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ORIGINAL ARTICLE

Socioeconomic inequalities show remarkably poor association with health and disease in Southern Croatia

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Abstract
Objectives This study aimed at investigating the association of socioeconomic status and health outcomes in populations of the two remote Croatian islands and one coastal city.
Methods Medical history and survey information were used to create 33 variables that were analysed using logistic regression. The population from the island of Vis was followed up and mortality data were used to calculate hazard ratios using Cox regression.
Results Socioeconomic inequalities were poorly associated with health and disease indices. In the matrix of 33 outcome variables and 13 socioeconomic predictor classes, only 10 associations were significant at the level of $P < 0.001$. None of the associations was replicated across samples. We did not detect the association of any socioeconomic estimate with mortality data for the island of Vis.
Conclusions Homogenous island populations were expected to have greater levels of social homogeneity and consequently less expressed inequalities in health. The lack of stronger association in the urban population of Split is likely the result of the mechanisms that persisted from the former communist regime and high level of retained formal and informal social support.

Keywords Socioeconomic factors · Health · Risk factor · Croatia

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Introduction

Socioeconomic inequalities have been identified as one of the most interesting targets in public health research and practice (Hosseinpoor et al. 2012b). Their impact on health seems to be strongly expressed across the entire human population (Hosseinpoor et al. 2012b; Phelan et al. 2010). Generally speaking, people with lower socioeconomic status, which is mainly measured by the educational attainment, income and occupational class, have been shown to have worse health (Hosseinpoor et al. 2012b) and greater risk of diseases and premature death (Doubeni et al. 2012). The effect of socioeconomic inequalities also extends to more determinants of morbidity, such as lifestyle and behavioural patterns (Phelan et al. 2010), including smoking, stress, social isolation (Phelan et al. 2010), physical exercise (Mackenbach and Bakker 2003), diet (Antonogeorgos et al. 2013; Mackenbach and Bakker 2003), or nutritional status and preventive health behaviours (Phelan et al. 2010).

Despite extensive presence, gender differences in socioeconomic inequalities were much less frequently investigated.

Gender perspective suggests strong differences between men and women (Erving 2011), with nearly universal over-privilege of men (Hosseinpoor et al. 2012a). Women were reported to have lower overall socioeconomic status (Sorlin et al. 2011), coupled with lower societal positions and consequently lower salaries (Erving 2011). Possible explanations take root in social and cultural norms which define gender roles, by which women are exposed to increased caregiving burden and lower salaries (Diaz-Granados et al. 2011).

As well as the level of socioeconomic status may differ between genders, it can also vary across cultures and settings (Kopp et al. 2011; Babinska et al. 2013; Schori et al. 2014). It is well documented that social, economic and political characteristics also have a great impact on health inequalities (McGrail et al. 2009). This makes health inequalities an issue of great interest for transitional countries, because they seem to increase along with growth of social inequalities (Sucur and Zrinscak 2007). The aim of this study was to investigate the association of socioeconomic status and health outcomes in three populations from Southern Croatia, with special interest in possible gender-related differences. The three populations were selected to reflect different contextual characteristics, namely a small island with previously described high level of socioeconomic equality (Smoljanovic et al. 2007), a larger island that is geographically closer to the mainland and an urban population of the second largest city in Croatia.

Methods

This study was performed within the "10,001 Dalmatians" project, which aims to develop a large-scale biobank that investigates the genetic (Köttgen et al. 2013; Berndt et al. 2013; Lu et al. 2013), environmental and social health risks through analysis of clinically relevant quantitative traits. A total of three sub-samples were involved, originating from the remote island of Vis, less remote and larger island of Korcula and coastal city of Split, which is the second largest city in Croatia. Sampling was completed in 2003 and 2004 (Vis), 2007 (Korcula) and 2008–2009 (Split). The sampling scheme in the first two samples was nearly systematic, by inviting all inhabitants who were listed in the voting register and general practitioner registries (but with no estimation of the sample representativeness due to difficulties in establishing the denominator; further explained in the Discussion). The sampling scheme for Split was convenient. The entire project was approved by the Ethical Boards of the Medical School, University of Split and the Croatian National Institute for Public Health. Each participant provided written informed consent to participate in this study.

Measurements

A total of five indices of socioeconomic status were used: years of schooling, objective material status assessment (self-reported individual income) (measured by the amount of kunas, a national currency, and classified in four categories; this question was not available in Vis), subjective material status estimation, material possessions [a 16 item list, which was used in previous studies (Kolcic et al. 2009; Smoljanovic et al. 2007)] and employment status classified in four categories. In addition, a number of survey-based questions were used to define variables that were analysed (supplementary material upon request).

A total of 33 binary outcome variables were used as outcome variables, depicting health status and diseases [hypertension, unregulated hypertension, diabetes, unregulated diabetes, gout, hyperuricaemia, osteoporosis, osteopenia, hyperlipidemia, hyperlipidemia (LDL), hyperlipidemia (HDL), hyperlipidemia (triglycerides), hyperlipidemia (total cholesterol)], behavioural and lifestyle patterns [excessive alcohol consumption, physical activity during daily work, physical activity during the leisure time, vitamin consumption, mineral consumption, nutrition indicators (consumption of: olive oil, animal fats, fresh fruits, leafy vegetables, root vegetables, potatoes, white fish, blue fish, sea-food-shells, crab, pork, beef, venison, chicken)], and psychological distress based on the General health questionnaire 30 (Goldberg 1972). Additionally, a multimorbidity indicator was defined as having at least two positive medical conditions in the same subject, including hypertension, hyperlipidaemia, hyperuricaemia, diabetes mellitus or gout. In the first instance, we compared subjects with two or more positive classes to these with none or a single positive class, to estimate the association with multimorbidity. In the second stage we did a similar thing, but focused on subjects with three or more positive classes, compared to those that had at most two or less. In both instances, we used a binary logistic regression, to provide easier model interpretations.

In order to investigate the association of socioeconomic status with mortality, we used the data from the Croatian Institute for Public Health, which maintains the database of causes of all deaths in Croatia. This process was used for the Vis island sample only, as a sufficient amount of time had passed to obtain a sufficient analysis sample size. All subjects from the Vis sample were cross-checked with the mortality database to identify those who had deceased in the period between 2003 and 2011, regardless on the place of their death (the attrition rate was expectedly very low, as the mortality register covers entire Croatia and thus includes any possible within-country migrants; notably, immigrants out of Croatia were not accounted for).

Statistical analysis

The analysis was based on initial comparison using Chi-square and Fisher's exact test (where appropriate), Mann–Whitney test and analysis of variance, accompanied by LSD post hoc test. The main analytic approach was the logistic regression, adjusting for the effects of age and all four socioeconomic indices. A separate model was made for each gender and sample, thus producing a set of six separate analytic models, performed for all 33 outcome variables. This resulted in the development of a large-scale matrix, yielding a total of 2310 association tests, based on 33 outcome variables × 70 possible associations (defined as the total number of odds ratios calculated for every table [3 regions × 2 genders × 13 socioeconomic predictor classes], minus eight classes of objective material status not available from Vis sample for both men and women). In addition, we used a Cox hazard model to establish the significance of socioeconomic variables in all-cause mortality prediction for the population from the island of Vis. Similarly to previous models, this one was also made separately for men and women, to investigate possible gender-related differences. Besides age, years of schooling, material possessions index, subjective material status and employment status were used as covariates, in an adjusted analytic model. All analyses were performed with SPSS version 18 (SPSS Inc, Chicago, IL). Due to multiple testing, the significance threshold was set at $P < 0.001$.

Results

A total of 3006 participants were included in this study, with almost equally sized subsamples: 1025 participants from the island of Vis, 969 from the island of Korcula and 1012 from the city of Split (Table 1). The initial comparison indicated a pattern of greater prevalence of unregulated hypertension in Vis, differences in hyperlipidaemia prevalence and physical exercise (Table 1). The basic socioeconomic status analysis pointed out substantial differences, with a consistent trend of the worse indices in Vis, intermediate in Korcula and better-off in the city of Split (Table 2). Notably, women had reported fewer years of schooling in all three sub-samples ($P < 0.001$ for Vis, $P = 0.001$ for Korcula and $P = 0.041$ for Split sample).Analysis of the outcome variables in logistic regression models indicated a strong lack of significant associations with socioeconomic status; in the matrix of 2310 tested associations we found a striking level of homogeneity, with only ten associations that were significant at the level of $P < 0.001$, attributable to a total of 0.43 % of all possible associations, much less than expected by chance alone. A more detailed analysis indicated that neither of these significant associations was replicated across samples and gender [data show hypertension (Table 3) and psychological distress (Table 4), the rest available upon request]. Furthermore, gender breakdown indicated lack of strong differences, with five significant results in men and five in women.

Table 1 Basic health-related descriptors of three investigated subsamples (Croatia; Vis 2003–2004, Korcula 2007, Split 2008–2009)

	Subsample			*P*
	Vis ($n = 1025$)	Korcula ($n = 969$)	Split ($n = 1012$)	
Gender; *n* (%)				
Men	426 (41.6)	345 (35.6)	395 (39.0)	0.024
Women	599 (58.4)	624 (64.4)	617 (61.0)	
Age in years; mean ± SD; (min–max)	56.1 ± 15.6 (17.5–90.8)	56.3 ± 14.2 (18.0–98.0)	50.3 ± 14.4 (18.0–85.0)	<0.001
Measured hypertension (blood pressure above 140/90 mmHg); *n* (%)	354 (34.5)	439 (45.3)	240 (23.7)	<0.001
Poorly regulated hypertension (measured hypertension despite anti-hypertensive drug use); *n* (%)[a]	298 (84.2)	213 (48.5)	117 (48.8)	<0.001
Hyperlipidemia–total cholesterol above 5 mmol/L; *n* (%)	424 (41.9)	687 (70.9)	695 (68.7)	<0.001
Hyperlipidemia—LDL above 3.5 mmol/L; *n* (%)	544 (53.8)	747 (77.1)	776 (76.7)	<0.001
Self-reported moderate or high daily physical activity; *n* (%)	670 (68.1)	674 (70.9)	475 (47.6)	<0.001
Excessive alcohol consumption: more than 2 units per day for women and more than 3 units per day for men; *n* (%)[a]	118 (11.5)	88 (9.1)	59 (5.8)	<0.001

[a] 1 unit = 200 ml for wine and beer, 30 ml for spirits

Table 2 Comparison of the four basic socioeconomic variables across three investigated samples (Croatia; Vis 2003–2004, Korcula 2007, Split 2008–2009)

Socioeconomic status	Subsample			*P**
	Vis ($n = 1020$)	Korcula ($n = 933$)	Split ($n = 1010$)	
Men				
Subjective material status				
Worse than others	65 (15.3)	36 (10.8)	22 (5.6)	<0.001$^{ks, vs}$
The same	253 (59.5)	202 (60.8)	212 (53.8)	
Better than others	107 (25.2)	94 (28.3)	160 (40.6)	
Objective material status (self-reported individual income) (kn)				
Up to 4000	117 (27.5)	113 (34.0)	27 (6.9)	<0.001$^{ks, vs}$
4001–6000	92 (21.6)	86 (25.9)	71 (18.0)	
6001–8000	86 (20.2)	62 (18.7)	93 (23.6)	
8001 and more	130 (30.6)	71 (21.4)	203 (51.5)	
Material household possessions list	9.98 ± 2.56	10.76 ± 2.89	11.49 ± 2.34	<0.001$^{vk, vs, ks}$
Educational level (years of schooling)	10.85 ± 3.40	11.41 ± 3.08	13.49 ± 2.82	<0.001$^{vs, ks}$
Women				
Subjective material status				
Worse than others	122 (20.5)	82 (13.6)	48 (7.8)	<0.001$^{ks, vs}$
The same	355 (59.7)	388 (64.6)	354 (57.5)	
Better than others	118 (19.8)	131 (21.8)	214 (34.7)	
Objective material status (self-reported individual income) (kn)				
Up to 4000	na	236 (39.3)	102 (16.6)	<0.001$^{vk, ks, vs}$
4001–6000	na	170 (28.3)	133 (21.6)	
6001–8000	na	98 (16.3)	122 (19.8)	
8001 and more	na	97 (16.1)	259 (42.0)	
Material household status	9.10 ± 2.78	10.32 ± 2.73	11.16 ± 2.51	<0.001$^{vk, vs, ks}$
Educational level (years of schooling)	9.37 ± 3.60	10.57 ± 3.45	12.90 ± 3.07	<0.001$^{vk, vs, ks}$

* Analysis of variance, with LSD post hoc test, where vs denotes significant difference at the level of $P < 0.001$ between Vis and Split, vk denotes significant difference at the level of $P < 0.001$ between Vis and Korcula and ks denotes significant difference at the level of $P < 0.001$ between Korcula and Split. A t test was used in case of objective material status, as the data were not available for Vis population

Multimorbidity was also not associated with socioeconomic status, either as having at least two positive classes at least two concomitant diseases; Table 5) or three or more positive diseases (data not shown). Finally, a total of 139 subjects had deceased from the Vis islands sample over the follow-up period, with approximately balanced gender structure of 64 men (46.0 %) and 75 women (54.0 %). A Cox proportional hazard model suggested that none of the socioeconomic indicators was associated with the overall mortality (Table 6).

Discussion

The results of this study suggest that the population of Southern Dalmatia is experiencing minimal, if any, effect of socioeconomic inequalities on health. This finding may at first sound surprising since a vast majority of similar studies indeed showed strong association of socioeconomic status with health (Hosseinpoor et al. 2012b). The lack of such association in this study can, therefore, be regarded as an exception, which requires a careful multidimensional analysis, aiming to identify possible reasons for such a result.

First, this study was based on two island populations. High levels of island population homogeneity were described before, ranging from reduced genetics and lifestyle variance (Miljkovic et al. 2013; Vitart et al. 2006), to the reduced or practically inexistent socioeconomic inequalities (Smoljanovic et al. 2007). Such findings are known to exist in other island populations, most notably in Cuba (Keck and Reed 2012). In the case of the island of Vis, such homogeneity was also supported by the continuous presence of a military complex on the island, until 1991, when the Croatian Homeland War begun. Additionally, high levels of homogeneity could also be associated with very restrictive economic prospects on the island, which caused substantial emigration and a strong reduction of the

Table 3 The association of hypertension and socioeconomic status (Croatia; Vis 2003–2004, Korcula 2007, Split 2008–2009)

Hypertension	Vis				Korcula				Split			
	Men		Women		Men		Women		Men		Women	
	P	OR (95 % CI)	*P*	OR (95 % CI)	*P*	OR (95 % CI)	*P*	OR (95 % CI)	*P*	OR (95 % CI)	*P*	OR (95 % CI)
Subjective material status												
Worse than others (Ref.)	0.386	1.00	0.613	1.00	0.632	1.00	0.777	1.00	0.477	1.00	0.465	1.00
Same as others	0.448	0.73 (0.33–1.61)	0.368	0.77 (0.44–1.34)	0.840	0.91 (0.40–2.10)	0.643	1.15 (0.62–2.14)	0.225	0.52 (0.18–1.48)	0.338	0.65 (0.27–1.56)
Better than others	0.185	0.51 (0.19–1.37)	0.370	0.70 (0.33–1.50)	0.673	1.23 (0.46–3.27)	0.986	0.99 (0.46–2.12)	0.307	0.56 (0.18–1.70)	0.705	0.82 (0.31–2.18)
Objective material status												
2000–4000 kn and less (Ref.)	na	na	na	na	0.506	1.00	0.123	1.00	0.831	1.00	0.892	1.00
4000–6000 kn	na	na	na	na	0.750	0.90 (0.47–1.70)	0.143	0.68 (0.41–1.13)	0.597	1.31 (0.47–3.62)	0.751	0.89 (0.45–1.77)
6000–8000 kn	na	na	na	na	0.246	0.63 (0.29–1.37)	0.231	0.67 (0.35–1.28)	0.889	0.92 (0.33–2.60)	0.894	1.05 (0.49–2.24]
8000–10,000 kn and more	na	na	na	na	0.178	0.55 (0.23–1.31)	0.462	1.30 (0.64–2.64)	0.940	1.04 (0.36–2.93)	0.615	0.81 (0.37–1.79)
Employment status												
Employed (Ref.)	0.654	1.00	0.366	1.00	0.779	1.00	0.635	1.00	0.234	1.00	0.327	1.00
Unemployed	0.418	0.62 (0.20–1.94)	0.394	0.57 (0.16–2.04)	0.319	1.54 (0.65–3.66)	0.604	1.21 (0.58–2.52)	0.433	0.61 (0.18–2.05)	0.536	0.69 (0.21–2.22)
Retirement/dependants	0.506	0.79 (0.39–1.57)	0.204	1.53 (0.79–2.96)	0.991	1.00 (0.51–1.96)	0.656	0.87 (0.50–1.54)	0.197	1.49 (0.81–2.74)	0.648	1.16 (0.60–2.26)
Housewife	na	na	0.241	1.56 (0.74–3.29)	na	na	0.518	1.23 (0.64–2.36)	na	na	0.239	0.51 (0.16–1.56)
Material household status	0.440	1.04 (0.93–1.16)	0.228	1.05 (0.96–1.14)	0.371	0.95 (0.86–1.05)	0.121	0.93 (0.84–1.01)	0.119	1.09 (0.97–1.22)	0.236	1.06 (0.95–1.18)
Educational level	0.249	0.95 (0.88–1.03)	0.011	0.91 (0.85–0.97)	0.192	0.94 (0.86–1.02)	0.270	0.96 (0.89–1.03)	0.773	0.98 (0.90–1.08)	0.016	0.90 (0.82–0.98)
Age	<0.001	1.05 (1.02–1.08)	<0.001	1.04 (1.02–1.06)	0.001	1.04 (1.01–1.06)	<0.001	1.09 (1.07–1.12)	<0.001	1.06 (1.03–1.08)	<0.001	1.11 (1.07–1.14)

Blood pressure over 140/90 mmHg

Table 4 The association of psychological distress measured by General Health Questionnaire 30 and socioeconomic status (Croatia; Vis 2003–2004, Korcula 2007, Split 2008–2009)

Psychological distress	Vis				Korcula				Split			
	Men		Women		Men		Women		Men		Women	
	P	OR (95 % CI)	*P*	OR (95 % CI)	*P*	OR (95 % CI)	*P*	OR (95 % CI)	*P*	OR (95 % CI)	*P*	OR (95 % CI)
Subjective material status												
Worse than others (Ref.)	0.015	1.00	0.001	1.00	0.014	1.00	0.128	1.00	0.276	1.00	0.039	1.00
Same as others	0.024	0.45 (0.22–0.90)	<0.001	0.38 (0.23–0.63)	0.009	0.33 (0.14–0.76)	0.552	0.85 (0.49–1.45)	0.349	0.62 (0.23–1.67)	0.047	0.50 (0.26–0.99)
Better than others	0.004	0.26 (0.10–0.65)	0.003	0.37 (0.19–0.72)	0.347	0.62 (0.23–1.66)	0.073	0.53 (0.26–1.06)	0.874	0.91 (0.31–2.66)	0.011	0.38 (0.18–0.80)
Objective material status												
2000–4000 kn and less (Ref.)	na	na	na	na	0.890	1.00	0.820	1.00	0.150	1.00	0.105	1.00
4000-6000 kn	na	na	na	na	0.589	1.21 (0.59–2.48)	0.764	0.93 (0.59-1.46)	0.404	1.54 (0.55–4.31)	0.275	1.37 (0.77–2.41)
6000–8000 kn	na	na	na	na	0.867	0.92 (0.35–2.39)	0.765	0.91 (0.52–1.61)	0.710	0.81 (0.28–2.36)	0.766	0.91 (0.49–1.68)
8000–10,000 kn and more	na	na	na	na	0.825	0.88 (0.30–2.55)	0.342	0.72 (0.37–1.40)	0.562	0.72 (0.24–2.13)	0.355	0.74 (0.40–1.38)
Employment status												
Employed (Ref.)	0.740	1.00	0.449	1.00	0.736	1.00	0.989	1.00	0.497	1.00	0.279	1.00
Unemployed	0.438	0.69 (0.27–1.75)	0.454	1.31 (0.64–2.68)	0.725	0.81 (0.27–2.48)	0.988	0.99 (0.52–1.88)	0.409	1.49 (0.57–3.83)	0.802	0.92 (0.48–1.74)
Retirement/dependants	0.804	0.92 (0.50–1.70)	0.222	0.72 (0.43–1.21)	0.720	0.86 (0.37–1.96)	0.981	0.99 (0.59–1.66)	0.308	1.35 (0.75–2.43)	0.054	0.64 (0.40–1.00)
Housewife	na	na	0.347	0.74 (0.40–1.37)	na	na	0.772	0.91 (0.50–1.65)	na	na	0.651	0.83 (0.39–1.8)
Material household status	0.187	0.93 (0.84–1.03)	0.494	0.97 (0.91–1.04)	0.344	0.94 (0.84–1.06)	0.391	0.96 (0.88–1.04)	0.942	0.99 (0.89–1.11)	0.607	1.02 (0.94–1.10)
Educational level	0.912	1.00 (0.93–1.08)	0.010	0.92 (0.87–0.98)	0.294	0.95 (0.86–1.04)	0.810	0.99 (0.93–1.05)	0.785	1.01 (0.92–1.10)	0.248	0.96 (0.90–1.02)
Age	0.516	1.00 (0.98–1.02)	0.285	1.00 (0.99–1.02)	0.048	1.03 (1–1.06)	0.010	1.02 (1.00–1.04)	0.925	1.00 (0.98–1.01)	0.299	1.00 (0.99–1.02)

GHQ score ≥5

Table 5 The association of multimorbidity and socioeconomic status (Croatia; Vis 2003–2004, Korcula 2007, Split 2008–2009)

Multimorbidity (defined as having at least two distinctive disease diagnoses)	Vis				Korcula				Split			
	Men		Women		Men		Women		Men		Women	
	P	OR (95 % CI)	*P*	OR (95 % CI)	*P*	OR (95 % CI)	*P*	OR (95 % CI)	*P*	OR (95 % CI)	*P*	OR (95 % CI)
Subjective material status												
Worse than others (Ref.)	0.436	1.00	0.397	1.00	0.406	1.00	0.134	1.00	0.316	1.00	0.365	1.00
Same as others	0.213	0.62 (0.29–1.31)	0.359	1.31 (0.73–2.34)	0.294	0.61 (0.25–1.52)	0.187	1.53 (0.81–2.91)	0.136	0.45 (0.15–1.28)	0.283	0.64 (0.28–1.44)
Better than others	0.241	0.58 (0.23–1.44)	0.906	0.95 (0.43–2.08)	0.725	0.82 (0.29–2.35)	0.993	0.99 (0.45–2.16)	0.241	0.51 (0.16–1.56)	0.703	0.83 (0.33–2.07)
Objective material status												
2000–4000 kn and less (Ref.)	na	na	na	na	0.487	1.00	0.224	1.00	0.981	1.00	0.113	1.00
4000–6000 kn	na	na	na	na	0.191	1.57 (0.79–3.12)	0.073	0.62 (0.37–1.04)	0.989	1.00 (0.35–2.9)	0.507	1.24 (0.64–2.39)
6000–8000 kn	na	na	na	na	0.947	1.02 (0.46–2.28)	0.159	0.63 (0.34–1.19)	0.939	1.04 (0.36–3.01)	0.690	1.15 (0.56–2.39)
8000–10,000 kn and more	na	na	na	na	0.949	0.97 [0.39-2.36]	0.771	0.9 [0.44-1.83]	0.872	0.91 [0.31-2.67]	0.199	0.61 [0.28-1.29]
Employment status												
Employed (Ref.)	0.225	1.00	0.186	1.00	0.972	1.00	0.682	1.00	0.474	1.00	0.618	1.00
Unemployed	0.155	0.46 (0.16–1.33)	0.092	0.27 (0.06–1.23)	0.867	1.07 (0.44–2.59)	0.578	0.81 (0.39–1.68)	0.782	0.86 (0.30–2.46)	0.500	1.35 (0.56–3.24)
Retirement/dependants	0.167	0.63 (0.33–1.21)	0.323	1.37 (0.73–2.58)	0.711	0.87 (0.44–1.74)	0.240	0.71 (0.40–1.25)	0.276	1.39 (0.76–2.55)	0.372	1.31 (0.72–2.4)
Housewife	na	na	0.836	1.08 (0.51–2.28)	na	na	0.711	0.88 (0.45–1.70)	na	na	0.715	0.83 (0.30–2.26)
Material household status	0.868	1.00 (0.91–1.11)	0.485	1.03 (0.94–1.12)	0.620	0.97 (0.87–1.08)	0.096	0.92 (0.84–1.01)	0.067	1.11 (0.99–1.24)	0.682	1.02 (0.92–1.12)
Educational level	0.265	0.95 [0.89-1.03]	0.054	0.93 [0.87-1.00]	0.038	0.90 [0.82-0.99]	0.187	0.95 [0.88-1.02]	0.093	0.92 [0.83-1.01]	0.143	0.94 (0.86–1.02)
Age	<0.001	1.07 (1.04–1.09)	<0.001	1.07 (1.05–1.10)	<0.001	1.05 (1.02–1.08)	<0.001	1.10 (1.08–1.13)	<0.001	1.07 (1.05–1.10)	<0.001	1.12 (1.09–1.16)

Table 6 Hazard ratios for all-cause mortality in Vis island sample (Croatia; Vis 2003–2004)

Variable	Men		Women	
	P	HR (95 % CI)	*P*	HR (95 % CI)
Age	<0.001	1.14 (1.08–1.20)	<0.001	1.15 (1.10–1.20)
Years of schooling	0.161	0.92 (0.83–1.03)	0.124	1.08 (0.97–1.19)
Material possessions	0.735	0.97 (0.83–1.13)	0.350	0.94 (0.83–1.06)
Subjective material status				
Worse than others (Ref.)	0.337	1.00	0.072	1.00
Same as others	0.494	1.47 (0.48–4.42)	0.067	2.10 (0.95–4.65)
Better than others	0.714	0.76 (0.17-3.27)	0.987	0.99 (0.29–3.34)
Employment status				
Employed (Ref.)	0.785	1.00	0.549	1.00
Unemployed	0.521	1.89 (0.26–13.4)	0.740	1.45 (0.15–13.2)
Retired	0.586	1.43 (0.38–5.33)	0.203	0.45 (0.13–1.53)
Housewife	n/a	n/a	0.340	0.51 (0.13–2.00)

island population in the past (Nejasmic and Misetic 2006). All of these mechanisms apparently managed to maintain homogeneity of the island's population and produce a stunning lack of association of social inequalities with health. Thus, it becomes apparent how external context and setting may affect social inequalities and that there may be mechanisms which inhibit substantial stratification and prevent the effects of social inequalities on health.

The case of the island of Korcula is less extreme, but follows a general pattern of historic emigration and reduced economic opportunities that promoted higher levels of social homogeneity, common in such small and isolated populations (Smoljanovic et al. 2007). The situation persists to a certain degree even at present, and both of the islands rely on tourism as the main economic factor.

The lack of strong association of health inequalities and health in the city of Split is by far less straightforward, and it can be partly attributed to a network of possible reasons, which can be broadly classified into four inter-connected groups. These include (a) systematic bias, (b) selection bias, (c) information bias and (d) existence of a number of possible mediating and confounding factors. A systematic bias could have occurred as the result of the survey not being appropriate for the use in this population and the possibility that it may not have captured the proper and locally specific information (Polasek and Sogoric 2009). Selection bias could affect these results via two separate mechanisms: population structure of Split could be similar to that of the islands, since Split represents the economical, legal and logistical centres for the entire Southern Croatia. Another mechanism from the selection bias category is the possibility that sample was not representative, in a sense that it favoured those in the middle range of the socioeconomic status and higher education (Kolcic and Polasek 2009), with fewer subjects belonging to the extreme strata, both poor and wealthy. It is worth noticing that even the large-scale surveys in Croatia, such as the Croatian Adult Health Survey in 2003 (Vuletic et al. 2009), did not manage to provide a balanced sampling of all population strata prior to weighting. The third group of explanations includes information bias, the possibility that subjects did not provide information truthfully and shielded their true earnings, which is prevalent in the region (Nastav and Bojnec 2007). This is closely related to the latest group, mediating and confounding factors. This group includes at least six mechanisms, some of which are closely related and could be quite prevalent. One of these mechanisms is formal social support which is shown in equitable health care, wide-base pension system and child support, subsidised ferry transport for islanders, subsidised nurseries and kindergartens, facilitated enrolment to kindergartens and schools for veterans' children, facilitated flat ownership from previous regime, low prevalence of homeless people, etc. (Raboteg-Šarić and Pećnik 2005; Sekulić 2012). It can also be explained by informal social support (high prevalence of social networks and support from the wider social groups) (Dobrotić and Laklija 2012; Jelusic et al. 2010) and extended family structure (social support within family, flat and land inheritance) (Raboteg-Šarić and Pećnik 2005). Other forms of mechanisms are corruption and nepotism which include bypassing the official canals and trajectories, speeding-up of selected processes (Budak and Rajh 2012), grey economy and tax evasion (side-jobs, cash payments and bribery) (Bejakovic 2009; Kurnoga Živadinović and Groznica 2012) and self-production with self-suffiency (food provision—home grown or self-caught). Therefore, the results of this study seem to provide an additional confirmation to the observed gradient of

socioeconomic differences across Europe, where southern countries like Italy and Spain had much lower levels of inequalities than northern countries did (Mackenbach et al. 2008).

The most probable explanation for existence of a fair share of these mechanisms resides in the past and former communistic regime. Prior to 1991, Split was also under strong military influence, with entire blocks of the town being built and dedicated to the military personnel, including separate hospitals and complete infrastructure built around them. Flat ownership was not individualised, since the military built flats that were bound to be used by the military personnel, while other civilian-built flats were bound to be used by the civilians. Such a system promoted apparently high level of homogeneity (at least for the majority of the population), with nearly inexistent mechanisms of more substantial personal gain and financial advancement above the expected social class a person was in. With the breakdown of this system it was expected that such social homogeneity would be reduced and dissolved and inequalities would emerge, a situation that happened in many other post-social countries (Janković et al. 2012; Shkolnikov et al. 2006). Jen et al. (2009) in their study of self-rated health and income inequality hypothesis also found no evidence that variations in self-reported health are linked to the degree of income inequality across 69 countries, including former communist countries. In line with nearly inexistent association of socioeconomic inequalities and health, this study did not detect gender-related differences, despite apparently lower socioeconomic status in women. This finding could also be related to some locally specific bias, due to uneven perception of socioeconomic status of a household by spouses, which was performed in the island of Vis and indicated that men overestimated the household possessions (Kolcic et al. 2009).

In addition to problems listed before, this study also suffers from several more external limitations. The problem in assessing the representativeness of the samples is based on the inability to define a denominator. Despite the official Census of population 2001 data, during the field work and contacts with the local population and post office, it became apparent that probably as much as half of the entire registered population does not actually live on the island. This practice was prevalent since official registration on the islands was associated with tax reduction. Another major problem with generalisation of these results is related to the inability to compare any form of socioeconomic analysis in the entire Croatian population. Since there have been no proper population-based surveys since 2003 (Vuletic et al. 2009), the only possible source of information had to be derived from the Census of population data. However, even the official Census of population that took place in 2011 has not yielded information on education composition yet, thus disabling any possibility to validate the results from this study, especially lack of mortality differences, with the entire population of Croatia. If such data become available in the future, it will be possible to cross-compare the results and provide a more comprehensive answer as to whether such equalities indeed persist in investigated populations or arise as the artefact of the reasons outlined before.

Conclusions

The Southern Dalmatian population seems to experience no indication of an association between socioeconomic conditions and health. It is debatable if this situation is transitional or constant in the absence of more data, but it does suggest that this population is very interesting for more in-depth research, aiming to provide a deeper understanding of mechanisms that seem to maintain such conditions.

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