparison of the concentration indices difficult.

The geographical inequalities in mental health might be explained by cultural differences across different regions of Iran. The geographical inequalities in health outcomes in Iran might be due to differences in unemployment rates, SES, and literacy levels for across different provinces [27]. Although, study by Movahedi et al. (2008) [28] demonstrated a decrease in the geographic inequality in some health indicators, the authors concluded that cross country differences in health remains an important public health problem in Iran.

The findings of this study demonstrated a more concentration of poor mental health among individuals with lower SES. Decomposing analysis demonstrated gender as the main contributor of observed inequality in the poor mental health prevalence. This is in line with the other inequality studies [29, 30] that suggested gender as a possible contributor to socioeconomic inequality in mental health. The contribution to E also showed that both sociodemographic (i.e. age, BMI, marital status, and SES) and geographical predictors (i.e. province) are varying between females and males. In a study by la Torre J et al. (2016) in Spain, mental health was mainly associated with SES among females [23]. Although, gender gaps in health and health-related factors is globally declining [31], it still exists in both developed and developing countries [32]. Females generally experience higher health-related outcomes including mental disorders, and healthcare services utilization [33]. SES of females are generally lower than males (see, for example, a positive value of the C for male in Table 3). The combination of poor mental health and lower SES of females as compared to males led to the significant contribution of gender factor to socioeconomic inequality in poor mental health in Iran. Demographic factors such as age and marital status also play an important role in the mental health inequalities in current study. Similar studies conducted in high- and middle-income countries have reported the same results [26, 34]. A study conducted by Morasae et al. (2012) in Tehran, demonstrated a contribution of 13.1% for age to socioeconomic inequality in mental health in Tehran, Iran [26]. In contrast with a

| Table 2 The E for mental health disorders (n = 130,078) |
|------------------------------------------------------|
| **Overall estimate**                                 |
| CI 95% Confidence Interval                           |
| 0.006, 0.015, −0.009                                  |
| **Gender**                                           |
| Female                                               |
| −0.025, 0.007, 0.005                                 |
| Male                                                 |
| −0.013, −0.006                                       |
| **Province**                                         |
| Fars (FA)                                            |
| −0.003, −0.011, 0.003                                |
| Kermanshah (KSH)                                    |
| −0.004, −0.012, 0.003                                |
| Guilan (GU)                                          |
| −0.017, −0.029, −0.004                               |
| East Azerbaijan (EA)                                 |
| −0.025, −0.035, −0.016                               |
| Mazandaran (MA)                                      |
| 0.038, 0.026, 0.050                                  |
| Sistan and Balouchestan (SB)                         |
| −0.090, −0.107, −0.074                               |
| Yazd (YA)                                            |
| −0.020, −0.031, −0.009                               |
| Kerman (KE)                                          |
| −0.028, −0.041, −0.016                               |
| Khuzestan (KH)                                       |
| −0.003, −0.009, −0.002                               |
| Chaharmahal and Bakhtiari (CB)                       |
| −0.045, −0.058, −0.029                               |
| Hormozgan (HO)                                       |
| −0.018, −0.029, 0.006                                |
| West Azerbaijan (WA)                                 |
| −0.004, −0.019, 0.010                                |
| Ardabil (AR)                                         |
| −0.020, −0.031, −0.010                               |
| Razavi Khorasan (RK)                                 |
| 0.005, −0.006, 0.015                                 |
Table 3 Decomposition of E of poor mental health (n = 130,078)

| Age groups       | Coefficient | Concentration index | Contribution | Contribution% | Summed  |
|------------------|-------------|---------------------|--------------|---------------|---------|
| 35–40            | Ref.        | –                   | –            | –             | –       |
| 40–45            | 0.0894003   | 0.0524              | 0.0001       | –1.2071       | –       |
| 45–50            | 0.2150607   | 0.030               | 0.0002       | –1.6621       | –       |
| 50–55            | 0.3051117   | –0.0048             | –0.0000      | 0.3805        | –       |
| 55–60            | 0.3049626   | –0.0577             | –0.0005      | 4.5390        | –       |
| 60–65            | 0.2760597   | –0.0788             | –0.0007      | 5.6091        | –       |
| 65 and older     | 0.308196    | –0.0633             | –0.0006      | 5.0436        | –       |
| Gender           |             |                     |              |               | 19.927  |
| Male             | –0.43360    | 0.1783              | –0.0024      | 19.9270       | –       |
| Female           | Ref.        | –                   | –            | –             | –       |
| Marital status   |             |                     |              |               | 1.9963  |
| Single           | Ref.        |                     |              |               | –       |
| Married          | –0.0611     | 0.0933              | –0.0002      | 1.4656        | –       |
| Divorced         | 0.0217      | –0.0779             | –0.0001      | 0.4353        | –       |
| Widowed          | 0.0879      | –0.0005             | –0.0000      | 0.1132        | –       |
| Other            | –0.0986     | –0.0007             | 0.0000       | –0.0178       | –       |
| Water-pipe use   |             |                     |              | –1.1424       | –       |
| No               | Ref.        |                     |              |               | –       |
| Yes              | 0.0623      | 0.0712              | 0.0001       | –1.1424       | –       |
| Alcohol Use      |             |                     |              | 0.8492        | –       |
| No               | Ref.        |                     |              |               | –       |
| Yes              | –0.0487     | 0.0677              | –0.0001      | 0.8492        | –       |
| Drug use         |             |                     |              | 0.3762        | –       |
| No               | Ref.        |                     |              |               | –       |
| Yes              | 0.1552      | –0.0094             | –0.0000      | 0.3762        | –       |
| Smoking status   |             |                     |              | –0.1247       | –       |
| Non-smoker       | Ref.        |                     |              |               | –       |
| Ex-smoker        | 0.21844     | –0.0006             | –0.0000      | 0.0336        | –       |
| Smoker           | 0.12433     | 0.0049              | 0.0000       | –0.1583       | –       |
| BMI              |             |                     |              | –0.7472       | –       |
| Underweight      | 0.01042     | –0.0225             | –0.0000      | 0.0605        | –       |
| Normal           | Ref.        |                     |              |               | –       |
| Overweight       | 0.02785     | 0.0784              | 0.0001       | –0.5632       | –       |
| Obese            | 0.04223     | 0.0225              | 0.0000       | –0.2445       | –       |
| Physical activity (Daily METs) |   |                     |              | –5.7784       | –       |
| Inactive (24–36.5) | Ref.     |                     |              |               | –       |
| Middle (36.6–44.9) | –0.1956   | 0.0703              | –0.0004      | 3.5431        | –       |
| Active (≥45)     | –0.3385     | –0.1068             | 0.0011       | –9.3215       | –       |
| Socioeconomic status |         |                     |              | 10.0531       | –       |
| 1st SES quintile (Poorest) | Ref. |                     |              |               | –       |
| 2nd SES quintile | 0.03825     | –0.3191             | –0.0004      | 3.1463        | –       |
| 3rd SES quintile | 0.05155     | 0.0012              | 0.0000       | –0.0154       | –       |
| 4th SES quintile | 0.00051     | 0.3197              | 0.0000       | –0.0421       | –       |
Table 3 Decomposition of E of poor mental health (n = 130,078) (Continued)

|                        | Coefficient | Concentration index | Contribution | Contribution% | Summed |
|------------------------|-------------|---------------------|--------------|---------------|--------|
| 5th SES quintile (Richest) | −0.04223    | 0.6397              | −0.0008      | 6.9643        |        |
| Region of cohort (province) |             |                     |              |               | −11.0293 |
| Fars (FA)              |             |                     |              |               | Ref.   |
| Kermanshah (KSH)      | −0.3517     | −0.0209             | 0.0002       | −1.8938       |        |
| Guilan (GU)           | 0.19355     | −0.0483             | −0.0003      | 2.4108        |        |
| East Azerbaijan (EA)  | 0.1363      | −0.0057             | −0.0000      | 0.1992        |        |
| Mazandaran (MA)       | 0.3011      | 0.0461              | 0.0004       | −3.5757       |        |
| Sistan and Balouchestan (SB) | 0.3056 | 0.0082              | 0.0001       | −0.6435       |        |
| Yazd (YA)             | 0.0654      | 0.0536              | 0.0001       | −0.9046       |        |
| Kerman (KE)           | 0.1688      | 0.0847              | 0.0004       | −3.6822       |        |
| Khuzestan (KH)        | −0.6571     | −0.0497             | 0.0010       | −8.4243       |        |
| Chaharmahal and Bakhtiari (CB) | 0.0956 | 0.0921              | 0.0003       | −2.2701       |        |
| Hormozgan (HO)        | −0.2641     | −0.0056             | 0.0000       | −0.3815       |        |
| West Azerbaijan (WA)  | −0.1006     | −0.0183             | 0.0001       | −0.4738       |        |
| Ardabil (AR)          | −0.1215     | 0.0551              | −0.0002      | 1.7239        |        |
| Razavi Khorasan (RK)  | −0.4975     | 0.0537              | −0.0008      | 6.8863        |        |
| Total                  |             |                     | 27.083       |               |        |
| Residual               |             |                     | 72.917       |               |        |
| The E                  |             |                     | −0.012       | 100.0         |        |

Physical activity (Daily METs): A MET is equal to resting metabolic rate, the amount of oxygen consumed at rest that is about 3.5 ml O2/kg/min

Ref. indicated reference group in the regression estimation

Fig. 2 Percentage contribution to Erreygers CIs of poor mental health by gender
study by Amroussia et al. [24], marital status had a small contribution to socioeconomic inequalities in poor mental health in Iran. Married people (compared to single, divorced and widowed) were found to have more contribution to socioeconomic inequality in poor mental health. This finding may be related to financial limitation that puts strains on marital relationship among couple. People from low socioeconomic groups usually experience more poor marital relationship, intimate partner violence, financial stress and pressure than those in high socioeconomic groups [35, 36].

There are a number of limitations need to be considered when interpreting the study results. First, the self-reported nature of drug use for mental health disorders might lead to recall bias. Second, because of the cross-sectional nature of the data, it was not possible to establish a causal correlation between explanatory variables and poor mental health outcome. Third, the estimated prevalence and the E may not be a representative sample of entire of Iran as data was not collected from some provinces in Iran.

**Conclusion**

The findings of the study showed that poor mental health is nearly equitable distributed among Iranian adults, but with important variations by gender, SES, and geography. These results suggested that interventional programs in Iran should focus on should focus more on socioeconomically disadvantaged people as a whole, with particular attention to the needs of women and those living in more socially disadvantaged regions.

**Abbreviations**
PERSIAN: Prospective epidemiological research in Iran; SES: Socioeconomic status; BMI: Body mass index; C: Concentration index; E: Erreygers concentration index

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**Authors’ contributions**
F N, Y P, B KM, S R, AKK, SS, MS, AZ, MM, BH, S E, MH, S Sh, AHM, ZK, AN, MN, ShSB, AF, BCH, HH, PMand MH contributed in the PERSIAN cohort design, data collection and had critical feedback on manuscript. YS, ZJSh, ShR, and MSajjadipour assisted in the prepare data for analysis and data analysis, writing and critically reviewing multiple manuscript drafts. All authors contributed to manuscript revision, read and approved the submitted version.

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**Availability of data and materials**
The datasets analyzed during the current study are available from the corresponding author on reasonable request.
Ethics approval and consent to participate
Data were collected after obtaining written informed consent from all of the participants. While each cohort center received the ethical approval from local universities, for the purpose of this study and pooling all PERSIAN site data, the ethics committee of Kermanshah University of Medical Sciences approved the study (IRKUMS.REC.1397.866).

Consent for publication
Not applicable.

Competing interests
There is no conflict of interest to be declared.

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