

## RESEARCH ARTICLE

# The relationship between happiness and self-rated health: A population-based study of 19499 Iranian adults

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## Abstract

### Background

Health is one of the most important factors that affect happiness. This study aimed to assess the association between happiness and self-rated health among the Iranian adult population.

### Methods

This cross-sectional study was conducted on a sample of adults aged 18–65 in Iran in 2020. Demographic information, the Oxford Happiness Questionnaire, and a single item on self-rated health were used to collect the data. The relationship between happiness with demographic variables and self-rated health was examined by performing logistic regression analyses.

### Results

In all, 19499 were studied (9845 males and 9654 females). The mean age of participants was  $36.38 \pm 8.17$  years. The mean happiness score was  $4.1 \pm 0.57$  (out of 6) and this for self-rated health was  $3.66 \pm 1.2$  (out of 5). The results obtained from logistic regression analysis showed that very poor health status (OR: 5.114, 95% CI,  $P = 4.490\text{--}5.824$ ,  $p < 0.001$ ), poor or very poor income status (OR: 1.553, 95% CI,  $P = 1.406\text{--}1.716$ ,  $p < 0.001$ ), unemployment (OR: 1.704, 95% CI,  $P = 1.432\text{--}2.029$ ,  $p < 0.001$ ), being aged 25–34 years (OR: 1.190, 95% CI,  $P = 1.088\text{--}1.302$ ,  $p < 0.001$ ), and years of education (OR for 10–12 years of education: 1.271, 95% CI = 1.174–1.377,  $p < 0.001$ ) were significant contributing factors to a lower happiness.

### Conclusion

The results showed that self-rated health was the most significant factor that affected happiness even after adjustment for socioeconomic variables, including age, income,

## OPEN ACCESS

**Citation:** Mohammadi S, Tavousi M, Haeri-Mehrizi AA, Naghizadeh Moghari F, Montazeri A (2022) The relationship between happiness and self-rated health: A population-based study of 19499 Iranian adults. PLoS ONE 17(3): e0265914. <https://doi.org/10.1371/journal.pone.0265914>

**Editor:** Forough Mortazavi, Sabzevar University of Medical Sciences, ISLAMIC REPUBLIC OF IRAN

**Received:** September 7, 2021

**Accepted:** March 10, 2022

**Published:** March 23, 2022

**Peer Review History:** PLOS recognizes the benefits of transparency in the peer review process; therefore, we enable the publication of all of the content of peer review and author responses alongside final, published articles. The editorial history of this article is available here: <https://doi.org/10.1371/journal.pone.0265914>

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**Data Availability Statement:** All relevant data are within the manuscript and its [Supporting information](#) files.

**Funding:** AM was supported by the Elite Researcher Grant Committee under award number [982978] from the National Institutes for Medical Research Development (NIMAD), ([www.nimad.ac.ir](http://www.nimad.ac.ir)), Tehran, Iran. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

**Competing interests:** The authors declare that they have no competing interests.

employment, and education. Indeed, improving population health might be an effective measure to improve happiness among Iranians.

## Introduction

The World Health Organization emphasizes that happiness is an essential factor in the concept of health [1,2] and is one of the main components of life satisfaction [3]. People who consider themselves happy have better physical health than people who think themselves unhappy [4]. Veenhoven defines happiness as ‘the degree to which an individual judges the overall quality of his or her life-as-a-whole favorably’; in other words, ‘how much one likes the life one lives’ [5].

According to the world happiness report (2017–2019), the highest and lowest happiness scores were for Finland and Afghanistan, respectively. The Islamic Republic of Iran ranked 118th among 153 countries. Although happiness score in Iran was lower than some countries in the Eastern Mediterranean Region (EMRO), such as Saudi Arabia, Pakistan, Morocco, but was higher than some other countries including Jordan, Tunisia, and Egypt [6].

One of the most frequently used measures of self-reported health status is a single question asking individuals to rate their overall health on a scale from excellent to very poor. There is widespread agreement that this simple global question provides a useful summary of how individuals perceive their overall health status [7]. The results of a cross-national study that compared health in Egypt, Iran, Jordan, and the United States showed that means and standard deviations of self-rated health by country was ( $2.79 \pm 0.85$ ), ( $2.99 \pm 0.81$ ), ( $3.06 \pm 0.83$ ), and ( $3.23 \pm 0.78$ ), respectively [8].

The association between happiness and health or association between happiness and some health-related behaviors are well documented. For instance, a review on subjective well-being (popularly referred to as happiness or life satisfaction) reported that higher subjective well-being was associated with good health and longevity, better social relationships, work performance, and creativity [9]. Also, a recent study from 15 European countries reported that compared to inactive people, there was a positive dose-response association between physical activity volume and happiness [10]. A review including longitudinal and experimental studies, have found strong associations between happiness and health outcomes [11] such as death, coronary heart disease (CHD) [12,13], stroke [14], type 2 diabetes [15] and life expectancy [16]. As such, it is argued that impaired happiness might be a consequence of ill-health but also could potentially contributor to the risk of several diseases since happiness includes affective well-being (feelings of joy and pleasure), eudemonic well-being (sense of meaning and purpose in life), and evaluative well-being (life satisfaction) [17].

Although an association between health status and happiness depends on how health is measured [18], a study showed that the relationship between happiness and self-rated health is somewhat more robust than the correlations between happiness and medical examinations [19]. Self-rated health is a widespread health measure that is based on personal perception of one’s about their own health. It is a reliable measure, especially when objective data are insufficient to reflect disease severity or in patients with the undiagnosed disease [20].

Although there are several many Iranian studies on happiness [21], it seems that the relationship between happiness and health is overlooked. There is no national study in Iran, unlike other countries [22–26]. Thus to fill the gap, this national study aimed to investigate the

relationship between happiness and health in Iran to contribute public health, health policy, and the existing knowledge on the topic.

## Materials and methods

### Design and participants

This was a national cross-sectional study conducted from 10 January to 20 January 2020 throughout all provinces in Iran. Currently Iran has 32 provinces with over 80 million populations. The inclusion criteria were aged 18–65, Iranian nationality, able to respond to the study questionnaires. No other restrictions were implemented.

### Sample size and sampling

The following formula was used to estimate the sample size:

$$n = \frac{z_{\alpha/2}^2 pq}{(rq)^2}$$

To estimate the sample size, according to a national study [27], and based on population density, the country was classified into five categories. Then, samples were selected based on multi-stage sampling from each category. In doing so, one province was randomly selected from each category. Then two cities and two rural settings were randomly selected in each province. Every household within the city and rural areas had the same probability of being sampled. The households to be sampled were selected using systematic sampling within each census section. Finally, sampling units (the individuals) were selected randomly from all eligible persons living in the same household. Informed consent was obtained from each individual after the purpose of the study was explained. Considering the effect size of 1.4, the sample size of 20320 was estimated. However, in practice, 19499 Iranian adults were entered into the study.

### Measures

1. The Oxford standard Happiness Questionnaire (OHQ): The overall happiness score could be derived from some of the items scores divided by 29, giving a score range from 1 to 6 (strongly disagree = 1, moderately disagree = 2, slightly disagree = 3, slightly agree = 4, moderately agree = 5, strongly agree = 6). The scores are interpreted as follows: Unhappy (1 to <2); moderately unhappy (2 to <3); not very happy/unhappy (3 to <4); somewhat happy/moderately happy (4); rather happy/pretty happy (4 to <5); very happy (5 to <6); too happy (6) [28]. Psychometric properties of the Iranian version of questionnaire are well documented. Cronbach's alpha coefficient (measure of internal consistency) and interclass correlation coefficient (measure of stability) were 0.90 and 0.79, respectively. The convergent and divergent validity of the questionnaire were high and acceptable [29].

2. Self-rated health: Self-rated health was assessed by a single item asking people to rate their general health status at present. Respondents self-rated their health status on a 5-point Likert scale as follows: very poor = 1, poor = 2, fair = 3, good = 4, very good = 5. The validity of self-rated health measures has been proven in several studies [30–32]. Validity and reliability of self-rated health measure among Iranian showed acceptable results. The criterion validity showed that the self-rated health and the WHO-5 well-being had positive correlation as expected ( $r = 0.5$ ,  $p < 0.001$ ). Additionally, the reliability of the self-rated health, using interclass correlation coefficient (ICC), was found to be 0.83; 95% CI (0.72 to 0.90) [32].

## Statistical analysis

Data were explored using descriptive statistics, including frequency, percentage, mean and standard deviation. The missing data were replaced with each item series mean. Logistic regression analyses were performed to assess the relationship between happiness and independent variables, including participants' health status. However, since some eminent scholars [33] believe that there is an auto-correlation between item 28 and the self-rated health, we did calculate, and reanalyze the data while item 28 (I do not feel particularly healthy) was excluded from the Oxford happiness score. As such for both with and without item 28 of the Oxford questionnaire, happiness as dependent variables were categorized into: 'happy' (scores ranging from 4 to 6) and 'unhappy' (scores ranging from 1 to 3). The results expressed as odds ratio and 95% confidence intervals. A significant level was set at  $P < 0.05$ . Since this questionnaire covers broader matters than happiness [33], we calculated correlations for the few items on life satisfaction with self-rated health separately.

## Ethics statement

The National Institutes for Medical Research Development (NIMAD), Tehran, Iran. ethics committee approved the study (IR.NIMAD.REC.I398.228). Due to the study design and all participants gave their verbal consent.

## Results

A total of 19499 Iranian adults participated in the study (9845 males and 9654 females). The mean age of participants was  $36.38 \pm 8.17$  years and the mean years of education were  $10.51 \pm 4.43$ . Demographic details of the participants are presented in [Table 1](#).

The results showed that the mean happiness score was  $4.1 \pm 0.57$  (out of 6), and this was  $3.66 \pm 1.2$  (out of 5) for self-rated health. Overall, 51.6% of the respondents scored more than four and less than 5, indicating a rather happy/pretty happy condition ( $4 >$  to  $< 5$ ). The findings also showed that 34.8% of the participants reported their health status as very good, and % 6.9 reported their health status as very poor. The detailed results are shown in [Table 2](#). In addition, the results obtained from correlation between few items on life satisfaction and self-rated health in are presented in [Table 3](#). Overall the findings showed a relatively low correlation ( $r = 0.15$ ).

The results obtained from logistic regression analysis showed that people with very poor health status (OR: 5.114, 95% CI,  $P = 4.490$ – $5.824$ ,  $p < 0.001$ ), people with poor or very poor income level (OR: 1.553, 95% CI,  $P = 1.406$ – $1.716$ ,  $p < 0.001$ ), unemployed (OR: 1.704, 95% CI,  $P = 1.432$ – $2.029$ ,  $p < 0.001$ ), aged (OR: 1.190, 95% CI,  $P = 1.088$ – $1.302$ ,  $p < 0.001$ ), and people with 10–12 years of education (OR:1.271, 95% CI,  $P = 1.174$ – $1.377$ ,  $p < 0.001$ ) were more likely to report a lower score for happiness. The results are shown in [Table 4](#). In addition, the results obtained from the same analysis when items 28 was excluded are shown in [Table 5](#). The results almost were very similar and no significant difference was observed from the previous analysis except age for 18–24 (OR:1.191, 95% CI,  $P = 1.038$ – $1.367$ ,  $p = 0.013$ ) and 6–9 years of education (OR:1.118, 95% CI,  $P = 1.024$ – $1.221$ ,  $p = 0.013$ ).

## Discussion

This study investigated the relationship between happiness and self-rated health in 19499 adults aged 18 to 65 years in Iran. To the best of our knowledge, this is the first Iranian national study that investigates the relationship between happiness and self-rated health among adult populations in Iran, a country located in a conflict area, and faces several challenges, including

Table 1. Frequency distributions of the participants' demographic characteristics.

	Female (n = 9845)	Male n = 9654)	Total) n = 19499)
	No. (%)	No. (%)	No. (%)
<b>Age(year)</b>			
18–24	982(10.0)	278(2.9)	1260(6.5)
25–34	3914(39.8)	3190(33.0)	7104(36.4)
35–44	3614(36.7)	3846(39.8)	7460(38.3)
45–65	1335(13.6)	2340(24.2)	3675(18.8)
<b>Education (year)</b>			
1–5	2062(20.9)	1353(14.0)	3415(17.5)
6–9	2163(22.0)	2211(22.9)	4374(22.4)
10–12	3304(33.6)	3109(32.2)	6413(32.9)
13≤	2316(23.5)	2981(30.9)	5297(27.2)
<b>Employment status</b>			
Employed	1150(11.7)	8478(87.8)	9628(49.4)
Housewife	8470(86.0)	0(0.0)	8470(43.4)
Retired	39(0.4)	389(4.0)	428 (2.2)
Student	180(1.8)	151(1.6)	331(1.7)
Unemployed	6(0.1)	636(6.6)	642(3.3)
<b>Income (self-reported)</b>			
Very good/ good	2323(23.6)	2007(20.8)	4330(22.2)
Intermediate	5962(60.6)	5862(60.7)	11824(60.6)
Very poor/poor	1560(15.8)	1785(18.5)	3345(17.2)

<https://doi.org/10.1371/journal.pone.0265914.t001>

Table 2. Overall distribution of Oxford happiness scores and self-rated health scores (n = 19499).

	Frequency	Percent
<b>Happiness (score range)</b>		
Unhappy (1 to < 2)	11	0.1
Moderately unhappy (2 to < 3)	474	2.4
Not very happy/unhappy (3 to <4)	7600	39.0
Somewhat happy/moderately happy (4)	329	1.7
Rather happy/pretty happy (4> to <5)	10059	51.6
Very happy (5 to <6)	1022	5.2
Too happy (6)	4	0.0
Mean (SD)	4.10 (0.57)	
<b>Happiness without item 28</b>		
Mean (SD)	4.09 (0.57)	
<b>Self-rated health</b>		
Very poor	1348	6.9
Poor	2349	12.0
Fair	4494	23.0
Good	4530	23.2
Very good	6778	34.8
Mean (SD)	3.66 (1.2)	-

<https://doi.org/10.1371/journal.pone.0265914.t002>

**Table 3. Correlation between the oxford happiness questionnaire few items on life satisfaction and self-rated health.**

	Correlation coefficient
I don't feel particularly pleased with the way I am(R)	0.08
I feel that life is very rewarding	0.12
Life is good	0.13
I do not think that the world is a good place (R)	0.11
I am well satisfied about everything in my life	0.11
Total	0.15

<https://doi.org/10.1371/journal.pone.0265914.t003>

economic sanctions. However, the data presented in the current study confirmed that happiness, to a large extent, is dependent on health and some socioeconomic factors related to income and employment. Specifically, although the findings add a little to knowledge, the main rationale for the study could be that this relation was explored in the Iranian context. In doing so it was suggested to examine the relationship between item 15 of the Oxford

**Table 4. Relationship between Oxford happiness scores, health status and demographic variables.**

	Univariate regression		Multivariate p value regression	
	OR(95% CI)	p value	OR(95% CI)	p value
<b>Age (years)</b>				
45–65	1.00 (ref)	-	1.00(ref)	-
35–44	1.203 (1.109–1.305)	<0.001	1.161(1.064–1.268)	0.001
25–34	1.251 (1.152–1.357)	<0.001	1.190(1.088–1.302)	<0.001
18–24	1.274(1.118–1.405)	<0.001	1.136(0.987–1.307)	0.075
<b>Gender</b>				
Male	1.00 (ref)	-	1.00(ref)	-
Female	1.117(1.055–1.183)	<0.001	1.021(0.899–1.160)	0.747
<b>Education level (years)</b>				
13≤	1.00(ref)	-	1.00(ref)	-
10–12	1.334(1.238–1.437)	<0.001	1.271(1.174–1.377)	<0.001
6–9	1.130(1.041–1.227)	0.004	1.041(0.951–1.139)	0.387
1–5	1.284(1.176–1.401)	<0.001	1.129(1.024–1.245)	0.015
<b>Employment</b>				
Employed	1.00(ref)	-	1.00(ref)	-
Housewife	1.231(1.160–1.306)	<0.001	1.231(1.079–1.403)	0.002
Retired	0.798(0.650–0.979)	0.031	0.877(0.703–1.093)	0.243
Student	1.333(1.070–1.662)	0.010	1.430(1.130–1.810)	0.003
Unemployed	2.261(1.922–2.660)	<0.001	1.704(1.432–2.029)	<0.001
<b>Income status(self-reported)</b>				
Good/Very good	1.00(ref)	-	1.00(ref)	-
Intermediate	1.030(0.959–1.106)	0.418	0.997(0.925–1.075)	0.937
Poor/Very poor	1.708(1.559–1.871)	<0.001	1.553(1.406–1.716)	<0.001
<b>Self-rated health</b>				
Very good	1.00(ref)	-	1.00(ref)	-
Good	1.147(1.060–1.242)	0.001	1.144(1.056–1.239)	0.001
Fair	1.419(1.312–1.534)	<0.001	1.417(1.310–1.534)	<0.001
Poor	3.062(2.779–3.373)	<0.001	3.085(2.798–3.403)	<0.001
Very Poor	5.073(4.461–5.768)	<0.001	5.114(4.490–5.824)	<0.001

<https://doi.org/10.1371/journal.pone.0265914.t004>

Table 5. Relationship between Oxford happiness scores (without item 28), health status and demographic variables.

	Univariate regression		Multivariate p value regression	
	OR(95% CI)	p value	OR(95% CI)	p value
<b>Age (years)</b>				
45–65	1.00 (ref)	-	1.00(ref)	-
35–44	1.230 (1.136–1.332)	<0.001	1.200(1.102–1.307)	<0.001
25–34	1.254 (1.158–1.359)	<0.001	1.211(1.110–1.323)	<0.001
18–24	1.315(1.157–1.495)	<0.001	1.191(1.038–1.367)	0.013
<b>Gender</b>				
Male	1.00 (ref)	-	1.00(ref)	-
Female	1.123(1.061–1.188)	<0.001	1.033(0.913–1.169)	0.609
<b>Education level (years)</b>				
13≤	1.00(ref)	-	1.00(ref)	-
10–12	1.374(1.277–1.479)	<0.001	1.308(1.209–1.414)	<0.001
6–9	1.215(1.121–1.316)	<0.001	1.118(1.024–1.221)	0.013
1–5	1.326 (1.216–1.445)	<0.001	1.168(1.062–1.285)	0.001
<b>Employment</b>				
Employed	1.00(ref)	-	1.00(ref)	-
Housewife	1.234(1.164–1.309)	<0.001	1.192(1.049–1.354)	0.007
Retired	0.815(0.669–0.993)	0.042	0.916(0.742–1.131)	0.417
Student	1.332(1.069–1.659)	0.010	1.415(1.121–1.787)	0.004
Unemployed	2.212(1.872–2.614)	<0.001	1.623(1.360–1.938)	<0.001
<b>Income status(self-reported)</b>				
Good/Very good	1.00(ref)	-	1.00(ref)	-
Intermediate	1.069(0.996–1.146)	0.063	1.032(0.959–1.110)	0.400
Poor/Very poor	1.812(1.654–1.986)	<0.001	1.642(1.488–1.812)	<0.001
<b>Self-rated health</b>				
Very good	1.00(ref)	-	1.00(ref)	-
Good	1.125(1.043–1.214)	0.002	1.123(1.040–1.213)	0.003
Fair	1.326(2.229–1.431)	<0.001	1.324(1.226–1.429)	<0.001
Poor	2.653(2.407–2.925)	<0.001	2.672(2.421–2.984)	<0.001
Very Poor	4.134(3.626–4.714)	<0.001	4.148(3.633–4.736)	<0.001

<https://doi.org/10.1371/journal.pone.0265914.t005>

Happiness Questionnaire (I am very happy) and self-rated health and see how the correlation compares with similar findings among other nations. The result showed that the correlation between item 15 and self-rated health is about 0.12 well below findings from other countries (see S1 Appendix) [34].

Although 2020 coincided with the Covid-19 pandemic, and Covid-19 as a health-threatening factor can affect the level of happiness [35], we were fortunate to collect the data before the pandemic began in Iran. The first tow of deaths related to COVID-19 was reported on February 19, 2020, in Iran [36] while we collected the data in early January 2020.

The findings suggest that individuals who reported lower health status were more likely to report unhappiness even after controlling for various demographic and socioeconomic factors. This result is in good agreement with those of previous investigations where it has been reported that self-rated health is an important determinant of happiness, or quantitatively much more important than other demographic and economic characteristics [37,38]. Similar studies, showing that when people suffer from a severe illness or are in pain, their capacity for

happiness is impaired. For example, chronic physical disease, mood, anxiety, and other mental disorders can significantly reduce happiness [39].

Also, the current study showed that employment status and income independently influenced happiness. Unemployed people are more likely to be unhappy than employed people, and people who reported lower income levels were more likely to be unhappy than those who had higher income. These results support a previous study that demonstrated that happy people were more likely to be employed and earn more than unhappy people [40]. The finding from another study that investigated the association between income and happiness in East and South Asia, including China, Singapore, Japan, India, Malaysia, Philippines, South Korea, Thailand, Taiwan, Hong Kong, showed that associations between income and happiness were strongly significant in some countries, including South Korea and Taiwan [41]. Thus policies aimed at increasing employment and reducing income disparities may increase happiness in individuals.

### Strengths and limitations

The study benefited from relatively large sample size and included people living in rural and urban communities with different socio-economic backgrounds. Another notable strength was the precision of the data collection by the trained interviewers. However, one might consider the probability of a socially desirable response behavior in the direct contact between interviewers and respondents. Thus the interpretation of the results needs caution.

Multistage sampling can simplify data collection when we have large, geographically spread samples, and we can obtain a probability sample without a complete sampling frame. However, it can lead to unrepresentative samples because large sections of populations may not be selected for sampling. Since we used multistage sampling, the result might not be generalized to all Iranians.

One should bear in mind that the Oxford Happiness Questionnaire covers a wide range of traits rather than happiness in the sense of life satisfaction [33]. Perhaps in future studies, if we are going to measure happiness in the sense of life satisfaction, there is a need to use an appropriate measure. In addition, item 28 of the Oxford Happiness Questionnaire is about self-rated health, and thus it might cause autocorrelation with the self-rated health measure, although the item 28 and the measure of self-rated health are worded differently. The latter is negative (I do not feel particularly healthy) while the former is positive and asks people to rate their current health. However, as indicated in reanalysis of the data (Table 5), the findings did not show any major differences to our earlier analysis as shown in Table 4.

### Conclusion

The results obtained from the current study confirmed that a strong relationship exists between health and happiness. Self-rated health was the most influencing factor affecting happiness even after adjusting for socioeconomic variables. It seems that adopting policies to improve public health and placing health on the public agenda could be an effective approach for increasing happiness.

### Supporting information

**S1 Appendix. The correlations between health and happiness in selected studies.**  
(DOCX)

**S1 Dataset.**  
(SAV)



## Acknowledgments

The authors are grateful to all participants, who made this study possible.

## Author Contributions

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## References

1. World Health Organization (WHO). The world health report. Mental health: new understanding, new hope. 2001. [cited 2021 Sep 5]. [http://www.who.int/whr/2001/en/whr01\\_en.pdf?ua=1](http://www.who.int/whr/2001/en/whr01_en.pdf?ua=1) 2018.
2. Helliwell JF, Huang H, Wang S, Norton M. Social environments for world happiness. World Happiness Report 2020. 2020:13–45.
3. Luchesi BM, de Oliveira NA, de Morais D, de Paula Pessoa RM, Pavarini SCI, Chagas MHN. Factors associated with happiness in the elderly persons living in the community. Arch Gerontol Geriatr. 2018; 74:83–87. <https://doi.org/10.1016/j.archger.2017.10.006> PMID: 29040889
4. Lathia N, Sandstrom GM, Mascolo C, Rentfrow PJ. Happier people live more active lives: using smartphones to link happiness and physical activity. Plos One. 2017; 12(1): e0160589. <https://doi.org/10.1371/journal.pone.0160589> PMID: 28052069
5. Veenhoven R. The concept of happiness. In: Conditions of happiness; 1984. pp. 12–38.
6. JF, Layard R, Sachs J, De Neve JE. World happiness report 2020. [https://www.wellbeingintlstudiesrepository.org/hw\\_happiness/1/](https://www.wellbeingintlstudiesrepository.org/hw_happiness/1/).
7. Fayers PM, Sprangers MA. Understanding self-rated health. Lancet. 2002; 359(9302):187–188. [https://doi.org/10.1016/S0140-6736\(02\)07466-4](https://doi.org/10.1016/S0140-6736(02)07466-4) PMID: 11812551
8. Ajrouch KJ, Moaddel M. Social structure versus perception: A cross-national comparison of self-rated health in Egypt, Iran, Jordan, and the United States. In: Values and Perceptions of the Islamic and Middle Eastern Peoples. Palgrave Macmillan, New York; 2007. pp. 181–208.
9. Diener Ed, Oishi S, Tay L. Advances in subjective well-being research. Nat Hum Behav. 2018; 2(4):253–260. <https://doi.org/10.1038/s41562-018-0307-6> PMID: 30936533
10. Richards J, Jiang X, Kelly P, Chau J, Bauman A, Ding D. Don't worry, be happy: cross-sectional associations between physical activity and happiness in 15 European countries. BMC Public Health. 2015; 15(1):1–8. <https://doi.org/10.1186/s12889-015-1391-4> PMID: 25636787

11. Lyubomirsky S, King L, Diener E. The benefits of frequent positive affect: does happiness lead to success?. *Psychol Bull.* 2005; 131(6):803–855. <https://doi.org/10.1037/0033-2909.131.6.803> PMID: 16351326
12. Carney RM, Freedland KE. Depression and coronary heart disease. *Nat Rev Cardiol.* 2017; 14(3):145–155. <https://doi.org/10.1038/nrcardio.2016.181> PMID: 27853162
13. Boehm JK, Kubzansky LD. The heart's content: the association between positive psychological well-being and cardiovascular health. *Psychol Bull.* 2012; 138(4):655–91. <https://doi.org/10.1037/a0027448> PMID: 22506752
14. Li M, Zhang XW, Hou WS, Tang ZY. Impact of depression on incident stroke: a meta-analysis. *Int J Cardiol.* 2015; 180(2015):103–110. <https://doi.org/10.1016/j.ijcard.2014.11.198> PMID: 25438228
15. Hackett RA, Steptoe A. Type 2 diabetes mellitus and psychological stress a modifiable risk factor. *Nat Rev Endocrinol.* 2017; 13(9):547–560. <https://doi.org/10.1038/nrendo.2017.64> PMID: 28664919
16. Diener H, Loeb I. Constructive reverse investigations into differential equations. *J Log Anal.* 2011; 3(2011):1–26.
17. Steptoe A. Happiness and health. *Annu Rev Public Health.* 2019; 40:339–359. <https://doi.org/10.1146/annurev-publhealth-040218-044150> PMID: 30601719
18. Angner E, Ghandhi J, Purvis KW, Amante D, Allison J. Daily functioning, health status, and happiness in older adults. *J Happiness Stu.* 2013; 14(5):1563–1574.
19. Veenhoven R. Healthy happiness: Effects of happiness on physical health and the consequences for preventive health care. *J Happiness Stud.* 2008; 9(3):449–469.
20. Lora E. Health perceptions in Latin America. *Health Policy Plan.* 2012; 27(7):555–569. <https://doi.org/10.1093/heapol/czr078> PMID: 22198965
21. World database of happiness. Archive of research findings on subjective enjoyment of life. [cited 2022 March 8]. <https://worlddatabaseofhappiness.eur.nl/search-the-database/search-all/>.
22. Wang F, Orpana HM, Morrison H, De Groh M, Dai S, Luo W. Long-term association between leisure-time physical activity and changes in happiness: analysis of the prospective national population health survey. *Am J Epidemiol.* 2012; 176(12):1095–1100. <https://doi.org/10.1093/aje/kws199> PMID: 23171884
23. Pierewan AC, Tampubolon G. Happiness and health in Europe: a multivariate multilevel model. *Appl Res Qual Life.* 2015; 10(2):237–252.
24. Graham C, Zhou S, Zhang J. Happiness and health in China: the paradox of progress. *World Dev.* 2017; 96:231–244.
25. Yiengprugsawan V, Somboonsook B, Seubsman SA, Sleight AC. Happiness, mental health, and socio-demographic associations among a national cohort of Thai adults. *J Happiness Stud.* 2012; 13(6):1019–1029. <https://doi.org/10.1007/s10902-011-9304-4> PMID: 23304071
26. Lawrence EM, Rogers RG, Wadsworth T. Happiness and longevity in the United States. *Soc Sci Med.* 2015; 145:115–119. <https://doi.org/10.1016/j.socscimed.2015.09.020> PMID: 26421947
27. Montazeri A, Omidvari S, Azin A, Aeenparast A, Jahangiri K, Sadighi J, et al. Happiness among Iranians: findings from the Iranian health perception survey (IHPS). *Payesh.* 2012; 11(4):467–475. [Persian].
28. Hills P, Argyle M. The Oxford Happiness Questionnaire: a compact scale for the measurement of psychological well-being. *Pers Individ.* 2002; 33(7):1073–1082.
29. Najafi M, Dehshiri Gh, Dabiri S, Sheikhi M, Jafari N. Psychometric properties of Persian version of the Oxford Happiness Questionnaire among college students. *Educ Meas.* 2013; 3(10):55–74.
30. Agyemang C, Denktas S, Bruijnzeels M, Foets M. Validity of the single-item question on self-rated health status in first generation Turkish and Moroccans versus native Dutch in the Netherlands. *Public Health.* 2006; 120(6):543–550. <https://doi.org/10.1016/j.puhe.2006.03.002> PMID: 16684550
31. Chandola T, Jenkinson C. Validating self-rated health in different ethnic groups. *Ethn Health.* 2000; 5(2):151–159. <https://doi.org/10.1080/713667451> PMID: 10984833
32. Hosseini RS, Momtaz YA, Mohammadi-Shahboulaghi F, Sahaf R, Soroush MR. Validity and reliability of Self Rated Health (SRH) measure among Iranian community-dwelling older adults. *J Gerontol Geriatr.* 2019; 67(2):103–108.
33. Veenhoven R. Measures of happiness: Which to choose? In: Brulé G & Maggino F (Eds.). *Metrics of subjective well-being: Limits and improvements*; 2017: 65–84. Springer, Dordrecht.
34. World database of happiness. [cited 2022 January 10]. <https://worlddatabaseofhappiness.eur.nl/search-the-database/correlational-findings/#id=1yD-HsBSIHDFpgD2EY>.
35. Veenhoven R, Burger M, Pleeging E. Effect van de COVID-19 pandemie op geluk in Nederland. *Mens Maatsch.* 2021; 96(3):307–330. [Dutch].

36. National Committee on COVID-19 Epidemiology, Ministry of Health and Medical Education, IR Iran. Daily situation report on coronavirus disease (COVID-19) in Iran; March 16, 2020. *Arch Acad Emerg Med.* 2020; 8(1): e26. PMID: [32259121](https://pubmed.ncbi.nlm.nih.gov/32259121/)
37. Subramanian SV, Kim D, Kawachi I. Covariation in the socioeconomic determinants of self rated health and happiness: a multivariate multilevel analysis of individuals and communities in the USA. *JECH.* 2005; 59(8):664–669. <https://doi.org/10.1136/jech.2004.025742> PMID: [16020643](https://pubmed.ncbi.nlm.nih.gov/16020643/)
38. Ljunge M. Health, and happiness: Evidence that health assessments travel with migrants and predict well-being. *Econ Hum Biol.* 2016; 22:35–46. <https://doi.org/10.1016/j.ehb.2016.03.004> PMID: [27015612](https://pubmed.ncbi.nlm.nih.gov/27015612/)
39. Scott KM, Lim C, Al-Hamzawi A, Alonso J, Bruffaerts R, Caldas-de-Almeida JM, et al. Association of mental disorders with subsequent chronic physical conditions: world mental health surveys from 17 countries. *JAMA Psychiatry.* 2016; 73(2):150–158. <https://doi.org/10.1001/jamapsychiatry.2015.2688> PMID: [26719969](https://pubmed.ncbi.nlm.nih.gov/26719969/)
40. Mwinnyaa G, Porch T, Bowie J, Thorpe RJ Jr. The association between happiness and self-rated physical health of African American men: a population-based cross-sectional study. *Am J Mens Health.* 2018; 12(5):1615–1620. <https://doi.org/10.1177/1557988318780844> PMID: [29947566](https://pubmed.ncbi.nlm.nih.gov/29947566/)
41. Lim HE, Shaw D, Liao PS, Duan H. The effects of income on happiness in East and South Asia: Societal values matter?. *J Happiness Stud.* 2020; 21(2):391–415.