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Polašek, Ozren; Šogorić, Selma

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Socioeconomic Inequalities Estimation from Public Health Surveys – Data Considerations, Strengths and Limitations

Ozren Polašek and Selma Šogorić

»Andrija Štampar« School of Public Health, School of Medicine, University of Zagreb, Zagreb, Croatia

A B S T R A C T

The estimation of socioeconomic inequalities has lately become one of the major topics in public health research, as the numerous studies are showing strong association of inequalities with health status and outcomes. The aim of this study was to provide a general overview of the individual data available for the socioeconomic inequalities estimation from a public health survey and to compare different proxies used for socioeconomic inequalities estimation. The data from the Croatian Adult Health Survey were used, which is a large representative cross-sectional study of the general Croatian population that was performed in 2003. Four variables were compared – education and occupation class, and objective and subjective socioeconomic estimation. Strong regional differences were recorded within Croatia, generally showing better socioeconomic indices in the capital, city of Zagreb. Although all of these variables were significantly associated to one another, breakdown into the gender stratified education-by-occupation groups indicated that income was unevenly distributed in these groups and that it had non-linear association with education, especially in the white-collared occupations. Although socioeconomic inequalities do show striking association with many health related indices and outcomes and should therefore be included in all types of research on human subjects, due attention is needed in research planning, data encoding and entry, as well as interpreting the results based on this data.

Key words: *socioeconomic inequalities, general population, occupation, education, income, Croatia*

Introduction

Ever since the Whitehall study results publication[1], socioeconomic inequalities have become one of the widely accepted health modifiers. A plethora of research studies have been undertaken, all resonating similar results and suggesting that majority of the socioeconomic indices show linear association with health status, marked by the poorer health indices in those with lower socioeconomic status[1]. Despite our increasing knowledge and attempts to tackle them, socioeconomic inequalities are often not only managing to persist, but also to widen over time[2,3], making them one of the most demanding challenges in public health.

Estimation of the individual socioeconomic status (and consequently inequalities) has most commonly been made using several indicators, including education class, occupation class and material possessions as the most common ones. While the first one is relatively straightforward to measure, the remaining two may be biased with the locus-specific modifiers which are not always easy to measure on the similar scale. Occupation may be classified in numerous ways, some of which become extremely complex and present a substantial methodological problem in cross-comparisons with other countries where occupation classification may differ[4]. One of the main limitations is the way in which material status is estimated is either to base the estimates on subjective or objective estimates. The dispute over this matter has been on-going, and in this moment it is still not clear which of these may be better in the socioeconomic inequalities estimation[5,6]. Although most studies suggest that these three domains of the socioeconomic inequalities are closely related, this may not always be so. This is of special interest in the former communistic countries which do not have strong social stratification, or at least, do not have a long history of social stratification[7].

Other indicators have also been used, including i.e. house or car ownership[8,9], or even neighbourhood based

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estimation of the socioeconomic inequalities in the absence of individual-level data[10,11]. Additionally, in ethnically diverse countries, such as the e.g. USA, race/ethnicity has often been used as the socioeconomic indicators (due consideration is needed here, as the race/ethnicity by itself is a factor associated with socioeconomic inequalities and probably not the cause for such differences)[12,13]. All this should be carefully considered, as the results of one study suggested that the selection of the indicator used in the socioeconomic inequalities estimation will have strong effect on the presence and magnitude of socioeconomic inequalities[14].

The aim of this study was to provide a general overview of the data available for the socioeconomic inequalities estimation from a public health survey and to compare different proxies used for socioeconomic inequalities estimation, including education and occupation class and subjective and objective material status estimation.

Materials and Methods

The data from the Croatian Adult Health Survey 2003 were used. This was a large, cross sectional study based on the representative sample of the Croatian adult population. Sampling frame was based on the random sample of households, from which one adult inhabitant was randomly selected and invited to participate in the study. The survey was performed in 2003, by a team of 248 public health nurses who performed face-to-face interviews with respondents in their homes. The details on the survey methodology and outcomes are given elsewhere[15].

For purposes of this study, four questions were analysed. Education was classified in four groups: respondents without completed school, those who completed the primary school only, completed secondary school and finally those who completed College or University degree. Occupation was classified in two groups – white-collared and blue-collared occupations (where all manual workers were classified as the blue-collared). Two ways of household material status estimations were used – subjective and objective. Subjective estimates were based on the individual feeling whether respondents material status was much worse, worse, the same, better or much better (in the analysis the two extreme groups were merged, resulting in the three groups – below average, the same as average and above average). Objective material status estimation was based on the monthly household income, which was adjusted to the number of household members, and then transformed into four quartile groups. Finally, all respondents were classified in education-by-occupation groups, in order to show the income by these groups.

Weighted estimates from the Croatian Adult Health Survey were used. Six regions scheme was used, defined as the respondents origin from Central Croatia, Northern Croatia, Eastern Croatia, Western Croatia, Southern Dalmatia and City of Zagreb.

Non-parametric methods were used in data analysis (chi-square in the use of categorical data, Mann-Whitney test for two samples analysis and Kruskal-Wallis for more than two groups analysis). Linear trend analysis was used in the estimation of the income in the education-by-occupation groups. Analysis was performed using SPSS, ver. 13 (SPSS Inc, Chicago, IL), with significance set at $P<0.05$.

Results

The analysis of the Croatian Adult Health Survey 2003 indicated that a total of 33.5% of the sample respondents have completed the primary school as the highest educational class, marked by the large and significant regional differences (Kruskal-Wallis $P<0.001$) (Table 1). At the same time, similar result with less clear regional differences was recorded for the occupation class ($\chi^2=98.34$, $P<0.001$) (Table 2). In terms of the subjective household

TABLE 1
CROATIAN ADULT HEALTH SURVEY 2003 SAMPLE BREAKDOWN ACCORDING TO THE ATTAINED EDUCATIONAL CLASS (PERCENT OF RESPONDENTS)

	Without completed school	Primary school	Secondary school	College or University
Men				
Northern Croatia	9.9	21.8	61.6	6.7
Central Croatia	8.5	24.2	57.4	9.8
Eastern Croatia	5.6	16.5	64.9	13.0
Western Croatia	2.5	13.5	66.9	17.1
Southern Dalmatia	9.1	19.9	60.3	10.8
City of Zagreb	1.8	8.3	59.2	30.6
Total men	6.3	17.6	61.4	14.7
Women				
Northern Croatia	20.6	31.6	39.6	8.2
Central Croatia	18.7	32.5	42.2	6.6
Eastern Croatia	17.0	24.3	49.1	9.6
Western Croatia	12.8	22.0	53.0	12.2
Southern Dalmatia	21.6	28.5	42.4	7.5
City of Zagreb	10.0	13.1	51.8	25.0
Total women	16.8	25.3	46.3	11.6
Total Croatia	11.9	21.6	53.5	13.1

TABLE 2
CROATIAN ADULT HEALTH SURVEY 2003 SAMPLE BREAKDOWN ACCORDING TO THE OCCUPATION CLASS (PERCENT OF RESPONDENTS)

	Blue collared occupations	White collared occupations
Men		
Northern Croatia	72.8	27.2
Central Croatia	74.3	25.7
Eastern Croatia	63.3	36.7
Western Croatia	62.1	37.9
Southern Dalmatia	63.3	36.7
City of Zagreb	51.4	48.6
Total men	64.7	35.3
Women		
Northern Croatia	73.7	26.3
Central Croatia	75.9	24.1
Eastern Croatia	68.2	31.8
Western Croatia	63.1	36.9
Southern Dalmatia	70.3	29.7
City of Zagreb	51.5	48.5
Total women	67.0	33.0
Total Croatia	65.9	34.1

TABLE 3
CROATIAN ADULT HEALTH SURVEY 2003 SAMPLE BREAKDOWN ACCORDING TO THE SUBJECTIVE MATERIAL STATUS ESTIMATION (PERCENT OF RESPONDENTS)

	Below average	The same as average	Above average
Men			
Northern Croatia	34.6	53.2	12.3
Central Croatia	47.4	44.2	8.4
Eastern Croatia	31.9	50.5	17.6
Western Croatia	33.6	57.6	8.7
Southern Dalmatia	40.2	47.1	12.7
City of Zagreb	29.4	53.1	17.5
Total men	36.6	50.3	13.0
Women			
Northern Croatia	38.8	51.6	9.6
Central Croatia	42.9	47.9	9.3
Eastern Croatia	39.5	51.6	8.8
Western Croatia	36.5	52.7	10.8
Southern Dalmatia	39.5	50.6	9.9
City of Zagreb	31.9	51.7	16.5
Total women	38.3	50.8	10.8
Total Croatia	37.5	50.6	11.9

estimation, the best indices were recorded in Eastern Croatia in men, while in contrast, women from Eastern Croatia were the least satisfied with their material possessions (Kruskal-Wallis $P<0.001$). The highest percent of women who were satisfied with their material situation was recorded in the City of Zagreb (Table 3). Finally, the analysis of the monthly household income adjusted to the number of household members suggested that the best indices were reported by the respondents from the city of Zagreb, with almost fourfold difference compared to the Central Croatia (Kruskal-Wallis $P<0.001$) (Table 5).

TABLE 4
CROATIAN ADULT HEALTH SURVEY 2003 SAMPLE BREAKDOWN ACCORDING TO THE MONTHLY HOUSEHOLD INCOME (PERCENT OF RESPONDENTS)

	Lower than 2000 Kn	2001–4000 Kn	4001–6000 Kn	Over 6000 Kn
Men				
Northern Croatia	19.5	28.9	29.2	22.4
Central Croatia	36.7	30.4	19.8	13.1
Eastern Croatia	15.7	26.8	40.1	17.3
Western Croatia	8.4	33.3	30.9	27.4
Southern Dalmatia	21.3	34.5	22.9	21.3
City of Zagreb	7.1	22.0	32.8	38.0
Total men	19.0	29.2	29.2	22.7
Women				
Northern Croatia	20.7	31.6	28.4	19.3
Central Croatia	36.5	33.7	19.9	9.9
Eastern Croatia	19.0	36.9	26.6	17.5
Western Croatia	13.7	35.0	28.0	23.4
Southern Dalmatia	22.3	31.5	28.1	18.1
City of Zagreb	9.2	26.4	30.2	34.1
Total women	20.8	32.5	26.6	20.1
Total Croatia	20.0	30.9	27.8	21.3

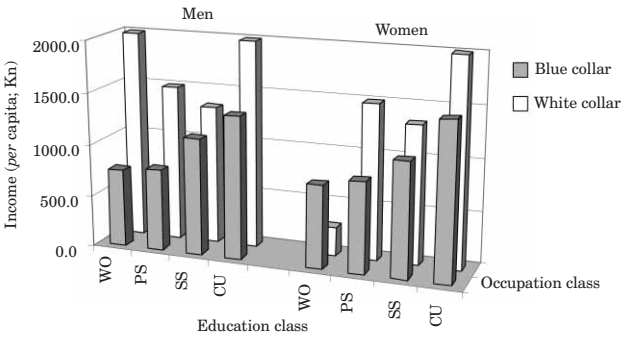

Fig. 1. Median income (per capita) according to education-by-occupation classes in CAHS sample (WO – without school, PS – completed only primary school, SS – completed secondary school, CU – College or University degree) in men and women.

Gender differences were recorded in education and *per capita* income ($P<0.001$), while other indices did not show significant gender differences ($P=0.070$ for occupation, $P=0.241$ for subjective material status estimation). Breakdown of the sample into the education-by-occupation class indicated that for blue collared occupations a linear and significant trend of increasing income (adjusted to the number of household members) in both men and women ($\beta=0.96$, $P=0.037$ and $\beta=0.95$, $P=0.046$, respectively). In white-collared occupations, there was no significant trend in neither men nor women ($\beta=-0.06$, $P=0.937$ and $\beta=0.89$, $P=0.110$, respectively).

Discussion

Estimation of socioeconomic inequalities has recently become one of the common research focuses in public health. However, any proper analysis must take into account a number of various factors and modifiers, in order to provide authoritative and useful indices of the socioeconomic status. Firstly, there is always a question of comparability of the same index when it is used in different populations, or even within the same population in different times, as a fair proportion of the inequalities may change over time and even show substantial widening[3]. Furthermore, there can be strong regional and cultural difference, especially in the countries that are as diverse as Croatia[15]. In one such study, the authors have developed a completely new set of socioeconomic inequalities estimates that would suit the characteristics of the local population of the Vis Island in Croatia[16]. The main reason for this was related to the high level of homogeneity that was seen in the local population, which resides in both reduced genetic diversity within that population and similar environmental exposures they are exposed to[17–20]. The index was based on the 16 items that were either present or absent from the household, thus offering a detailed account of the possessions. However, even the use of targeted socioeconomic (actually material status) estimate, did not manage to show significant differences in this highly homogenous population[16]. Thus, even the use of adjusted socioeconomic index may not always yield significant differences and show association with health status in some populations which are very homogoenous[16].

What was even more interesting, the same isolated population was used to show differences in spousal estimates of the household material status. The results of the paired data (spouses) suggested significant differences in the education level (which are expected based on the Census data), but at the same time men were recorded to significantly overestimate their material household belongings (or conversely, women were recorded to underestimate household material status)[21]. While this difference may only be prevalent in that isolated population, it should be noted that there are studies which use gender-dependent estimates in the pooled analysis, thus enabling the possibility that this may be the source of bias[21].

In terms of use of a single index vs. combination of more variables, non-linear relationship of income and education (present in the white-collared occupations) suggests that averaging any of the socioeconomic inequalities into a single variable is most likely to produce biased estimates. Although pooling various items into a single index has been previously proposed[22], a number of studies have resonated that each of the inequality measures should be treated independently[14]. This result is in line with the theoretical expectations, where each of the (three commonly used) socioeconomic inequality can be treated as the proxy for different property. Additionally, due attention is needed in all stages of research on socioeconomic inequalities. Firstly, in the planning phase, all proxies should be carefully discussed in order to see whether there are some population specificities which will make the data more or less difficult to use during the analysis stage, as seen in the case of island population[16]. Secondly, a careful and targeted codex of attributes and data dictionary should be prepared, in order to provide methodological framework for data entry. Finally, due attention is needed in the analysis stage, where all socioeconomic inequality proxies should be used, as some of them do not necessarily show linear association with one another.

Socioeconomic inequalities investigation is especially interesting in the former communistic countries, where such differences were suppressed over the long periods (or were claimed to have been suppressed)[7,23]. Transition in these countries has introduced a unique set of rules and development of social classes that were rather unstable and difficult to precisely measure. This was even more aggravated in Croatia, during 1991–1995 war[24], when a substantial amount of the population has lived in the suboptimal conditions, further affecting the importance and magnitude of socioeconomic inequalities[7]. All this resulted in the extremely fast socioeconomic gradient development in the post-war years, marked by the existence of severe differences nowadays. The problem here is that there is no golden standard, a measure that could be properly used in the wide range of scenarios (being equally effective in various countries in various times). Even the use of the relative measures, such as quartiles,

does not necessarily mean that all estimates are comparable. If we add the possibility for gender differences, recall bias and issues related to the respondent's willingness to provide truthful answer we end up with the very complex and possibly highly imprecise mixture of indicators which are then correlated to some precisely measured health indicators or outcomes.

One of the interesting findings from this study is the percent of the respondents who considered themselves to be in the average socioeconomic status. In both men and women this percent was very close to 50%, indicating that in the sufficiently large sample majority of respondents indicated that their material status was similar to others. However, remaining 50% were unevenly distributed in the below and above average, with almost four times more respondents who indicated they were below average. Most of these below average were from the Central Croatia, where at the same time most blue-collared respondents were recorded, and their objective material status was by far the worse among all regions of Croatia.

Several recent studies have focused on the methods to measure socioeconomic inequalities, suggesting that the choice of the inequality indicator has a strong effect on the amount and intensity of the inequalities under study[25,26]. Furthermore, it is very important to properly present all the relevant information in inequalities studies, especially if the public health survey data has been weighted or not, as even this has been associated with different outcomes that show socioeconomic inequalities or tend to underestimate them due to weighting[27]. This is especially important for studies which were performed in public health surveys that do use weighting, such as Croatian Adult Health Survey[28].

Giving that the socioeconomic inequalities have a strong and widespread effect on the health status and indices, they should be included in any form of data collection in medicine. In cases of lacking or inexistent data, at least education class and/or occupation should be used as the socioeconomic status proxies, ensuring that the study results are not confounded by the socioeconomic inequalities.

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REFERENCES

1. MARMOT MG, SHIPLEY MJ, ROSE G, Lancet, 5 (1984) 1003. — 2. JEMAL A, WARD E, ANDERSON RN, MURRAY T, THUN MJ, Plos ONE, 3(5) (2008) e2181. — 3. MACKENBACH JP, BOS V, ANDERSEN O, CARDANO M, COSTA G, HARDING S, REID A, HEMSTRÖM O, VALKONEN T, KUNST AE, Int J Epidemiol, 32 (2003) 830. — 4. CENTRAL BURREAU OF STATISTICS OF THE REPUBLIC OF CROATIA, Narodne novine, 111 (1998) — 5. MACLEOD J, DAVEY SMITH G, METCALFE C, HART C, Soc Sci Med, 61 (2005) 1916. — 6. ADLER N, Soc Sci Med, 63 (2006) 846. — 7. MASTILICA M, KUSEC S, BMJ, 331 (2005) 223. — 8. RAMSAY SE, WHINCUP PH, MORRIS RW, LENNON LT, WANNAMETHEE SG, Ann Epidemiol, 18 (2008) 896. — 9. EBRAHIM S, PAPACOSTA O, WANNAMETHEE G, ADAMSON J, STUDY BRH, Soc Sci Med, 59 (2004) 2109. — 10. HAVARD S, DEGUEN S, BODIN J, LOUIS K, LAURENT O, BARD D, Soc Sci Med, 67 (2008) 2007. — 11. STAFFORD M, GIMENO D, MARMOT MG, Eur J Public Health, 18 (2008) 604. — 12. SHAVERS VL, BROWN ML, J Natl Cancer Inst, 94 (2002) 334. — 13. KRIEGER N, QUESENBERRY C, PENG T, AL. E, Cancer Causes Control, 10 (1999) 525. — 14. MACKENBACH JP, KUNST AE, Soc Sci Med, 44 (1997) 757. — 15. VULETIC S, POLASEK O, KERN J, STRNAD M, BAKLAIC Z, Coll Antropol, 33 Suppl 1(2009) 3. — 16. SMOLJANOVIC A, VORKO-JOVIC A, KOLCIC I, BERNAT R, STOJANOVIC D, POLASEK O, Croat Med J, 48 (2007) — 17. POLASEK O, KOLCIC I, SMOLJANOVIC A, STOJANOVIC D, GRGIC M, EBLING B, KLARIC M, MILAS J, PUNTARIC D, Croat Med J, 47 (2006) 649. — 18. VITART V, BILOGLAV Z, HAYWARD C, JANICIJEVIC B, SMOLEJ-NARANCIC N, BARAC L, PERICIC M, KLARIC IM, SKARIC-JURIC T, BARBALIC M, POLASEK O, KOLCIC I, CAROTHERS A, RUDAN P, HASTIE N, WRIGHT A, CAMPBELL H, RUDAN I, European Journal of Human Genetics, 14 (2006) 478. — 19. RUDAN I, BILOGLAV Z, VORKO-JOVIC A, KUJUNDZIC-TILJAK M, STEVANOVIC R, ROPAC D, PUNTARIC D, CUCEVIC B, SALZER B, CAMPBELL H, Croatian Medical Journal, 47 (2006) 601. — 20. RUDAN I, CAMPBELL H, RUDAN P, Collegium Antropologicum, 23 (1999) 531. — 21. KOLCIC I, POLASEK O, RUDAN I, J Epidemiol Communit Health, 63 (2009) 175. — 22. MURRAY CJL, GAKIDOU EE, FRENK J, Bull World Health Organ, 77 (1999) 537. — 23. WALTERS S, SUHRCKE M, Socioeconomic inequalities in health and health care access in central and eastern Europe and the CIS: a review of the recent literature (Working paper 2005/1) (World Health Organization, Copenhagen, 2005). — 24. POLASEK O, Eur J Epidemiol, 21 (2006) 61. — 25. HARPER S, LYNCH J, MEERSMAN SC, BREEN N, DAVIS WW, REICHMAN ME, Am J Epidemiol, 15 (2008) 889. — 26. MESSER LC, Am J Epidemiol, 15 (2008) 900. — 27. FIREBAUGH G, The new geography of global income inequality (Harvard University Press, Cambridge, MA, 2003). — 28. POLASEK O, KOLCIC I, VONCINA L, STRNAD M, VULETIC S, KERN J, Rural Remote Health, 7 (2007) 749.

O. Polašek

»Andrija Štampar« School of Public Health, School of Medicine, University of Zagreb, Rockefellerova 4, 10000 Zagreb, Croatia
e-mail: opolasek@snz.hr

PROCJENA SOCIOEKONOMSKOG STANJA NA TEMELJU PODATAKA IZ ANKETA – OSOBINE, SNAGE I SLABOSTI PODATAKA

S A Ž E T A K

Procjena socioekonomskog stanja je u posljednje vrijeme postala jedna od vrlo čestih tema u istraživanjima u javnom zdravstvu, jer su dosadašnja istraživanja često ukazivala na snažnu povezanost socioekonomskog stanja i zdravstvenih pokazatelja i ishoda. Svrha ovog istraživanja bila je pružiti pregled podataka na osobnoj razini dobivenih u anketnom istraživanju, koji se koriste za procjenu socioekonomskog stanja i usporediti različite pokazatelje socioekonomskog stanja. U istraživanju su korišteni podaci iz Hrvatske zdravstvene ankete, na temelju reprezentativnog uzorka odrasle populacije Hrvatske koji je anketiran tijekom 2003. godine. Korištena su četiri pokazatelja – razina obrazovanja, zanimanje te osobni i stvarni pokazatelji materijalnog stanja. Zabilježene su izražene regionalne razlike unutar Hrvatske, s najboljim pokazateljima u gradu Zagrebu. Iako su četiri istraživana pokazatelja bila snažno povezana, podjela u spolne odijeljene skupine po obrazovanju i zanimanju ukazala je na nelinearnu povezanost prihoda s obrazovanjem, posebno izraženu kod ispitanika s zanimanjima bijelog ovratnika. Iako socioekonomsko stanje pokazuje snažnu povezanost s raznim pokazateljima zdravlja i bolesti i njihovim ishodima i stoga bi se ovi podaci trebali prikupljati u svim istraživanjima koja uključuju ljude, potrebno je posvetiti dosta pažnje prilikom planiranja istraživanja, načinu na koji se podaci šifriraju i unose, kao i interpretaciji rezultata.