



Original articles

Socioeconomic status and psychological distress do not predict mortality risk in the island population of Vis, Croatia

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Aims

To investigate the association between socioeconomic status and psychological distress measured by the General health questionnaire (GHQ-30) with all-cause mortality, cardiovascular mortality and cancer mortality on the Croatian island of Vis.

Methods

This population-based cohort consisted of 1,025 subjects (426 men and 599 women), who were followed up for 18 years or a total of 5.8 million days. The causes of death were extracted from the Croatian National Institute of Public Health database. We calculated the adjusted hazard ratios, with subjective material status, years of schooling and a composite household material status used as estimates of socioeconomic status.

Results

There were 279 cases of death (27.2%). Socioeconomic status and psychological distress did not predict either the specific or the all-cause mortality risk. In addition, the interaction between socioeconomic variables and psychological distress also did not yield a significant hazard ratio in all three instances (all-cause, cardiovascular or tumour mortality).

Conclusions

These results confirm previous reports of the high level of social equality in the population of the island of Vis. Small and isolated communities may experience a lesser extent of social inequalities in health.

INTRODUCTION

The detrimental effect of declining social status on health is well known.^{1,2} Despite numerous difficulties in obtaining exact estimates of socioeconomic status, social status is believed to be fairly constant in Mediterranean countries.³ Several studies from Croatia suggest that isolated island communities may pertain higher levels of social homogeneity, reflected in both a generalized lack of health inequalities,^{4,5} extending even on to mortality.⁶ Sadly, these beneficial effects seem to be declining, as new generations most frequently achieve poorer health, diet and mortality profiles.^{7,8}

One of the mechanisms of how social inequalities may be exerting their detrimental effects is stress. The association of psychological distress and increased mortality risk has been a subject of many studies over the years.⁹ Most studies reported a significant association between mortality and psychological distress,^{9–14} especially correlated with cardiovascular diseases and cancer.^{12,15,16} Psychological distress measured by different scales and questionnaires, like

GHQ, was often previously found to predict mortality.^{17,18} GHQ is one of the most commonly used instruments for mental stress estimation.^{19,20} It was not designed to diagnose specific disorders but to distinguish healthy individuals from ones with self-perceived psychological disorders, especially depressive and anxiety disorders.²¹ The questionnaire contains questions about the general level of happiness, the experience of depressive and anxiety symptoms and sleep disturbance.^{10,20} While the original version was made out of 60 questions, several shorter versions were developed, with 30, 28, 20 and 12 questions. In these shorter versions, questions that could be positively answered by people suffering from physical illness were omitted.²² The 30-question version of the questionnaire (GHQ-30) is particularly well designed to diagnose minor psychiatric disorders and uses the best discriminators for establishing psychiatric cases derived from the full version. It contains an equal number of positive and negative questions, indicating health and illness, respectfully.²²

Therefore, the aim of this 18-year follow-up study was to investigate how social inequalities alongside psychological

Table 1. Comparison of the deceased and survived subjects

	Deceased (n=279)	Survived (n=746)	P
Age at surveying (years); mean±SD	68.4±10.1	51.6±14.7	<0.001
Gender; n (%)			
Men	139 (49.8)	287 (38.5)	0.001
Women	140 (50.2)	459 (61.5)	
Education (years of schooling); mean±SD	8.4±3.8	10.6±3.4	<0.001
Material household status; mean±SD	8.5±2.9	9.8±2.6	<0.001
Subjective material status; n (%)			
Worse than others	60 (21.5)	128 (17.2)	0.062
Same as others	170 (60.9)	442 (59.2)	
Better than others	49 (17.6)	176 (23.6)	
Psychological distress; n (%)			
Present	125 (44.8)	291 (39.0)	0.093
Absent	154 (55.2)	455 (61.0)	
BMI (kg/m ²); mean±SD	28.2±4.1	27.0±4.2	<0.001
Physical activity during daily work; n (%)			
Sitting and light	104 (37.3)	210 (28.2)	0.005
Moderate and heavy	175 (62.7)	536 (71.8)	

distress affect mortality (all-cause, cardiovascular and cancer mortality) in the population of the island of Vis.

METHODS

This study was performed within the larger project “10,001 Dalmatians,” which investigates environmental determinants of health and disease in Dalmatia, Croatia.^{5,23} For the purposes of this study, we included subjects who were recruited from the island of Vis. Sampling was completed in 2003 and 2004. All inhabitants listed in the voting register and general practitioner registries were invited to join the study.

The estimates of the socioeconomic status included years of schooling, subjective material status (classified in three groups; worse than others, same as others or better than others) and a composite material household status (measured as the sum of 16 items that could have been present in the household, including wooden floors, second TV, art collections, over 100 books, etc).⁴

Psychological distress was measured with the GHQ-30 using the original binary rating model with a four-point response scale 0-0-1-1 (presence of symptom: not at all=0, same as usual=0, more than usual=1, much more than usual=1).^{12,16} Points were summed for each individual, and the final GHQ score ranged from 0-30. We applied a GHQ-30 cut-off score of ≥5 where all those scoring 0-4 were considered non-distressed, and all those scoring 5-30 were considered psychologically distressed.

Causes of death for deceased subjects were obtained from the register of the Croatian National Institute of Public Health, from 2003 to 2021, thus yielding a total of 18 years of the follow-up period. This source was used to ex-

tract the date, and ICD-10 encoded cause of death, assigning subjects to cardiovascular or cancer mortality groups.

The initial comparison was made with the chi-square test and t-test, while Cox's proportional hazards regression model with 95% confidence intervals was utilized to calculate hazard ratios. Models were adjusted for age, sex, body mass index (BMI), physical activity, subjective material status, household material status and education (years of schooling). The significance threshold was set at $P < 0.05$. All analyses were performed with SPSS ver 18 (SPSS Inc, Chicago, IL).

RESULTS

A total of 1,025 subjects were included (426 men and 599 women). The follow-up period lasted for 18 years, amounting to a total of 5,775,140 days. During this period, there were 279 deaths (27.2%), with 122 (43.7%) caused by cardiovascular disease, 103 (36.9%) by cancer and 54 by other causes (19.4%).

The bivariate analysis showed that the deceased subjects were significantly older, more commonly men, with lower education and material household status, with elevated body mass index and less physically active (Table 1). Interestingly, psychological distress and subjective material status did not show a formally significant difference between these two groups (Table 1). Instead, psychological distress was more common in the elderly, women, and subjects with lower socioeconomic status (Table 2).

The multivariate analysis of the all-cause mortality only had a marginal effect on the material household status (Table 3). In addition, neither cardiovascular mortality nor cancer-related mortality showed any significance concern-

Table 2. Comparison of the non-distressed and distressed groups of participants

	Psychologically distressed (n=416)	No signs of psychological distress (n=609)	P
Age at surveying (years); mean±SD	57.9±15.2	55.0±15.7	0.003
Gender; n (%)			
Men	126 (30.3)	300 (49.3)	<0.001
Women	290 (69.7)	309 (50.7)	
Education (years of schooling); mean±SD	9.25±3.77	10.47±3.96	<0.001
Material household status; mean±SD	8.93±2.90	9.86±2.53	<0.001
Subjective material status; n (%)			
Worse than others	113 (27.2)	75 (12.3)	<0.001
Same as others	235 (56.5)	377 (61.9)	
Better than others	68 (16.3)	157 (25.8)	
BMI (kg/m ²); mean±SD	27.2±4.3	27.4±4.1	0.504
Physical activity during daily work; n (%)			
Sitting and light	144 (34.6)	170 (27.9)	0.022
Moderate and heavy	272 (65.4)	439 (72.1)	

ing the socioeconomic status or psychological distress (Table 3). Finally, we created an interaction model, where three socioeconomic variables and psychological distress were entered into a Cox regression model as the interaction term, alongside age and gender as confounders. The model yielded no significant results, with the hazard ratio for the interaction item for all-cause mortality of 1.00 [95% confidence intervals 0.99-1.01]. Similarly, neither the cardiovascular nor the cancer mortality showed significance when a similar interaction item was entered in the model.

DISCUSSION

This study shows an exceptional level of social homogeneity in the isolated population of the island of Vis in Croatia, reflected in the absence of effect of social inequalities or psychological distress on mortality. This absent correlation disagrees with numerous previously published studies.^{1,9-14,24} However, some existing studies reported an association between absent mortality and anxiety and depression,²⁵ or psychological distress.²⁶ Although a link between psychological distress and cardiovascular mortality is well established,^{12,27-29} some studies suggested that psychological symptoms were only associated with cardiovascular events, but not with cardiovascular mortality.^{17,30} Interestingly, we found comparably lower cardiovascular mortality and greater cancer-related mortality than national data,³¹⁻³⁴ despite a rather prevalent extent of psychological distress.

The results of this study showed significant differences between psychologically distressed and non-distressed regarding socioeconomic factors, confirming some previous studies.^{11,17} It has also been hypothesized that socioeconomic inequalities may partly be caused by psychological distress that stems from social deprivation.³⁵ Our study was

not able to reproduce these results as the interaction model of socioeconomic status showed no correlation with psychological distress. All these findings support previous ideas that the interplay of socioeconomic status, psychological distress, and mortality are complex.^{36,37}

The limitations of this study include a relatively small sample size or a possibility that the results of the study might be specific for the investigated population. Another problem may arise from the mortality data, which may be biased, especially in small communities. Nevertheless, these results support the findings of previously reported high levels of social homogeneity in small and isolated populations.

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COMPETING INTERESTS

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Table 3. Association between material status and mortality

	All-cause mortality		Cardiovascular mortality		Cancer mortality	
	P	HR [95% CI]	P	HR [95% CI]	P	HR [95% CI]
Age	<0.001	1.08 [1.07-1.09]	0.083	1.02 [0.99-1.04]	0.034	1.03 [1.01-1.06]
Gender						
Men [Ref.]		1.00		1.00		1.00
Women	<0.001	0.49 [0.38-0.64]	0.002	0.48 [0.30-0.76]	0.288	1.30 [0.80-2.13]
Education [years of schooling]	0.174	0.97 [0.93-1.01]	0.891	0.99 [0.94-1.06]	0.213	1.04 [0.98-1.11]
Material household status	0.099	0.95 [0.93-1.01]	0.280	0.96 [0.94-1.06]	0.309	0.95 [0.87-1.05]
Subjective material status						
Worse [Ref.]	0.952	1.00	0.940	1.00	0.502	1.00
Same as others	0.783	1.04 [0.77-1.42]	0.830	0.94 [0.56-1.60]	0.535	1.19 [0.69-2.03]
Better than others	0.773	1.06 [0.71-1.60]	0.910	1.04 [0.56-1.93]	0.660	0.84 [0.39-1.81]
Psychological distress	0.334	1.13 [0.88-1.45]	0.185	1.32 [0.88-1.98]	0.220	0.73 [0.45-1.20]
BMI [kg/m ²]	0.786	1.00 [0.96-1.03]	0.931	0.99 [0.95-1.05]	0.314	0.97 [0.92-1.03]
Physical activity during daily work						
Sitting and light [Ref.]		1.00		1.00		1.00
Moderate and heavy	0.209	0.85 [0.66-1.10]	0.297	0.81 [0.55-1.20]	0.136	0.71 [0.45-1.11]

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AUTHOR CONTRIBUTIONS

OP and IK conceived the study. ML and AC performed the analysis and drafted the manuscript. All authors approved the final version and are held responsible for the entire article content.

RAW DATA

The entire raw dataset is available as the Supplementary material.

ETHICS

This study was approved by the Ethical boards of the Medical School, University of Zagreb, the Multi-Centre Research Ethics Committee for Scotland, The University of Split School of Medicine and the Lothian NHS Board (approvals available upon request to the corresponding author). The use of mortality data was approved by the Ethical Board of the Croatian National Institute of Public Health.

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REFERENCES

1. Rubio Valverde JR, Mackenbach JP, Nusselder WJ. Trends in inequalities in disability in Europe between 2002 and 2017. *J Epidemiol Community Health*. 2021;75(8):712-720. [doi:10.1136/jech-2020-216141](https://doi.org/10.1136/jech-2020-216141)
2. Mackenbach JP. Re-thinking health inequalities is necessary. *European journal of public health*. 2020;30(4):622. [doi:10.1093/eurpub/ckaa002](https://doi.org/10.1093/eurpub/ckaa002)
3. Petmesidou M, Papatheodorou C. *Poverty and Social Deprivation in the Mediterranean: CROP*.; 2006.
4. Smoljanović A, Vorko-Jović A, Kolčić I, Bernat R, Stojanović D, Polasek O. Micro-scale socioeconomic inequalities and health indicators in a small isolated community of Vis Island, Croatia. *Croat Med J*. 2007;48(5):734-740.
5. Polasek O, Kolcic I, Smoljanovic A, et al. Demonstrating reduced environmental and genetic diversity in human isolates by analysis of blood lipid levels. *Croatian Medical Journal*. 2006;47(4):649-655.
6. Stipčić A, Ćorić T, Erceg M, Mihanović F, Kolčić I, Polašek O. Socioeconomic inequalities show remarkably poor association with health and disease in Southern Croatia. *Int J Public Health*. 2015;60(4):417-426. [doi:10.1007/s00038-015-0667-x](https://doi.org/10.1007/s00038-015-0667-x)
7. Kolčić I, Relja A, Gelemanović A, et al. Mediterranean diet in the southern Croatia – does it still exist? *Croat Med J*. 2016;57(5):415-424. [doi:10.3325/cmj.2016.57.415](https://doi.org/10.3325/cmj.2016.57.415)
8. Rehberg J, Stipčić A, Ćorić T, Kolčić I, Polašek O. Mortality patterns in Southern Adriatic islands of Croatia: a registry-based study. *Croat Med J*. 2018;59(3):118-123. [doi:10.3325/cmj.2018.59.118](https://doi.org/10.3325/cmj.2018.59.118)
9. Fredman L, Magaziner J, Hebel JR, Hawkes W, Zimmerman SI. Depressive symptoms and 6-year mortality among elderly community-dwelling women. *Epidemiology*. 1999;10(1):54-59. [doi:10.1097/00001648-199901000-00010](https://doi.org/10.1097/00001648-199901000-00010)
10. Puustinen PJ, Koponen H, Kautiainen H, Mäntyselkä P, Vanhala M. Psychological distress measured by the GHQ-12 and mortality: A prospective population-based study. *Scand J Public Health*. 2011;39(6):577-581. [doi:10.1177/1403494811414244](https://doi.org/10.1177/1403494811414244)
11. Rasul F, Stansfeld SA, Hart CL, Gillis CR, Smith GD. Psychological distress, physical illness and mortality risk. *J Psychosom Res*. 2004;57(3):231-236. [doi:10.1016/s0022-3999\(03\)00618-4](https://doi.org/10.1016/s0022-3999(03)00618-4)
12. Robinson KL, McBeth J, Macfarlane GJ. Psychological distress and premature mortality in the general population: A prospective study. *Ann Epidemiol*. 2004;14(7):467-472. [doi:10.1016/j.annepidem.2003.11.007](https://doi.org/10.1016/j.annepidem.2003.11.007)
13. Russ TC, Stamatakis E, Hamer M, Starr JM, Kivimaki M, Batty GD. Association between psychological distress and mortality: Individual participant pooled analysis of 10 prospective cohort studies. *BMJ*. 2012;345(jul31 4):e4933. [doi:10.1136/bmj.e4933](https://doi.org/10.1136/bmj.e4933)
14. Henderson M, Hotopf M, Shah I, Hayes RD, Kuh D. Psychiatric disorder in early adulthood and risk of premature mortality in the 1946 British Birth Cohort. *BMC Psychiatry*. 2011;11. [doi:10.1186/1471-244x-11-37](https://doi.org/10.1186/1471-244x-11-37)
15. Colton CW, Manderscheid RW. Congruencies in increased mortality rates, years of potential life lost, and causes of death among public mental health clients in eight states. *Prev Chronic Dis*. 2006;3(2):A42.
16. Hamer M, Molloy GJ, Stamatakis E. Psychological distress as a risk factor for cardiovascular events: pathophysiological and behavioral mechanisms. *J Am Coll Cardiol*. 2008;52(25):2156-2162. [doi:10.1016/j.jacc.2008.08.057](https://doi.org/10.1016/j.jacc.2008.08.057)
17. Ariyo AA, Haan M, Tangen CM, et al. Depressive symptoms and risks of coronary heart disease and mortality in elderly Americans. *Circulation*. 2000;102(15):1773-1779. [doi:10.1161/01.cir.102.15.1773](https://doi.org/10.1161/01.cir.102.15.1773)
18. Huppert FA, Whittington JE. Symptoms of psychological distress predict 7-year mortality. *Psychol Med*. 1995;25(5):1073-1086. [doi:10.1017/s0033291700037569](https://doi.org/10.1017/s0033291700037569)
19. Gardner J, Oswald A. How is mortality affected by money, marriage, and stress? *J Health Econ*. 2004;23(6):1181-1207. [doi:10.1016/j.jhealeco.2004.03.002](https://doi.org/10.1016/j.jhealeco.2004.03.002)
20. Puustinen PJ, Koponen H, Kautiainen H, Mäntyselkä P, Vanhala M. Gender-specific association of psychological distress with cardiovascular risk scores. *Scandinavian Journal of Primary Health Care*. 2010;28(1):36-40. [doi:10.3109/02813431003648131](https://doi.org/10.3109/02813431003648131)

21. Carvalho HW de, Patrick CJ, Jorge MR, Andreoli SB. Validation of the structural coherency of the General Health Questionnaire. *Rev Bras Psiquiatr.* 2011;33(1):59-63. [doi:10.1590/s1516-44462011000100012](https://doi.org/10.1590/s1516-44462011000100012)
22. Goldberg DP, Williams P. *A User's Guide to the General Health Questionnaire*. Windsor: NFER-Nelson; 1988.
23. Rudan I, Marušić A, Janković S, et al. "10001 Dalmatians:" Croatia launches its national biobank. *Croat Med J.* 2009;50(1):4-6. [doi:10.3325/cmj.2009.50.4](https://doi.org/10.3325/cmj.2009.50.4)
24. Markkula N, Härkänen T, Perälä J, et al. Mortality in people with depressive, anxiety and alcohol use disorders in Finland. *Br J Psychiatry.* 2012;200(2):143-149. [doi:10.1192/bjp.bp.111.094904](https://doi.org/10.1192/bjp.bp.111.094904)
25. Persson G. Five-year mortality in a 70-year-old urban population in relation to psychiatric diagnosis, personality, sexuality and early parental death. *Acta Psychiatr Scand.* 1981;64(3):244-253. [doi:10.1111/j.1600-0447.1981.tb00780.x](https://doi.org/10.1111/j.1600-0447.1981.tb00780.x)
26. Kisely S, Campbell LA, Cox M. The effect of study design on the reporting of mortality due to colorectal cancer in adults with mental illness in Nova Scotia. *Can J Psychiatry.* 2012;57(6):389-394. [doi:10.1177/070674371205700609](https://doi.org/10.1177/070674371205700609)
27. May M, McCarron P, Stansfeld S, et al. Does psychological distress predict the risk of ischemic stroke and transient ischemic attack? *Stroke.* 2002;33(1):7-12. [doi:10.1161/hs0102.100529](https://doi.org/10.1161/hs0102.100529)
28. Yasuda N, Mino Y, Koda S, Ohara H. The differential influence of distinct clusters of psychiatric symptoms, as assessed by the general health questionnaire, on cause of death in older persons living in a rural community of Japan. *J Am Geriatr Soc.* 2002;50(2):313-320. [doi:10.1046/j.1532-5415.2002.50064.x](https://doi.org/10.1046/j.1532-5415.2002.50064.x)
29. Stansfeld SA, Fuhrer R, Shipley MJ, Marmot MG. Psychological distress as a risk factor for coronary heart disease in the Whitehall II Study. *Int J Epidemiol.* 2002;31(1):248-255. [doi:10.1093/ije/31.1.248](https://doi.org/10.1093/ije/31.1.248)
30. Stewart RAH, North FM, West TM, et al. Depression and cardiovascular morbidity and mortality: cause or consequence? *Eur Heart J.* 2003;24(22):2027-2037. [doi:10.1016/j.ehj.2003.08.017](https://doi.org/10.1016/j.ehj.2003.08.017)
31. Vrdoljak E. Cancer in Croatia; where do we stand and how to move forward? *Croat Med J.* 2012;53(2):91-92. [doi:10.3325/cmj.2012.53.91](https://doi.org/10.3325/cmj.2012.53.91)
32. Kirac I, Šekerija M, Šimunović I, et al. Incidence and mortality trends of gastric and colorectal cancers in Croatia, 1988-2008. *Croat Med J.* 2012;53(2):124-134. [doi:10.3325/cmj.2012.53.124](https://doi.org/10.3325/cmj.2012.53.124)
33. Kelava I, Tomičić K, Kokić M, et al. Breast and gynecological cancers in Croatia, 1988-2008. *Croat Med J.* 2012;53(2):100-108. [doi:10.3325/cmj.2012.53.100](https://doi.org/10.3325/cmj.2012.53.100)
34. Janković M, Samaržija M, Jakopović M, Kuliš T, Znaor A. Trends in lung cancer incidence and mortality in Croatia, 1988 to 2008. *Croat Med J.* 2012;53(2):93-99. [doi:10.3325/cmj.2012.53.93](https://doi.org/10.3325/cmj.2012.53.93)
35. Wilkinson RG. Health, hierarchy, and social anxiety. *Annals of the New York Academy of Sciences.* 1999;896(1):48-63. [doi:10.1111/j.1749-6632.1999.tb08104.x](https://doi.org/10.1111/j.1749-6632.1999.tb08104.x)
36. Ponizovsky AM, Haklai Z, Goldberger N. Association between psychological distress and mortality: The case of Israel. *J Epidemiol Community Health.* 2018;72(8):726-732. [doi:10.1136/jech-2017-210356](https://doi.org/10.1136/jech-2017-210356)
37. Moncho J, Pereyra-Zamora P, Tamayo-Fonseca N, Giron M, Gómez-Beneyto M, Nolasco A. Is recession bad for your mental health? The answer could be complex: evidence from the 2008 crisis in Spain. *BMC Med Res Methodol.* 2018;18(1). [doi:10.1186/s12874-018-0538-2](https://doi.org/10.1186/s12874-018-0538-2)

SUPPLEMENTARY MATERIALS

Supplementary material

Download: <https://joghep.scholasticahq.com/article/29662-socioeconomic-status-and-psychological-distress-do-not-predict-mortality-risk-in-the-island-population-of-vis-croatia/attachment/75070.xlsx>
