Socioeconomic status as the strongest predictor of self-rated health in Iranian population; a population-based cross-sectional study

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A B S T R A C T

Background: There is little evidence comparing the role of subjective versus objective indicators of socio-economic status (SES) on individuals' self-rated health (SRH) in Iran.
Objectives: We aimed to investigate underlying predictors of SRH including subjective and objective SES in Tehran, a multi-ethnic city.
Method: This is an analysis of cross-sectional survey data on subjective and objective SES from a population-based case-control study conducted in Tehran, Iran (2015). We used random digit dialing for study sample recruitment. Linear regression models were used for estimating crude and adjusted coefficients (95% confidence intervals). Age, gender, SES as well as cigarette smoking were included as confounders.
Results: 15–50 years old residents of Tehran were recruited in the study ($n = 1057$). High reported objective and subjective SES was consistently associated with a better SRH. Subjective current SES ($p < .001$), subjective adolescence SES ($p = .018$), change in subjective SES (current vs. adolescent) ($p = .034$) and participants' education years ($p < .001$). Improvements over time in current SES in comparison to SES rated during adolescence increased the participants' SRH after adjustment for potential confounders (coefficient = 0.170, 95% CI: (0.015, 0.325)). Female participants (coefficient = −0.305, 95% CI: (−0.418, −0.192)) and smokers (high category vs. never smokers) (coefficient = −0.456, 95% CI: (−0.714, −0.197)) reported significantly worse SRH. Increasing age − 0.008 (95% CI: −0.014, −0.002) was associated with decreased SRH.
Conclusion: High subjective and objective SES consistently was the most important predictor of high SRH.

1. Introduction

There are important social, environmental and cultural determinants impacting health at population level. This reinforces the need to monitor the overall health of the general population using standard health indicators [1] in relation to changes and developments of those determinants. Self-rated health (SRH) is a common health indicator assessing the overall health status in epidemiologic studies. Its worldwide use, simplicity and briefness [2], as well as its validity, and reliability [3,4] have been well established [5,6]. SRH indicators can

therefore be used as predictors of subsequent mortality [5,7–10] and health issues [6,11,12]. Social, mental and physical aspects of general health are also reflected by SRH [5,8,12–15]. Although SRH is not a clinical health indicator, it can predict several health outcomes [16].

Evidence suggests that people with lower socioeconomic status (SES) more likely report poor SRH than people in higher socioeconomic categories [17–20]. Molarius et.al in a survey conducted among 36,048 participants aged 18–79 years in Sweden, demonstrated that all of psychosocial (including social support and social capital), environmental (including work and housing conditions), and lifestyle factors

(including physical activity and smoking) are independently associated with SRH [17]. Subjective SES has been defined as "person's subjective perceptions of their rank, relative to others, in the socioeconomic hierarchy" [21]. Prior research has also shown that subjective SES is independently associated with SRH [22–24].

There are a few reports on SRH which have simultaneously considered the role of its important predictors [25]. Here, using data from a population-based study in Tehran, a multiethnic city, we aimed to investigate the underlying predictors of SRH including subjective and objective SES. The results of this study could provide additional insight into the Iranian general health level and its important predictors.

2. Method

The current data is part of a population-based case-control study conducted in Tehran, Iran [26–28]. We analyzed data from the general population sample in this study. All residents of 22 municipality areas of Tehran aged 15–50 years during 2015 (nearly 5.11 million persons) constituted the reference population. The telephone survey was conducted by standard random digit dialing (RDD) protocol. We randomly selected the study sample from the 15–50 year old general population as described previously [26]. The participants were selected proportional to population size of each of the 22 areas of Tehran. We tried to give a nonzero probability of selection to all residential households with telephone. We randomly generated 4457 numbers; 2856 of those were inactive or non-residential numbers. From the 1601 residential and active numbers, we did not find any eligible person in 91 households (5.7%), yielding 1510 (94.3%) contactable households with at least one eligible individual. To select one eligible individual per household, we used the Kish method [29,30]. Finally, the full interview was done in 1057 (response rate = 70.0%) of 1510 contactable households with at least one eligible member. Each interview took on average 15 min.

2.1. Data collection

Phone interviews were conducted by 10 trained interviewers, selected for their strong communication and interview skills, using standardized data collection procedures. The data collection activities were monitored for any interviewer bias by randomly recording interviews. At the start of each interview, the main study objectives were fully elucidated to the study participants. We obtained verbal informed consent from all participants. The study was approved by the ethics committee of Tehran University of Medical Sciences (approval number: 127334–26,145–188-02-93).

2.2. Measurement

We obtained data on self-rated health (SRH) based on a single question: "How would you rate your general health status?" rated along a 5-point numeric scale as suggested by WHO [31]. The scores ranged from 5 to 1 (very satisfied, satisfied, neither satisfied nor unsatisfied, dissatisfied, and very dissatisfied). This was used as a proxy for measuring the overall health level of participants [5,14]. Its reliability and predictive validity has been published previously [6,8,32].

2.3. Subjective and objective SES

In current study, we used several indicators for SES i.e. objective ones (participants' education level as well as parental education level (as a proxy for SES during adolescence) and subjective ones (MacArthur's Scale of Subjective Social Status) [24].

2.4. Subjective SES (for both current and adolescent period)

Subjective socioeconomic status (sSES) was rated by the participants being asked to imagine a ladder with 10 stairs with the following

instruction: "Imagine a ladder with 10 stairs representing where people stand in Tehran. At the top level of the ladder, there are those with the most money and the highest education and job situation. Conversely, at the bottom, there are those with the least money, and the poorest education and the worst job situations, i.e., the higher the stairs, the better the social status and vice versa." The participants were then requested to select the stair that best shows their socio-economic status in Tehran society twice: for the current time and for the time during their adolescence [33] allowing us to calculate a deterioration (when current SES was worse than adolescent SES), no change (when current and adolescent SES was similar) or improvement (when current SES was better than adolescent SES) in sSES over time. For analyses, the 10-item score of sSES was transformed into 5 categories. This scale has been shown to have good reliability and validity [24,34,35].

2.5. Objective SES (oSES)

We obtained the participants' years of schooling as a proxy for objective SES by asking the self-reported number of successful years of schooling and University. For each participant the data on the following education variables were separately obtained; i) The number of participants' successful years of schooling as well as ii) the parental years of schooling during the participants' adolescence (i.e. illiterate or primary school, guidance school, high school, associate's or bachelor's degree and master's degree and higher). The parental years of schooling during the participants' adolescence was also obtained as another proxy for past oSES i.e. during the participants' adolescence.

2.6. Smoking

Participants were asked whether they ever smoked waterpipe at least once a week for a minimum 6 months. Then detailed information on duration (years), amount (average frequency per week) was also obtained. The total amount of waterpipe smoking was calculated by multiplying the average frequency per week by 52 weeks and the duration (years) [36]. We also obtained information relating cigarette smoking history (total duration (years), average amount smoked per day, converted to pack-years), second hand smoking (ever lived with anyone who regularly smoked, duration (years), timing (before/after or during 13–19 years)) [37].

2.7. Statistical methods

Categorical and continuous data were described as percent and mean (SD), respectively. In bivariate analysis, several variables were examined to detect their potential confounding role including age, gender, marital status, and cigarette smoking. The interaction between the key variables of interest was examined. The linear regression model assumptions were tested and found to have been met for homoscedasticity, linearity, and normality of residuals. We included potential confounding variables i.e. smoking, age and sex to the final regression models. The significance level was set at $P < .05$. All analyses were performed using STATA version 14.0 software (Stata Corporation, College Station, TX).

3. Results

The detailed participant recruitment flow-chart is shown in Fig. 1. The respose rate was 70% and 48.5% of the participants were male. While 2.5% of participants had schooling year of less or equal to primary school, 50.5% of them had universal edjucation level. More than 67% of recruited sample rated their health as satisfied or very satisfied. The mean age of the 1057 analyzed participants was 31.3 years and 51.5% were female. The majority of participants were < 40 years old. The mean (SD) of current sSES was 3.27 (0.99). While 187 (18.8%) of participants rated their sSES as low or very low, 424 (42.6%) had rated
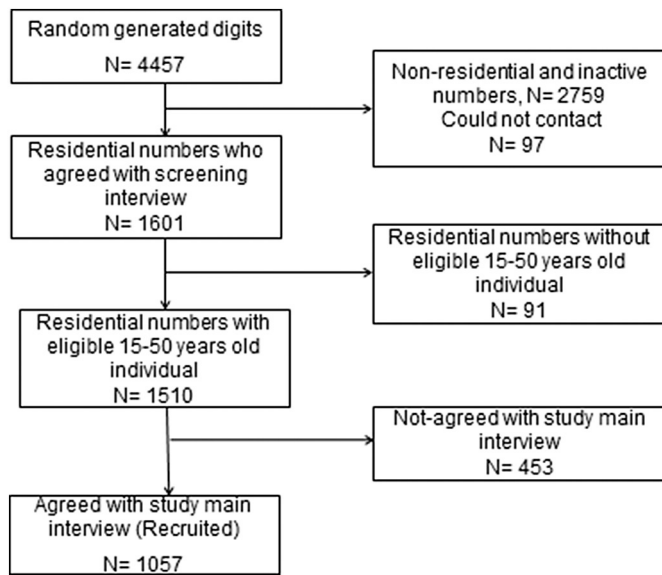
Fig. 1. Detailed recruitment flow-chart of participants, Tehran, 2015.

their sSES as high or very high. The SRH of > 68% participants was rated as satisfied or very satisfied. In bivariate analysis, a higher proportion of females reported better SES (58.2 vs. 41.7, $p = .007$). Those who reported higher SES was significantly younger than those who were in lower SES level ($p = .004$). Interestingly, while 100% of those with higher SES rated their health as satisfied or very satisfied, reversely, all of those with lower SES rated their health equal or less than "neither satisfied nor dissatisfied" ($p < .001$) (Table 1).

3.1. SRH and its determinants

Except for sSES, the other covariates showed a negative association with current SRH.SRH decreased with increasing age and female people as well as smokers had significantly worse reported SRH. High sSES was

the most important predictor of high SRH (Table 2).

The correlations between all types of sSES and oSES were statistically significant ($p < .003$) (data not shown). All SES measures i.e. objective and subjective indicators were independently associated with SRH. Importantly, increases in all of SES variables were consistently associated with an increase in SRH. Improvement in sSES i.e. current sSES vs. adolescent sSES significantly increased the SRH ($P < .05$). Similarly, parents with more years of schooling significantly had a better SRH ($P < .05$). Among SES indicators, the current sSES demonstrated the strongest association with SRH. All of these associations remained after adjustment for age, sex and cigarette smoking (Table 3). Neither father's nor mother's ethnicity was associated with the SRH (data not shown).

4. Discussion

In this study we provided cross-sectional evidence of the role of several variables including objective and subjective SES, socio-economic development, in general (cross-sectionally) but also over time (representing adolescence vs. current status) as well as history of diagnosed depression in participants' self-rated health. Higher objective and subjective indicators were consistently associated with an increase in SRH. Importantly, improvement in current SES vs. adolescence SES enhanced the participants' SRH after adjustment for potential confounders. Female participants, drug users and those with a history of depression reported significantly worse SRH. Increasing in age was also associated with decrease SRH in Iranian adults. We identified high SES as the most important predictor of high SRH.

We observed a consistent finding demonstrating a positive association between both sSES and oSES with overall health which likely reinforces the validity of the study findings. Increases in both current and adolescent sSES were consistently associated with a significant increase in SRH. This finding is in line with the literature [38–46]. In a meta-analysis by Cundiff JM et al. conducted in 2017, the authors concluded that sSES was apparently associated with SRH [45]. In other meta-analysis and reviews sSES has been reported as a predictor for several adverse health outcomes [42–44]. Both oSES and sSES have been demonstrated as important predictors for mental health [43]. Some

Table 1
Characteristics of 1057 general population, Tehran, 2015.

Variables	Total	SES	SES	P
	N (%)	(1–3)	(4–5)	
Gender				
Male	513 (48.53)	288 (50.44)	177 (41.75)	–
Female	544 (51.47)	283 (49.56)	247 (58.25)	0.007
Age (years); mean (SD)	31.3 (9.3)	32.40 (9.12)	30.73 (8.97)	0.004
Age (years)				
< 20	136 (12.9)	57 (10.00)	47 (11.08)	0.002
20 to < 30	349 (33.1)	175 (30.70)	163 (38.44)	
30 to < 40	362 (34.3)	207 (36.32)	142 (33.49)	
40–50	209 (19.8)	131 (22.98)	72 (16.98)	
Marital status				
Single	462 (43.9)	183 (43.26)	236 (41.55)	0.59
Married	591 (56. 1)	240 (56.74)	332 (58.45)	
Participants' years of schooling				< 0.001
Illiterate or primary school (age 7–11 yrs)	26 (2.5)	20 (3.50)	5 (1.18)	
Guidance school (age 12–14 yrs)	60 (5.7)	43 (7.53)	15 (3.54)	
High school (age 15–18 yrs)	437 (41.3)	252 (44.13)	147 (34.67)	
Associate's or Bachelor's degree	441 (41.7)	222 (38.88)	203 (47.88)	
Master's degree and higher	93 (8.8)	34 (5.95)	54 (12.74	
Years of schooling; median (range)	13 (24)	12 (23)	14 (24)	< 0.001
Self-rated health				
1 (Very dissatisfied)	11 (1.04)	11 (3.32)	0 (0.00)	< 0.001
2 (Dissatisfied)	87 (8.24)	87 (26.28)	0 (0.00)	
3 (Neither satisfied nor dissatisfied)	233 (22. 06)	233 (70.39)	0 (0.00)	
4 (Satisfied)	569 (53.88)	0 (0.00)	569 (78.48)	
5 (Very satisfied)	156 (14.77)	0 (0.00)	156 (21.52)	

Table 2

A multiple linear regression model demonstrating standardized and unstandardized coefficient of predictors of SRH in Iranian adults, Tehran, 2015.

Variables	Crude coefficients (95%CI)	Adjusted coefficients (95% CI)	Beta (standardized coefficients)	P
Age	−0.013 (−0.019, −0.008)	−0.008 (−0.014, −0.002)	−0.088	**0.005**
Female gender	−0.212 (−0.314, −0.110)	−0.305 (−0.418, −0.192)	−0.179	**< 0.001**
sSES (Current)	0.143 (0.090, 0.196)	0.146 (0.093, 0.198)	0.169	**< 0.001**
Cigarette smoking				
Never		1	–	–
< 5 pack-year	0.003 (−0.138, 0.144)	−0.139 (−0.0290, 0.012)	−0.060	0.07
≥ 5 pack-year	−0.378 (−0.629, −0.127)	−0.456 (−0.714, −0.197)	−0.111	**0.001**

Bold values indicates statistically significance

Table 3

Six multilinear regression models representing the adjusted association between different indicators of SES and SRH in Iranian adults, Tehran, 2015.

Variables		Unadjusted coefficients (95% CI)	Adjusted coefficients (95% CI) *	Beta (standardized coefficients)	P
sSES					
Model 1	sSES (current)	0.146 (0.093, 0.198)	0.137 (0.086, 0.189)	0.169	< 0.001
Model 2	sSES (adolescent)	0.069 (0.017, 0.122)	0.065 (0.013, 0.118)	0.075	0.015
Model 3	Change in sSES (current vs. adolescent)				
	Deterioration in SES			–	–
	No change in SES	0.148 (−0.011, 0.310)	0.098 (−0.058, 0.254)	0.057	0.22
	Improvement in SES	0.203 (−0.045, 0.361)	0.170 (0.015, 0.325)	0.010	0.032
oSES					
Model 4	Participants' years of schooling (years)	0.022 (0.001, 0.041)	0.023 (0.007, 0.038)	0.087	< 0.001
Model 5	Mother years of schooling level in 15th				
	Illiterate or primary school (age 7–11 yrs)			–	–
	Guidance or high school (age 12–18 yrs)	0.193 (0.084, 0.303)	0.125 (0.006, 0.245)	0.073	0.039
	Associate's or Bachelor, Master and higher	0.349 (0.176, 0.523)	0.222 (0.036, 0.408)	0.082	0.019
Model 6	Father years of schooling level in 15th				
	Illiterate or primary school (age 7–11 yrs)			–	–
	Guidance or high school (age 12–18 yrs)	0. 222 (0.106, 0.337)	0.155 (0.0031, 0.279)	0.091	0.014
	Associate or Bachelor, Master and higher	0.267 (0.124, 0.409)	0.181 (0.028, 0.333)	0.086	0.020

All six models were adjusted for age, sex and cigarette smoking.

researchers suggest that the sSES could be used as a more practical predictor of health and also change in health over time than oSES [35]. In the Korean Longitudinal Study of Aging (KLoSA) which longitudinally analyzed the data from 8250 individuals the authors found that sSES could play a role in overall quality of life [46]. In both crude and adjusted analyses, the economic status (47.8%) as well as the level of education (29.2%) were the main contributors to inequality in SRH in Nedjat S et al. study conducted on 2464 residents of Tehran in 2008 in Iran [47].

Interestingly, we found that improvement in sSES (current vs. adolescent sSES) were associated with an increase in overall health. In a 16 year longitudinal analysis of the annual Swedish Survey of Living Conditions, Björn Halleröd et al. reported that changes in job-related prestige as well as income is associated with changes in health [48].

Female and older-age respondent reported worse SRH. There are inconsistent reports regarding the gender differences in SRH. While there is no reported sex difference in self-rated poor health in some papers [49,50], women have reported worse SRH in other studies [51,52]. However, better rated SRH by younger people is supported by the literature [47,49,51,52]. SRH may reflect different aspects of health in various populations. Similarly, the potential role of several context-based factors including demographic and socioeconomic variables should be considered when exploring the reported SRH in different cultures [53]. Evidence shows that there is cross-country differences in reported SRH [54]. Wiking et al. in a study among immigrants from Poland, Turkey, and Iran compared to Swedish-born participants found that ethnicity is associated with poor SRH. Moreover, acculturation, and discrimination have been reported as two important factors in the underlying pathway between ethnicity and poor SRH [55].

As expected, we found a significant association between cigarette smoking and poor SRH. Importantly, there was an apparent dose-response pattern between the amount of smoking and poorer SRH (p = .001). Consistent with this finding, nonsmokers in the study by Dong et al. of Shanghai residents (≥ 60 years old, n = 2001), reported a better SRH [51]. Wang MP et al. in a cross-sectional study of 36,225 randomly selected Chinese adolescents have reported that smoking behavior plays a role in poor SRH [56]. Inconsistently, in a cross-sectional study on national representative samples in Italy and Serbia, smoking could not predict SRH [57]. In the CASPIAN study recruited 6640 girls and 6846 boys in Iran, the 'non-smokers' reported the highest proportions of better SRH [58].

The results of our current study should be interpreted considering a number of limitations. Temporality should be considered as one of the well-known limitations of cross-sectional observational data. The inability to determine temporality between SRH and its predictors from cross-sectional surveys precludes us from drawing causal conclusions with respect to the identified associations. We used parental years of schooling and participants' years of schooling as a proxy for participants adolescent and current SES, respectively. However, this is only a proxy for SES and further researches should consider the other valid scales for SES. Although a single-item SRH question is well-acknowledged as a reliable and valid tool, it would be more reasonable to measure the main outcome of this study using a more ideal multi-item scale. The response rate (70%) in this study was found to be satisfactory. Although the usefulness and efficacy of RDD sampling as well as its similarity with address-based sampling were previously demonstrated [59–61], some possibility of selection bias may still have remained. This could affect the validity of study findings. There was the possibility of the underreporting in particular with respect to the sensitive behaviors. Moreover, as Iran is experiencing a large amount of political and economic turmoil, there would be a lot of political and economic uncertainty affecting SES, stress, depression, SRH, as well as the inter-

relation between them. These noises may have impacted the results of this study and considering the role of them is recommended for drawing a better conclusion on the study results.

5. Conclusion

Our assessment of population-level determinants of health suggests that promoting economic development can have profound effects on the health of the adult population. High sSES was the most important predictor of high SRH. The comparable reported finding between subjective and objective measures of SES and SRH underscores the similarity of sSES and oSES performance in health assessment and perhaps no need to simultaneously measure both of them in the future studies.

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Declaration of competing financial interests

The authors declare they have no actual or potential competing financial interests.

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