

Occupational class and educational level inequalities in major cardiovascular risk factors in Turkey: 2008–2016

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ABSTRACT

Background We aimed to investigate the magnitude of occupational class (OC) and educational level (EL) inequalities in cardiovascular risk factors in Turkey from 2008 to 2016 and compare these inequalities with neighbouring European countries.

Methods We used the Turkey Health Survey among a representative sample of the Turkish population. We estimated relative index of inequality (RII) for four cardiovascular risk factors (obesity/overweight, hypertension, diabetes, smoking) by OC/EL with an interaction term for survey year and compared selected results with neighbouring countries.

Results Men with lower OC and EL smoked more (e.g. RII for EL = 1.40 [1.26–1.55]); however, the remaining risk factors were mostly lower in these groups. Women in lower socio-economic groups smoked less (e.g. RII for EL = 0.36 [0.29–0.44]), however, had higher prevalence of the remaining risk factors. Significant interactions with survey year were only found in a few cases. The pattern of inequalities in Turkey is largely similar to neighbouring countries.

Conclusions Inequalities in cardiovascular risk factors are less systematic in Turkey than in most high-income countries, but ongoing trends suggest that this may change in the future.

Keywords chronic disease, risk factors, social determinants, socio-economic factors

Introduction

During the epidemiological transition, non-communicable diseases have largely replaced infectious diseases as the main causes of death.¹ In the contemporary world, cardiovascular diseases have become the leading cause of death in developing countries as well as in developed countries.² In high-income countries cardiovascular risk factors are concentrated among lower socio-economic groups,^{3,4} but patterns are less clear in middle-income countries.^{5–9} Recent analyses of middle-income countries have shown that women in lower socio-economic groups mostly had a higher risk of obesity, whereas the association varied among men,⁵ the prevalence of hypertension⁶ and incidence of diabetes⁷ was higher among people in lower socio-economic groups and men with a lower socio-economic position (SEP) smoked more, whereas the association varied among women.^{8–11}

Turkey is an upper–middle-income country,¹² which bridges Europe and Asia.¹³ Per capita income in the country has increased during the 2000s, however, then stagnated.¹⁴ Earlier studies have briefly touched on the association

between educational level (EL) and cardiovascular risk factors in Turkey^{15–18}; however, trends in inequalities by SEP, especially by occupational class (OC), have not yet been fully addressed.

The aim of this study to investigate the magnitude of OC and EL inequalities in cardiovascular risk factors in Turkey between 2008 and 2016 and to compare the results with neighbouring European countries.

Methods

Study population

The study population consists of respondents 15 years and older to the Turkey Health Survey, a regular health interview survey conducted by the Turkish Statistical Institute. The

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surveys have been held every 2 years from 2008 to 2016 using two-stage, stratified, cluster sampling.^{19–23} The details of the sampling schemes are shown in [Supplementary Table 1](#).

Outcomes

The outcomes of this study are obesity/overweight, hypertension, diabetes and smoking. Obesity and overweight are defined based on height and weight of the participant. In all survey years, participants were asked ‘How much do you weigh without clothes and shoes?’ and ‘How tall are you without shoes?’. The body mass index (BMI) is calculated by dividing weight (kg) to square of height (m). In cases 18 and younger, BMI is categorized using z scores for each specific age and sex using z scores of sixth month in each age. BMI z scores > 2 are categorized as obese and >1 are categorized as overweight.²⁴ Participants 19 and older are categorized as obese if BMI is ≥ 30.0 and overweight if BMI is ≥ 25.0 .

For hypertension and diabetes from survey years 2008 to 2012, participants were asked ‘Do you have or have you ever had high blood pressure (hypertension)/diabetes?’ separately. This is followed by the question ‘Have you had this disease/condition in the past 12 months?’. In survey years 2014 and 2016, the time period and the existence of the risk factor were merged into one question and it was asked as ‘During the past 12 months, have you had high blood pressure (hypertension)/diabetes?’.

Tobacco smoking-related questions were first introduced in 2010. In survey years 2010 and 2012, three questions elaborated the tobacco smoking behaviour of the participant, determining ever smokers (‘Have you ever smoked any tobacco product?’), ever regular smokers (‘Regularly [at least 100 times a year], have you ever smoked any tobacco products?’) and current status of smoking (‘Do you smoke at all nowadays?’). The answer for the last question had three options: ‘Daily smoker’, ‘Occasional smoker’ and ‘Former smoker’. In survey years 2014 and 2016, the tobacco smoking part of the surveys began with the question ‘Do you smoke?’. The answer had four options as ‘Yes, daily’, ‘Yes, occasionally’, ‘Not at all’ and ‘I quit’. Further questions inquiring ‘ever smoking’ and ‘ever regular smoking’ were not asked to daily smokers. Smokers were defined as the participants who responded the questionnaires as ‘Daily smoker’ in all survey years.

SEP variables

SEP variables of this study were OC at household level and EL at the individual level. For the classification by OC, we used the occupation as coded according to the International Standard Classification of Occupation (version 88 in

2008–2012 surveys and version 08 in 2014 and 2016 surveys) and the respondent’s employment status (employer, self-employed, employee, family worker), generating six OC categories ([Supplementary Table 2](#)). Armed forces workers were excluded from the analysis based on their varying individual position in social stratification. The highest OC category in a household was assigned to all members in the same household regardless of individual OC. Turkish Statistical Institute excluded the employment status variable in 2010 due to quality concerns, thus OCs could not be generated for this survey year ($n = 14\,447$, 14.5%). There were 7149 (7.6%) participants whose OC could not be determined, because no individual in the household had occupational and/or employment status information. The OC analysis includes 71 932 participants. EL was categorized into four groups: Primary school or lower, secondary school, high school and university or higher EL. The EL analysis included a total of 93 528 participants.

The data have been obtained anonymously, and no ethical board approval was sought for the research.

Statistical analysis

The distribution of respondents by OC and EL was calculated for each gender and survey year ([Supplementary Table 3](#)). There were differences between the questionnaires by survey year and the surveys from 2008 to 2012 included ‘Unknown’ and ‘Refusal’ codes for the outcomes, which resulted in around 6% missings for BMI, 0.1% missings for hypertension and 0.1% missings for diabetes. Older age group, lower EL, female gender, being single and not having health insurance were more frequent among the participants with missing variables ([Supplementary Table 4](#)). Two separate imputation models were fitted to impute the above-mentioned missing outcomes for OC and EL using respondents’ OC/EL, age group (15–44, 45–59, ≥ 60), marital status (married, single, divorced, widowed) and healthcare coverage (insured, out of pocket, green card) dummies. The imputation model for OC additionally included dummies for EL. Ten imputations were run for each model. Direct standardization was applied using three broad age groups.

Log-binomial regression models were fitted to obtain a summary measure of relative inequalities [relative index of inequality, (RII)] and absolute inequalities [slope index of inequality, (SII)] by gender for OC/EL, separately.²⁵ Respondents’ OC/EL(s) were transformed into riddit scores for each gender and survey year (WRIDIT package in STATA).²⁶ Riddit scores were calculated as the proportion of participants in the higher OC/EL(s) plus one half of the proportion of the participants in the SEP.²⁷ Thus, the riddit scores take values

between 0.0 and 1.0 from the highest to the lowest SEP. The RII can be interpreted as a relative risk, i.e. the ratio of the prevalence of the risk factor among the persons with the lowest SEP as compared with that among those with the highest SEP, whereas the SII can be interpreted as the risk difference between the two. The results for RII are presented in the main body of the article, whereas the results for SII are shown in [Supplementary Table 5](#). An interaction term $\text{ridit score} \times \text{survey year}$ was included to detect significant linear changes in the RII or SII by survey year, and P values of the interaction are shown in the results. First observation year for the each outcome was taken as '0' and the difference between survey years was calculated for this continuous survey year variable. When a statistically significant interaction was obtained ($P < 0.05$), further models were fitted by survey year. All models were adjusted for age groups. Sampling weights were applied. The imputation models were fitted in SPSS 25.0 (IBM Corporation), and the RII/SII models were fitted in Stata 15.1 for Windows (StataCorp LLC).

For the international comparison, the data of four neighbouring European countries were obtained from the European Health Interview Survey 2006.²⁸ The prevalence ratios (PR) and confidence intervals (CI) of the lowest EL (secondary school or lower) to the highest EL (university or higher) were estimated for obesity ($\text{BMI} \geq 30.0 \text{ kg/m}^2$) and daily smoking for both genders, restricting the analysis to the 30–79-year-old population and using the closest available data from the Turkey Health Survey (2008 for obesity, 2010 for smoking). The prevalence of the outcomes was standardized with the direct method using the European Standard Population 1976.

Results

[Table 1](#) shows the distributions of survey respondents by OC and EL for each survey year. The majority of the population consisted of small entrepreneurs, high-skilled workers and low-skilled workers, which together accounted for close to two thirds of the population in all survey years among both men and women. Over time, a strong increase has occurred in EL: in 2008 half of the men and two thirds of the women had primary school or a lower level of education only, but this proportion declined considerably in later years.

Inequalities by OC

[Figure 1a and b](#) show the estimated prevalence of the outcomes and RIIs by OC among men and women, taking all survey years together. The models indicate that among men obesity (RII = 0.70; 95% CI, 0.56–0.87), overweight

(RII = 0.83; 95% CI, 0.76–0.90) and diabetes (RII = 0.56; 95% CI, 0.39–0.80) were concentrated among higher OC groups, whereas lower OC groups smoked more (RII = 1.18; 95% CI, 1.08–1.28). Among women; all cardiovascular risk factors were concentrated among lower OCs, except smoking, which was less prevalent in lower OCs (RII = 0.77; 95% CI, 0.65–0.90).

Inequalities by EL

[Figure 1c and d](#) show the estimated prevalence of the outcomes and RIIs by EL among men and women, taking all survey years together. Lower educated men were more obese (RII = 1.32; 95% CI, 1.08–1.61) and smoked more (RII 1.40; 95% CI, 1.26–1.55). Among women, a decrease in the prevalence of all outcomes were seen by increasing EL, except for smoking where the prevalence increased from the lowest EL group up to the high school graduates (from 11.7% to 20.8%); however, it decreased again among the university or higher graduates (18.4%). Lower educated women smoked less compared with the higher educated (RII = 0.36; 95% CI, 0.29–0.44) and all of the remaining outcomes were concentrated among women with lower EL. The highest RII was observed for obesity (RII = 6.07; 95% CI, 4.91–7.50).

Trends in inequalities

[Figure 2](#) shows the trends in inequalities for those outcomes where the inequalities were significant when all survey years are taken together, and where significant interactions were observed between SEP and survey year. There were significant interactions among men for diabetes by OC ($P = 0.03$) ([Fig. 1a](#)) and among women for smoking by EL ($P < 0.01$) ([Fig. 1d](#)). For diabetes by OC among men, the inequalities tended to reverse from 2008 (RII = 0.59; 95% CI, 0.38–0.92) to 2016 (RII = 1.02; 95% CI, 0.74–1.39) ([Fig. 2a](#)). For smoking among women by EL, the RII was 0.36 (95% CI, 0.27–0.47) in 2010 but attenuated over time and reached a value of 0.61 (95% CI, 0.47–0.78) in 2016 ([Fig. 2b](#)).

Comparison with the neighbouring countries

[Table 2](#) shows the comparison of PRs between four neighbouring European countries and Turkey. Inequalities in obesity and smoking in Turkey appear to be somewhat similar to those in Bulgaria, Cyprus, Greece and Romania. In all countries, lower educated women are more obese than higher educated women, and lower educated men smoke more than higher educated men. However, some differences are found for obesity among men (e.g. lower educated men are less obese in Romania and slightly more obese in Turkey) and for smoking among women (lower educated women smoke less in

Table 1 Crude prevalence of OC and EL distributions of participants by survey year

SEP		Men					Women				
		2008	2010	2012	2014	2016	2008	2010	2012	2014	2016
OC											
Administrators	<i>n</i>	857	—	1036	671	618	862	—	1061	691	605
	%	13.4	—	7.9	7.9	8.8	12.6	—	7.7	7.6	7.7
Professionals	<i>n</i>	678	—	1571	1104	1007	760	—	1828	1246	1203
	%	10.5	—	12.0	13.2	14.3	10.3	—	12.8	13.7	15.0
Small entrepreneurs	<i>n</i>	1,624	—	2954	2124	1706	1765	—	3022	2067	1692
	%	24.3	—	24.4	24.9	23.1	24.9	—	23.7	23.1	22.3
High-skilled workers	<i>n</i>	1303	—	3246	2,358	1,974	1,421	—	3426	2625	2177
	%	20.9	—	27.1	29.9	27.8	20.7	—	25.9	28.9	27.3
Low-skilled workers	<i>n</i>	1430	—	2725	1634	1492	1541	—	2883	1823	1659
	%	22.6	—	22.3	18.6	19.9	22.7	—	22.8	19.1	20.3
Elementary job workers	<i>n</i>	541	—	786	568	492	648	—	961	764	703
	%	8.4	—	6.2	6.4	6.0	8.8	—	7.1	7.6	7.4
EL											
Primary school or lower	<i>n</i>	3340	3004	5561	3754	3108	5332	5162	8926	6209	5488
	%	48.0	44.2	41.1	40.6	37.2	66.4	62.2	58.4	58.8	55.5
Secondary school	<i>n</i>	1222	1248	2787	1708	1559	1025	1266	2473	1495	1417
	%	19.8	21.1	23	20.9	21.9	13.8	16.8	18.0	15.5	16.2
High school	<i>n</i>	1346	1190	2679	1824	1656	1111	1090	2258	1538	1450
	%	21.2	20.9	21.7	21.7	22.7	13.8	13.3	14.6	14.8	15.1
University or higher	<i>n</i>	754	845	1898	1435	1345	525	642	1473	1166	1219
	%	11.1	13.8	14.1	16.8	18.3	6.0	7.7	9.0	11.0	13.2

Turkey as well as in Bulgaria and Romania, but not in Cyprus and Greece).

Discussion

Main finding of this study

The results of this pooled and time-trend analysis on socio-economic inequalities in major cardiovascular risk factors in Turkey between 2008 and 2016 differ by gender. Men in lower socio-economic groups smoked more and the remaining risk factors were mostly lower in these groups namely overweight, obesity and diabetes by OC. In contrast, men with lower EL were more obese than men with higher EL. Among women, the magnitude of the inequalities was higher than men and all of the cardiovascular risk factors were concentrated among women in lower socio-economic groups, except smoking.

The inequalities for diabetes among men tended to reverse from 2008 to 2016 by OC and attenuated for smoking among women from 2010 to 2016 by EL where the burden increased in lower socio-economic groups in both cases. The

inequalities in Turkey were largely similar to the neighbouring countries, especially Bulgaria and Romania.

What is already known on this topic

In the middle-income countries, women with lower SEP are usually more obese or overweight,⁵ individuals with lower SEP have more diabetes⁶ or hypertension⁷ and men with lower SEP smoke more.^{8–11} Among women, our results are in accordance with the aforementioned findings. On the other hand, the direction of the association between SEP and obesity among men⁵ and smoking among women⁸ vary by country. In our study, men with lower OC are less obese; however, men with lower EL are more obese and overweight and women with lower EL smoke more.

Obesity and diabetes are challenging cardiovascular risks of the recent decades and the recommended target for non-communicable disease prevention is halting the rise of the risk factors.²⁹ The concentration of these risk factors among individuals with lower SEP suggests obesity is an avoidable outcome, which also suggests attenuating the inequality is plausible.

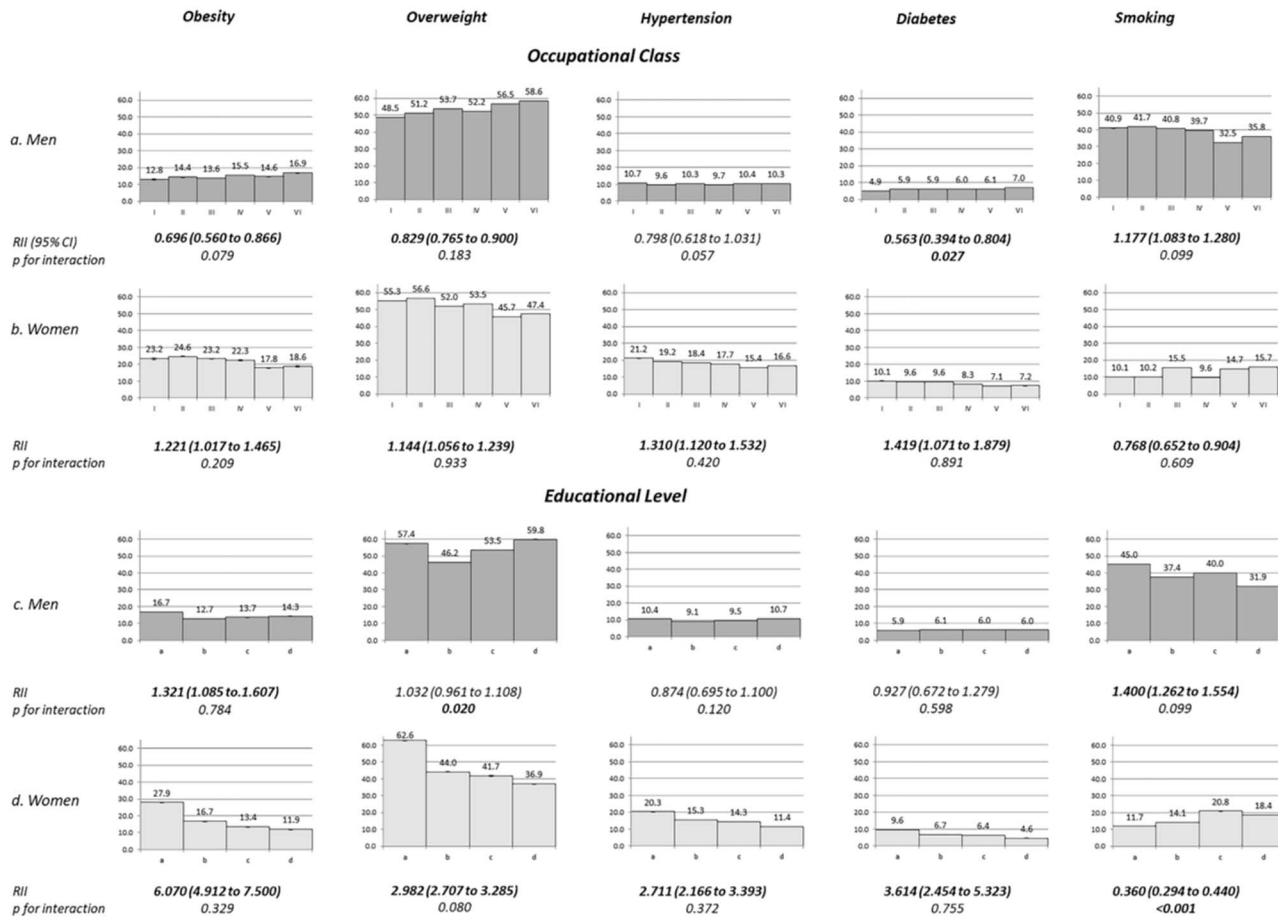


Fig. 1 Age group adjusted prevalence of cardiovascular risk factors by SEP, inequality indexes and the significance of the interaction term between SEP ridit score and survey year in the whole sample. (i) elementary job workers, (ii) low-skilled workers, (iii) high-skilled workers, (iv) small entrepreneurs, (v) professionals, (vi) administrators. (a) Primary school or lower, (b) secondary school, (c) high school, (d) university or higher. RII value > 1.0 indicates disadvantage among lower SEP; interaction term indicates an interaction between ridit score and survey year if $P < 0.05$; bold values indicates $P < 0.05$.

Smoking is an area where policies are shown to be much more effective when strongly implemented³⁰ and policies have been found to be effective or neutral in reducing inequalities; however, the results are mostly from high-income countries.^{31,32}

What this study adds

We analyzed socio-economic inequalities in cardiovascular risk factors in an upper-middle-income country in five consecutive survey years. First, we combined all five survey data with an interaction term between SEP and survey year. Then for the significant trends, we did further analysis to observe the changing nature of the inequalities.

Men with lower OC had lower diabetes prevalence; the burden of diabetes increased by survey year. Diagnosis of diabetes requires healthcare access in contrast to the other cardiovascular risk factors assessed in this study. Turkey implemented major transformations in the healthcare

and health financing system during 2000s. Establishing an umbrella healthcare purchaser was one of the main pillars of the transformation, which was accomplished in 2008. This may have resulted an increase in diabetes diagnosis among men with lower OC.³³ Another important contribution of this study is the increase in smoking prevalence among women with lower EL, despite comprehensive tobacco control policy. In Turkey, first legislation that restricted tobacco sales and smoking in public places had been accepted in 1996 and the law was amended in 2008 to be in line with Framework Convention of Tobacco Control. Following the decrease in smoking prevalence in high-income countries transnational tobacco companies targeted women with lower SEP in low- and middle-income countries.³⁴ The lobbying actions to undermine tobacco control policies may be responsible for the increasing prevalence among women with lower EL.

The study period covers 8 years and includes OC as a SEP variable. The previous analysis on inequalities in

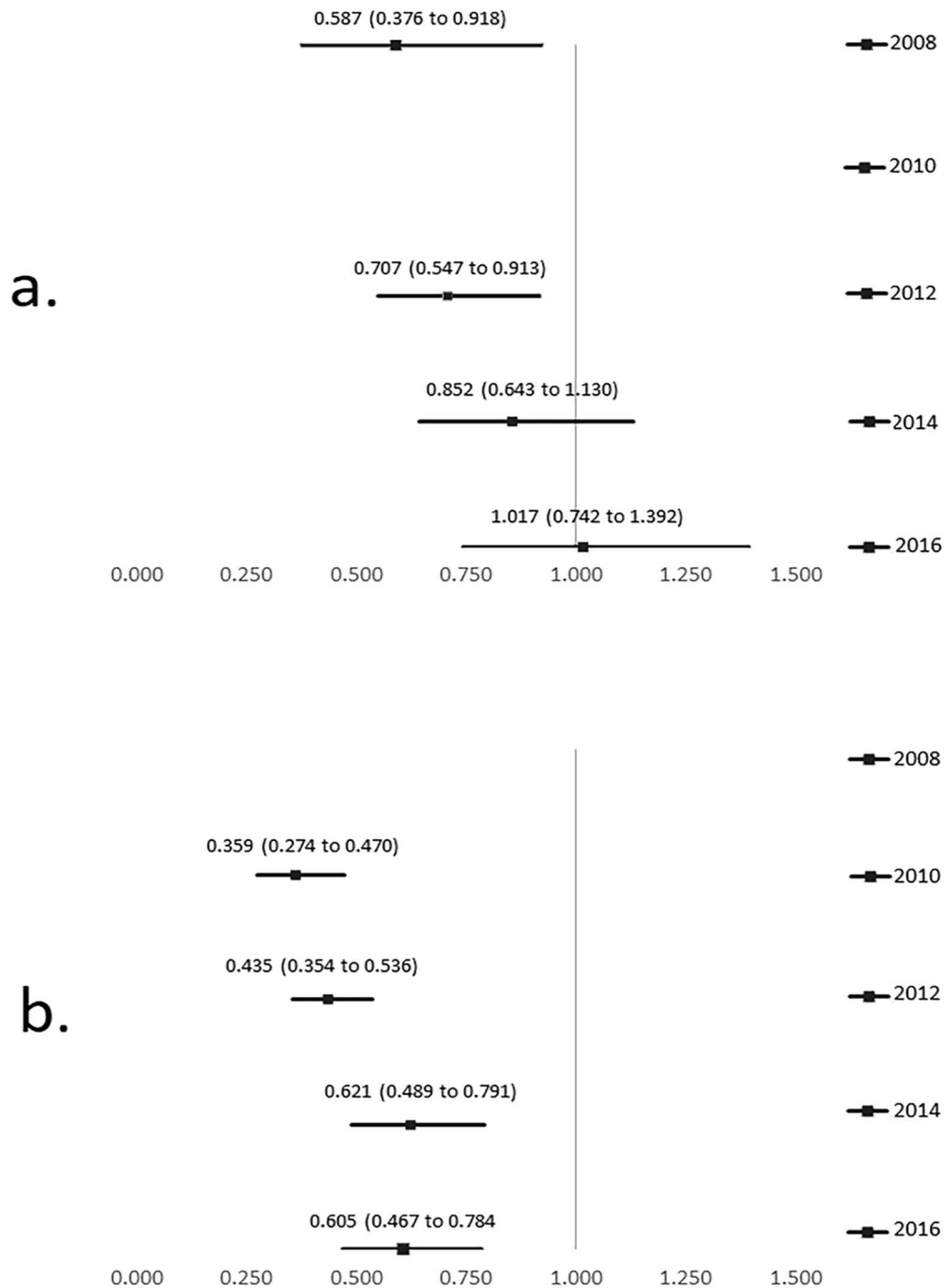


Fig. 2 RII by survey year diabetes by OC in men (a) smoking by EL in women (b). RII > 1.0 indicates disadvantage among lower SEPs.

cardiovascular risk factors in Turkey included single survey year data for overweight,¹⁶ smoking¹⁵ and diabetes,¹⁸ and EL was the only SEP variable. A more detailed but similar to the OC classification we applied had been tested in an empirical study in Turkey previously.³⁵

Limitations of this study

The period covered in this study may be subject of a wider shift in the previously existing inequalities, especially for smoking due to its more limited observation period. The latest OC status of the respondents has been obtained during

Table 2 Comparison of relative risks for obesity and smoking in Turkey with the neighbouring European countries among 30–79-year-old men and women

Gender	Per capita GDP ^a	Obesity PR (95% CI)	Smoking
Bulgaria			
Men	5989 ^b	0.753 (0.482–1.177)	1.721 (1.494–1.856)
Women		1.645 (1.114–2.483)	0.802 (0.588–0.902)
Cyprus			
Men	31 471 ^b	1.305 (0.985–1.655)	1.578 (1.368–1.694)
Women		1.420 (1.018–2.180)	0.926 (0.613–1.529)
Greece			
Men	29 176 ^b	1.258 (0.930–1.718)	1.612 (1.447–1.897)
Women		1.869 (1.388–2.605)	1.097 (0.911–1.301)
Romania			
Men	7369 ^b	0.540 (0.347–0.773)	1.334 (1.211–1.405)
Women		1.229 (0.840–1.813)	0.527 (0.398–0.624)
Turkey			
Men	10 603 ^c	1.017 (1.012–1.021)	1.491 (1.487–1.496)
Women	10 672 ^d	2.586 (2.566–2.606)	0.340 (0.339–0.342)

The prevalence of the risk factors was age-standardized using the European Standard Population 1976.

^aGross domestic product, adjusted for international US dollar in 2010, source: World Bank.

^b2006.

^c2008.

^d2010.

surveys; however, OC may change over time; thus, we may have missed to show accumulated effects of former OC, if any. Depending on high informal employment rates in the country,³⁶ participants may have avoided correctly addressing employment status question. A previous study suggests the assignment of the highest OC in the household to the other members³⁷ as we used in our study; however, there may be a difference between household-level and individual-level position in the social hierarchy. The prevalence of administrators and high-skilled workers has changed between 2008 and 2012, despite there are no declared difference in data collection method, which may have resulted in a misclassification. Participants with lower EL may have underestimated their outcomes.⁴

There were high rates of missing data, especially for BMI; thus, we fitted imputation models. The association between SEP and obesity indicated different directions for OC and EL. Men with lower OC work more in manual occupations compared with higher OCs. ELs of the highest OC (administrators) were lower than the second OC category (professionals). EL may have a stronger association for obesity than OC.

The change in the structure of smoking history after 2012 may have minimal effect on the result.

The wider CIs from the summary measures of the neighbouring countries may have been the results of smaller sample sizes than our study.

Conclusion

In Turkey, between 2008 and 2016, socio-economic inequalities in cardiovascular risk factors were less systematic than most high-income countries; however, this picture may change in the future. The most of the cardiovascular risk factors were less among men in lower socio-economic groups, except smoking. However, cardiovascular risk factors were higher among women in lower socio-economic groups, except smoking and the magnitude of the inequalities were higher compared with men. Few of the risk factors showed significant trends to the disadvantage of lower socio-economic groups, which may result more systematic inequalities in the future. Inequalities in cardiovascular risk factors in Turkey were similar with the neighbouring countries. The policies should be tailored considering gender and socio-economic differences in cardiovascular risk factors and the trends to the disadvantage of lower socio-economic groups should be monitored.

Supplementary data

Supplementary data are available at the *Journal of Public Health* online.

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Conflicts of Interest

None declared.

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