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ORIGINAL ARTICLE

The impact of ethnicity, place of residence and socioeconomic status on health-related quality of life: results from a Greek health survey

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Abstract
Objectives The impact of socioeconomic status (SES) on health previously studied demonstrates that low SES relates to lower health. In Greece, related studies are limited and focused on native population. The aim of this study was to assess the influence of residence, ethnicity and SES on health-related quality of life (HRQoL).
Methods The study was carried out in Thessaly using a sample of 1,372 individuals (18+ years old, response rate 91.4%) via face-to-face interview. Multiple stepwise linear regression analyses were performed investigating the impact of the above factors on HRQoL, measured by SF-36. Interaction effects between socioeconomic and demographic variables were performed.
Results Disadvantage of SES, i.e. primary education and low income, was associated with impaired HRQoL in physical and mental health. Albanians reported better HRQoL compared to Greeks but after controlling for SES factors health disparities became insignificant. Rural residents were related to better general and mental health.
Conclusions SES is an independent predictor of HRQoL, but ethnicity and place of residence had weak impact. Investigating the underline mechanisms that impair HRQoL, so as to take policies that will elucidate the risk of poor health in disadvantage groups, is important.

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Introduction

One of the most extensively studied determinants of health is the socioeconomic status (SES) and its profound association with morbidity and mortality (Bacon et al. 2009; Adler and Ostrove 1999). The SES is usually determined by factors such as education, income, occupational status, or access to health insurance and in certain cases with place of residence, whereas it is strongly associated with an individual's health and well being (Bacon et al. 2009; Adler and Ostrove 1999; Doiron et al. 2008). Previous studies have shown that low SES has been related to worse health status and quality of life, higher prevalence of health risk behaviors and lower self-assessed health (Mackenbach et al. 2008; Hemingway et al. 1997).

Despite certain advances over the years in the quality and access to health care services, it is noteworthy that the discrepancy on health status between social classes has persisted, even though the diseases that produce morbidity and mortality have changed over time (Wilkinson 1996). In an attempt to explain the effects of SES on health, researchers have stratified the variables that would measure the individual's social standing. In particular, the socio-demographic, economic, environmental, behavioral, psychological and physiological variables that can be measured could each exert differential and important results on health status (Anderson and Cheryl Armstead 1995).

The patterns of health status observed in Europe and the US appear to be due to differences between individuals with low SES (i.e. low education, low income, manual occupation) and their "privileged" counterparts (i.e.

university education, high income, non-manual occupation). These inequalities are thought to be attributed to the socioeconomic structure of each country and such patterns have several similarities when comparing different countries (Mackenbach et al. 2008; Huguet et al. 2008; Alexopoulos and Geitona 2009).

Gender and age have been extensively studied and are thought to be important predictors of health-related quality of life (HRQoL) (Michel et al. 2009). Among all the SES factors, the educational, economic and occupational status are most elaborately investigated (Regidor et al. 1999; Yamazaki et al. 2005; Riise et al. 2003). Each of these measures can capture distinctive aspects of social position, but they are also affected by each other or by other variables such as ethnicity and residence. Educational status operates through a complex mechanism; it can be measured easily and is attained early in life, it is also rarely affected by health impairments, but is associated both with income and occupation. Higher educational status is associated with lower mortality and morbidity, better self-reported health and higher physical functioning. Education is a factor that can also put forth parameters of lifestyle and behavior of an individual and should be assessed in relation to the other socioeconomic factors (Shkolnikov et al. 2006; Kunst and Roskam 2007).

On the other hand, the economic status, usually determined by income, has been shown to reduce mortality substantially and continues to do so past the point at which basic needs are satisfied (Marmot 2002). It is a variable that should be assessed with caution because studies (Marmot 2002) argue that wealth should be measured as well in order to capture the economic reserves. Income matters to health because it links material deprivation and restrictions of social interactions that can overall affect the individual's well-being, but particularly in a society that offers fewer goods and services (Deaton 2002). The role of occupation among individuals in later life has been questioned and the degree at which working conditions influence health is unclear (Riise et al. 2003). Determining occupational status in studies that investigate SES can be advantageous since it can indicate the outcome of educational attainment, the social position and could give a better understanding on the income of the individual in a particular socioeconomic group (Dahl et al. 2006; Mackenbach et al. 2008).

Few studies have assessed the impact of ethnicity and residency on health status and their interaction with each other and with HRQoL. These two factors could identify the discrepancy in health status between rural and the extensively studied urban residents and between the immigrant and native population (Bhopal 2007). As far as ethnicity is concerned, immigrants are thought to be at a higher risk for lower health. This is true not only because they usually belong to the lowest socioeconomic strata of the society, but also because of the limitations they face in health access and utilization due to their linguistic, cultural and administrative problems also linked to the insurance of their residence permit (Bollini 1995). Residency can also have an impact on HRQoL through possible differences in income distribution, access to information and access to health care (Philip et al. 2002). Furthermore, in studies investigating HRQoL, no particular focus has been given to the low occupational status that is expected to represent the rural population and the differences of their health status perception. It is, therefore, of great interest to measure the interaction of such socially different groups in accordance with health status (Slifkin et al. 2000).

Several tools have been used to assess health but questionnaires designed from a series of questions that form a number of scales such as the SF-36 questionnaire are thought to be more reliable and suitable for research. SF-36 is a generic tool of health assessment that has been widely adopted because of its brevity and its comprehensiveness and has been broadly used in population-based studies (Jenkinson et al. 1994); therefore it is appropriate for a population study that assesses HRQoL.

Greek studies investigating the relationship between self-assessed health and SES are limited (Alexopoulos and Geitona 2009; Pappa et al. 2009). These studies have a geographical restriction since they do not investigate HRQoL according to residency and also ethnicity has not been fully investigated in Greece. The differences that are expected to be exerted in such groups because of their health behaviors, early social conditions and personal expectations are hypothesized to be associated with their ethnicity and could prove valuable for our understanding of immigrants as a differential social group and could also put forth important information regarding the integration of ethnic groups in the Greek society.

The aim of this study was to assess, in a sample of native Greeks and immigrants (mostly Albanians) living in the periphery of Thessaly, the impact of factors such as demographic characteristics, SES, ethnicity and place of residence on self-perceived health as estimated by the SF-36 questionnaire. The main target was to investigate the impact of variables that have not been previously studied in Greece, such as place of residence and ethnicity, on aspects that constitute HRQoL.

Methods

Samples and variables

A cross-sectional study was carried out in 2006 in the prefecture of Thessaly using a representative sample of 1,372 individuals (18+ years old, response rate 91.4%) via

face-to-face interview by trained personnel. Thessaly is one of the 13 geographical regions of Greece, subdivided into four prefectures and is also the third largest region, population-wise, where 6.7% of the Greek population lives. According to the national census of 2001 and the immigration office, the population distribution is 66% urban, 34% rural and 3.4% different ethnicity (88% Albanians) residents. Institutionalized individuals were excluded. The participants in the study were chosen proportionally to the population size, according to a three-staged methodology. In particular, in the first stage, a random sample of building blocks was selected proportionally to size. In the second stage, households were selected by systematic sampling and in the third stage one participant from each household was selected by random sampling. The basic questionnaire that was applied was comprised of three parts: HRQoL (measured by SF-36), demographic and socioeconomic characteristics (age, gender, educational level, occupation, health insurance, average monthly income, ethnicity and residence) and health service utilization information.

This questionnaire is thought to be able to estimate, with good precision, physical and mental health related to quality of life and has been substantially validated in a number of studies including studies conducted for the Greek population (Pappa et al. 2005; Anagnostopoulos et al. 2005) that were comparable to the results from studies conducted in Europe and the USA. The SF-36 questionnaire is a generic tool that involves eight scales such as physical functioning (PF), role limitations due to physical health problems (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role limitations due to emotional problems (RE) and mental health (MH) and two summary scores: physical health (PCS) and mental health (MCS). Higher scores (0–100 range) reflect better HRQoL.

In an attempt to assess the socioeconomic gradient in health, we investigated gradient associations between socioeconomic variables and health in order to properly assess the risk of poor health. Except for the demographic characteristics of gender and age (continuous), we used dummy variables for education defined by primary and secondary, with reference category the university level of education. We also used dummy variables for income defined by low (<880 Euros), medium (881–1,760 Euros), with reference category high income (>1,764 Euros). Finally, place of residence defined by urban/rural and ethnicity defined by Greeks/Albanians were included in the study.

Statistical analysis

The SF-36 health survey was scored according to the documented procedure (Ware et al. 1994). Student's t test and one-way ANOVA were tested for significant mean differences in eight scales and in two summary scores according to demographic and socioeconomic characteristics. The existence of potential co-linearity issues among the independent variables was excluded by Spearman correlation coefficient and variance inflation factors (VIF $\geq$ 10). Multiple stepwise linear regression analyses were used to assess the influence of independent demographic and socioeconomic variables on SF-36 scales and two summary scores. Subsequently, the models were extended by estimating the two-way interaction effects between education or income and demographic variables in order to test the combined effects of education/income and gender or education/income and age on health outcomes. Furthermore, we tested the two-way interaction effects between ethnicity and demographic variables to examine whether the effect of ethnicity on HRQoL was modified by gender or age. A two-tailed p value of less than 0.05 is considered significant in all the models of testing. The statistical analysis was carried out with the statistical package SPSS v.16 (SPSS Inc, Chicago, IL, USA).

Results

Descriptive data

Table 1 presents the demographic and socioeconomic characteristics of our sample which consisted of 48.1% men and 51.9% women with a mean age of approximately 43 years of age. The sample distribution according to age was higher for the group of 18–34 years of age. The majority of the individuals (66%) lived in the urban areas of Thessaly and the remaining 34% in the rural areas, which roughly represents the population distribution of Thessaly according to the 2001 consensus.

Furthermore, the majority of individuals (59.7%) had completed a 12-year (secondary) education, whereas 50.4% of the respondents reported a monthly income of 883–1,760 Euros. The participants were mostly manual workers (58.7%), representing the occupational status of Thessaly, according to the Greek labor force survey in 2000. Finally, 75.9% of the respondents were Greeks and the remaining 24.15% were Albanians. Univariate analysis (Table 1) showed that all the independent variables gender, age, place of residence, ethnicity, education and income were significantly associated with HRQoL. The most profound results were that the variables of education and income were related to poor health, while the variables of rural residents and Albanian ethnicity were related to better health. All the above-mentioned differences were found to be statistically significant ($p < 0.05$).

Table 1 Socio-demographic characteristics of the sample ($N = 1,372$) and mean (SD) of SF-36 scales scores according to demographic and socioeconomic characteristics (prefecture of Thessaly, Greece, 2009)

	N (%)	Mean (SD)							
		PF	RP	BP	GH	VT	SF	RE	MH
Gender									
Male	660 (48.1)	82.78 (21.99)	74.88 (37.78)	80.03 (17.46)	64.10 (17.61)	58.95 (22.79)	72.74 (24.09)	73.73 (36.45)	64.32 (18.95)
Female	712 (51.9)	78.94 (23.04)	67.02 (38.91)	76.49 (17.73)	62.41 (17.53)	55.18 (22.13)	66.95 (26.10)	63.48 (38.96)	60.83 (20.97)
Age									
18–34	431 (31.4)	91.38 (12.95)	84.97 (29.95)	85.08 (15.57)	71.48 (14.62)	66.48 (19.84)	77.90 (23.36)	75.79 (33.32)	67.11 (20.05)
35–44	376 (27.4)	85.54 (16.48)	79.18 (31.89)	80.15 (16.36)	63.80 (14.66)	59.21 (18.13)	71.27 (22.25)	74.20 (34.50)	62.23 (17.80)
45–54	258 (18.8)	81.72 (18.33)	68.41 (38.13)	75.54 (16.68)	60.76 (16.79)	55.21 (20.21)	67.87 (22.66)	68.99 (35.69)	62.49 (18.08)
55–64	152 (11.1)	67.76 (23.71)	48.02 (41.44)	70.97 (17.41)	55.05 (17.49)	46.94 (24.75)	63.89 (26.39)	54.60 (38.65)	57.34 (21.30)
65–75+	155 (11.3)	51.06 (29.73)	37.41 (42.00)	65.77 (18.21)	49.42 (20.97)	38.06 (24.61)	52.17 (29.85)	46.45 (49.30)	55.48 (23.99)
Ethnicity									
Greek	1,042 (75.9)	79.29 (23.36)	69.48 (39.21)	77.05 (17.76)	63.39 (18.68)	56.09 (23.59)	69.15 (26.62)	65.16 (38.16)	62.22 (21.26)
Albanians	330 (24.1)	85.53 (19.34)	75.00 (36.15)	81.78 (16.94)	62.77 (13.76)	59.84 (18.51)	71.59 (20.55)	78.68 (36.11)	63.41 (15.86)
Education									
Primary	355 (25.9)	64.52 (28.18)	48.31 (41.47)	69.17 (18.23)	54.42 (19.51)	45.07 (24.50)	59.68 (28.63)	55.02 (43.27)	56.77 (21.81)
Secondary	819 (59.7)	85.73 (17.36)	76.89 (35.49)	81.00 (16.39)	65.34 (15.69)	59.79 (19.87)	72.94 (22.55)	71.99 (35.50)	63.50 (18.79)
University	198 (14.4)	89.54 (15.03)	85.98 (26.94)	82.78 (16.18)	69.25 (16.45)	66.81 (20.66)	74.55 (25.01)	77.60 (32.36)	68.70 (19.67)
Household income									
Low	398 (29.0)	71.15 (26.81)	60.23 (41.00)	74.58 (18.83)	60.04 (20.74)	51.54 (25.31)	64.57 (27.22)	57.45 (42.11)	59.04 (22.38)
Medium	692 (50.4)	83.01 (20.33)	72.36 (37.04)	78.78 (17.07)	63.04 (16.17)	56.90 (21.32)	70.35 (24.53)	71.58 (35.88)	62.75 (19.31)
High	282 (20.6)	88.95 (15.89)	81.91 (34.86)	81.84 (16.57)	68.00 (15.14)	64.91 (18.65)	75.53 (22.95)	76.12 (34.05)	66.80 (17.60)
Residence									
Urban	906 (66.0)	80.43 (22.78)	69.48 (39.40)	77.92 (17.61)	62.44 (17.80)	56.57 (22.43)	68.97 (25.22)	67.77 (38.71)	61.75 (20.07)
Rural	466 (34.0)	81.49 (22.30)	73.39 (36.77)	78.73 (17.81)	64.79 (17.06)	57.81 (22.71)	71.24 (25.43)	69.67 (36.91)	63.98 (20.08)
Occupation									
Manual	805 (58.7)	80.05 (23.39)	69.78 (39.73)	77.36 (17.67)	63.71 (18.10)	56.50 (23.59)	68.64 (26.21)	66.83 (38.16)	62.10 (20.99)
Non-manual	567 (41.3)	81.84 (21.44)	72.26 (36.81)	79.37 (17.65)	62.58 (16.82)	57.69 (20.91)	71.29 (23.91)	70.66 (37.95)	63.09 (18.76)

SD standard deviation, *PF* physical functioning, *RP* role physical, *BP* bodily pain, *GH* general health, *VT* vitality, *SF* social functioning, *RE* role emotional, *MH* mental health

All the above differences were found to be statistically significant ($p < 0.05$)

Table 2 Multiple linear coefficients of SF-36 scales and interaction effects in the overall sample (prefecture of Thessaly, Greece, 2009)

	B coefficient[a] (p value < 0.05)							
	PF	RP	BP	GH	VT	SF	RE	MH
Gender	5.86††	11.22††	4.93††	3.63††	5.77††	7.41††	11.76††	4.17††
Age	−7.66††	−9.97††	−4.03††	−4.92††	−5.85††	−5.19††	−6.01††	−2.14††
Residence	−1.11†	−3.27†	−1.06†	−1.93††	−1.30†	−2.24†	−3.35†	−2.31††
Change of R^2	0.310	0.196	0.151	0.172	0.177	0.114	0.091	0.049
Education								
Primary	−8.29††	−17.53††	−6.06††	−5.43††	−9.52††	−4.15†	−8.29††	−6.84††
Secondary	−2.71†	−7.52††	−2.00†	−2.30†	−6.07††	−0.63†	−7.42††	−4.72††
Income								
Low	−6.42††	−4.73††	0.23†	−1.64††	−3.98††	−3.38†	−8.12††	−3.29††
Medium	−2.70††	−4.29†	−1.19†	−2.74††	−5.05††	−3.09†	−2.07†	−2.49†
Ethnicity	−0.84†	0.72†	−2.20††	2.86††	−0.91†	0.72†	−10.43††	−0.29†
Change of R^2	0.024	0.017	0.009	0.014	0.024	0.003	0.018	0.012
R^2	0.334	0.213	0.160	0.186	0.201	0.117	0.109	0.061
Education × age F	1.10†	2.07††	1.51†	1.90†	1.24†	1.84†	2.04††	0.52†
Income × age F	0.84†	1.33†	0.24†	0.52†	0.80†	0.16†	1.42†	0.43†
Household income × residence F	3.61††	1.27†	0.35†	1.86†	3.29††	2.39†	3.94††	4.19††

PF physical functioning, *RP* role physical, *BP* bodily pain, *GH* general health, *VT* vitality, *SF* Social Functioning, *RE* role emotional, *MH* mental health

[a] Non-standardized regression coefficient ($^{\dagger}p > 0.05$, $^{\dagger\dagger}p < 0.05$)

SES and HRQoL

Multiple linear regression models (Table 2) revealed significant predictors of the eight SF-36 dimensions and the two summary scores. The absence of serious collinearity issues was insured by variance inflation factors (the VIF computed for the independent variables were less than 10). Each SF-36 scale was explained by portions of variance ranging from 6% for mental health to 33.4% for physical functioning that was also the most significantly influenced scale by this set of independent variables. Gender and age had the most pronounced influence on HRQoL with males and younger individuals reporting significantly higher scores in all eight scales. Place of residence influenced only two scales, with urban residents reporting significantly lower scores in general health (−1.93) and mental health (−2.31) when compared to the rural residents.

After controlling for the influence of demographic variables, significant differences in perceived health between socioeconomic variables were tested. Individuals with lower educational level (primary) reported significantly lower scores than those with university level education in all the SF-36 scales apart from social functioning. The higher mean decrease of HRQoL was seen in role physical (−17.53, $p < 0.05$) and the lowest mean decrease was seen in general health (−5.43, $p < 0.05$). Differences between secondary and university level of education were statistically significant for four scales only: role physical, vitality, role emotional and mental health. Household income was of a mediocre importance as it appeared to significantly influence only six and three scales, in low and medium income gradients, respectively. The higher impairment of HRQoL exerted when comparing low to high income concerned role emotional (−8.12, $p < 0.05$), whereas general health was the least affected (−1.64). Differences observed between medium and high income categories were significant for physical functioning, general health and vitality. On the other hand, ethnicity showed a poor impact on two scales of SF-36 and a high impact on one scale, with Greeks reporting significantly higher scores for general health (2.86) and significantly lower scores for role emotional (−10.43, $p < 0.05$) and bodily pain (−2.20).

Only the interaction effect between age and education showed statistical significance seen for role physical ($F = 2.07$) and role emotional ($F = 2.04$), whereas the interaction between household income and residence showed statistical significance for physical functioning ($F = 3.61$), vitality ($F = 3.29$), role emotional ($F = 3.94$) and mental health ($F = 4.19$).

In the residence-specific analysis (Tables 3, 4), both the rural and urban subgroups showed that gender and age were significant predictors for all the SF-36 scales, with females reporting lower scores for all the scales of SF-36 and the elderly showing a deteriorating health perception. On the other hand, in the rural subgroup, the less educated

Table 3 Multiple linear coefficients of SF-36 scales and interaction effects in rural subjects (prefecture of Thessaly, Greece, 2009)

	B coefficient[a] (p value < 0.05)							
	PF	RP	BP	GH	VT	SF	RE	MH
Gender	6.46††	9.65††	7.14††	4.05††	7.07††	7.83††	12.18††	5.78††
Age	−5.94††	−9.44††	−3.80††	−4.26††	−4.77††	−4.20††	−4.65††	−2.01††
Change of R^2	0.250	0.166	0.132	0.153	0.128	0.081	0.071	0.034
Education								
Primary	−11.93††	−13.88††	−3.45†	−8.98††	−11.27††	−4.84†	−13.30††	−5.30†
Secondary	−3.50†	−7.36†	0.9†	−4.82††	−7.55††	−1.42†	−12.74†	−4.36†
Household income								
Low	−9.74††	−8.57†	0.11†	−1.95†	−3.83†	−5.43†	−11.08††	−0.80†
Medium	−8.08††	−10.05††	−2.17†	−5.40††	−9.08††	−8.23††	−11.55††	−3.79†
Ethnicity	−2.01†	4.03†	−0.46†	2.77†	−3.87†	1.10†	−12.81††	−2.26†
Change of R^2	0.045	0	0	0.042	0.020	0.009	0.011	0.010
R^2	0.305	0.166	0.132	0.195	0.168	0.090	0.082	0.044
Education × age F	1.77†	2.14††	1.57†	1.15†	1.19†	1.87†	2.33††	1.39†
Income × age F	0.45†	0.81†	0.54†	0.54†	0.76†	0.39†	0.70†	0.47†

PF physical functioning, *RP* role physical, *BP* bodily pain, *GH* general health, *VT* vitality, *SF* social functioning, *RE* role emotional, *MH* mental health

[a] Non-standardized regression coefficient ($^{\dagger}p > 0.05$, $^{\dagger\dagger}p < 0.05$)

Table 4 Multiple linear coefficients of SF-36 scales and interaction effects in urban subjects (prefecture of Thessaly, Greece, 2009)

	B coefficient[a] (p value < 0.05)							
	PF	RP	BP	GH	VT	SF	RE	MH
Gender	5.95††	11.92††	3.72††	3.49††	5.23††	7.25††	11.70††	3.29††
Age	−8.39††	−10.14††	−4.10††	−5.81††	−6.26††	−5.59††	−6.48††	−2.09††
Change of R^2	0.342	0.211	0.164	0.177	0.206	0.133	0.102	0.055
Education								
Primary	−6.61††	−19.57††	−7.55††	−3.49†	−9.15††	−4.03†	−6.18†	−8.10††
Secondary	−0.051†	−8.00††	−0.083	0.02†	−6.20††	0.03†	−0.02†	−5.50††
Household income								
Low	−4.98††	−3.13†	−0.66†	−1.78†	−4.12††	−2.66†	−7.00†	−5.42††
Medium	−0.30†	−1.50†	−0.81†	−1.16†	−3.10†	0.70†	2.38†	−1.74†
Ethnicity	−0.17†	0.22†	−2.87†	2.84††	0.11†	0.80†	−9.35††	0.40†
Change of R^2	0.016	0.020	0.012	0.004	0.016	0	0.023	0.025
R^2	0.358	0.231	0.176	0.181	0.222	0.133	0.125	0.080
Education × age F	1.66†	1.72†	1.81†	2.43††	1.53†	1.33†	1.12†	0.99†
Income × age F	0.94†	1.80†	0.66†	0.48†	0.67†	0.38†	1.22†	0.24†

PF physical functioning, *RP* role physical, *BP* bodily pain, *GH* general health, *VT* vitality, *SF* social functioning, *RE* role emotional, *MH* mental health

[a] Non-standardized regression coefficient ($^{\dagger}p > 0.05$, $^{\dagger\dagger}p < 0.05$)

people (primary) reported worse health in five out of the eight SF-36 scales: physical functioning, role physical, general health, vitality and role emotional. A comparison between the secondary and the university educational level revealed differences only in general health and vitality. In the urban population, individuals with primary or secondary education reported lower scores in five (physical functioning, role physical, bodily pain, vitality and mental health) and three (role physical, vitality and mental health) scales, respectively, compared to those with university level educational status.

In addition, individuals with low income in the rural subgroup reported a significant decline of 9.74 and 11.08 units in PF and RE, respectively, compared to those with

high income, whereas in the urban resident subgroup, the individuals with low income reported significant health impairment in three scales physical functioning, vitality, and mental health ranging from 4 to 7 units. Comparison of medium to higher income revealed significantly poorer self-perceived health for six out of the eight subscales (physical functioning, role physical, general health, vitality, social functioning and role emotional) in the rural subgroup, whereas in the urban subgroup it showed no significant differences.

Ethnicity influenced only one scale (role emotional) and two scales (general health and role emotional) in the rural and urban population, respectively. In particular, Greeks from both urban and rural areas reported a significant decline of approximately 11 units in role emotional and also an increase of 2.84 units in GH was seen in the urban subgroup. The variance explained by the regression models in the rural subgroup ranged between 30.5% in the physical functioning and 4.4% in the mental health scale, whereas the variance in the urban subgroup ranged between the same scales but explained a higher percentage of the population represented by 35.8 and 8.0%, respectively.

Additional two-way interaction effect analyses between educational level and age identified statistically significant interaction effects for general health ($F = 2.43$, $p < 0.05$) in the urban subpopulation and for role physical ($F = 2.14$, $p < 0.05$) and role emotional ($F = 2.33$, $p < 0.05$) in the rural subpopulation. The overall effect of interaction between household income and residents revealed that higher income in urban and rural residents in comparison to lower income in urban and rural residents, respectively, relates to lower HRQoL of mental health mostly observed for the urban residents. The rural residents showed a higher negative impact on their HRQoL when comparing higher to medium income.

The multiple linear regression models performed for the overall sample and the resident-specific samples (Table 5) also revealed a significant impact on the summary scores of physical and mental health. Gender and age as expected showed a positive impact for both the summary scores towards the males and the younger subjects. Lower educational level affected the physical and mental health summary scores in both the overall sample and the resident subgroups in comparison to the higher level of education (university), whereas the secondary level of education showed a negative impact on mental health only in the rural subgroup. Household income had a significant impact on mental health and on physical and mental health for the lower income urban group and the medium income rural group, respectively. The effect on mental health was also shown by the interaction of household income and residence. Albanian ethnicity negatively influenced physical

Table 5 Multiple linear coefficients of SF-36 summary scores and interaction effects in overall sample, rural and urban subjects (prefecture of Thessaly, Greece, 2009)

	B coefficient[a] (p value < 0.05)					
	Overall sample		Rural subjects		Urban subjects	
	PCS	MCS	PCS	MCS	PCS	MCS
Gender	$2.12^{\dagger\dagger}$	$2.43^{\dagger\dagger}$	$2.31^{\dagger\dagger}$	$3.07^{\dagger\dagger}$	$2.06^{\dagger\dagger}$	$2.16^{\dagger\dagger}$
Age	$-2.90^{\dagger\dagger}$	$-1.20^{\dagger\dagger}$	$-2.47^{\dagger\dagger}$	$-0.80^{\dagger\dagger}$	$-3.11^{\dagger\dagger}$	$-1.34^{\dagger\dagger}$
Residence	$-0.38^{\dagger}$	$-1.02^{\dagger}$	N/A	N/A	N/A	N/A
Change of R^2	0.312	0.044	0.261	0.031	0.341	0.054
Education						
Primary	$-2.26^{\dagger\dagger}$	$-2.54^{\dagger\dagger}$	$-3.47^{\dagger\dagger}$	$-3.68^{\dagger\dagger}$	$-3.12^{\dagger\dagger}$	$-2.13^{\dagger}$
Secondary	$-0.76^{\dagger}$	$-2.68^{\dagger\dagger}$	$-0.46^{\dagger}$	$-3.55^{\dagger\dagger}$	$-0.06^{\dagger}$	$-0.05^{\dagger}$
Household income						
Low	$-1.17^{\dagger}$	$-1.83^{\dagger}$	$-2.27^{\dagger}$	$-0.69^{\dagger}$	$-0.72^{\dagger}$	$-2.59^{\dagger\dagger}$
Medium	$-1.01^{\dagger}$	$-1.46^{\dagger}$	$-2.06^{\dagger\dagger}$	$-3.22^{\dagger\dagger}$	$-0.57^{\dagger}$	$-0.67^{\dagger}$
Ethnicity	$-0.76^{\dagger\dagger}$	$-0.74^{\dagger}$	$1.62^{\dagger}$	$-1.99^{\dagger}$	$0.50^{\dagger}$	$-0.37^{\dagger}$
Change of R^2	0.016	0.010	0.021	0.015	0.009	0.010
R^2	0.328	0.054	0.283	0.046	0.350	0.064
Education × age F	$1.23^{\dagger}$	$1.46^{\dagger}$	$0.70^{\dagger}$	$1.45^{\dagger}$	$2.37^{\dagger\dagger}$	$1.31^{\dagger}$
Income × age F	$0.62^{\dagger}$	$0.60^{\dagger}$	$0.41^{\dagger}$	$0.50^{\dagger}$	$1.11^{\dagger}$	$0.52^{\dagger}$
Household income × residence F	$1.03^{\dagger}$	$5.00^{\dagger\dagger}$	N/A	N/A	N/A	N/A

PCS Physical Health Summary Score, *MCS* Mental Health Summary Score

[a] Non-standardized regression coefficient ($^{\dagger}p > 0.05$, $^{\dagger\dagger}p < 0.05$)

health only in the overall sample model. The interaction of age with education was only significant for the physical health summary score of the urban subgroup and the interaction of age with income showed no statistical significance.

Discussion

In the present study, we investigate the association between HRQoL and the independent variables of ethnicity, place of residence and SES, upon a population of Greek natives and Albanian immigrant in the Greek periphery of Thessaly. Univariate analysis showed significant differences between ethnicity and HRQoL as well as between SES and HRQoL, findings that have been demonstrated by previous studies (Zahran et al. 2005). HRQoL is affected by various factors, so multiple regression models were used in order to assess the influence of ethnicity and SES on HRQoL as estimated by SF-36 after controlling for other determinants.

As previously demonstrated by other studies (Michel et al. 2009; Cesari et al. 2008), men and younger individuals showed better HRQoL compared to women and elderly, respectively. Older age is associated with greater deterioration in physical health than in mental health, possibly due to the high morbidity and the existence of chronic diseases, whereas studies (Walters et al. 2001) support our finding that older age is related to better mental health, possibly due to underlying mechanisms that can affect health over the lifespan and can reduce health inequalities in accordance with the accumulative effect of social exposure (Araya et al. 2003).

The impact of SES, measured by education, monthly income and occupation (excluded by the multiple regression models) described the important graded socioeconomic differences in HRQoL. Education was a strong predictor for the eight SF-36 scales and the two summary scores after controlling for other socio-demographic factors, a finding that has been previously reported by a Greek urban population study (Pappa et al. 2009), with each greater effect in the lower end of the educational gradient. The magnitude of the differences was high for seven scales ranging from approximately 18 points for role physical to more than 5 points for general health. Lower educational level has been previously shown to be a good predictor for mortality rates (Muller 2002) and the frequency of reported health problems (Eng and Feeny 2007) and has been associated with significantly higher prevalence of health risk behaviors (Lantz et al. 1998) and with deteriorating HRQoL in patients with coronary heart disease (Veenstra et al. 2004). Secondary education had an impact on only four scales and affected vitality in both the urban and rural residents. Overall, educational status affected more the urban population than the rural counterparts. These differences could be attributed to the fact that the majority of rural residents had completed only the secondary level of education; therefore, their perception of bodily pain is different from their urban counterparts. Also, mental health was only affected in the urban subpopulation, since in the rural residents good mentality is possibly perceived to be less important than the requirement of meeting basic needs.

Monthly income was also a significant predictor of HRQoL. In particular, the health disparities between low and high income were statistically significant for six scales ranging for more than 8 points for role emotional to 1.64 points for general health. Low income increased the risk of poorer health, with a more significant impact towards the contributing scales for the construction of the mental health summary score. The impact of medium income was mediocre, possibly because of the limitations exerted by the total household income. Previous studies have characterized that the equivalent income and income per capita are more appropriate and better predictors of HRQoL (Muller 2002). Medium income though appeared to be a good predictor of HRQoL in the rural population with no effects seen in the urban population the majority of which belonged in the medium income block. It is of interest that an increase in SES reduced the magnitude of health disparities. This improvement implies that a change in material and psychosocial characteristics is sufficient to decrease health inequalities and increase HRQoL. Further analysis of such changes would facilitate health policy makers to take a course of action that could reduce the socioeconomic differences in HRQoL.

Residence is another independent factor that has not been adequately investigated in Greece. Univariate analysis showed a positive trend for the urban counterparts. The multiple regression analysis though did not confirm such a high impact since only two scales, general health and mental health was statistically influenced in the rural population. It is of interest that some studies demonstrated that the rural population in America reports better satisfaction with their health status (Cleary and Howell 2006; Philip et al. 2002) and that inhabitants of village communities are more satisfied with their life situation which improves their health status perception (Reklaitiene et al. 2009). The residence-specific analysis showed that primary education was associated with impaired HRQoL in both rural and urban areas, whereas the impact of income was more profound for the rural residents. Also, in the rural areas, income inequalities—medium versus high income—affected six out of eight SF-36 scales ranging from more 11.55 points deterioration for role emotional to 5.40 points for general health. Contrarily, income inequalities—low versus high income—in urban areas indicated the unequal

distribution of income in these areas (Wilkinson and Pickett 2006), affecting therefore mostly scales that contribute towards the mental health summary score. According to our results, education and income did not explain adequately the differences in HRQoL in respect to the place of residence. Living conditions in rural/urban areas involve other significant factors that can influence HRQoL, such as access to health care services or other important material resources, as well as effects by differential physical and social environments. In addition, it should be stressed that any differences observed in HRQoL are usually dependent on the country of residence and the association of rural residence with better general and mental health could be a characteristic of Greece. Further investigation is needed to determine the reasons for HRQoL disparities in urban and rural areas.

Important ethnic differences on HRQoL were exerted according to the univariate analysis. Albanians reported better health in all the SF-36 scales except general health, ranging from 10.43 points for role emotional to 2.20 points for bodily pain. This health benefit of Albanians was explained by their younger age (mean age 39.2) as shown by the ANOVA analysis. Albanian immigrants come to Greece in search of a job and better living conditions for themselves and their families, so it is expected that younger and healthier individuals have the ability to immigrate. In addition, it is generally thought that different ethnic groups have different perception of health possibly rooted in their cultural and linguistic differences (Kandula et al. 2007). Further multiple regression analysis after controlling for other socioeconomic determinants showed that ethnicity was not a strong predictor of HRQoL as it affected only three scales. Native Greeks reported better general health and Albanian immigrants reported better role emotional and bodily pain. Albanian immigrants belong to low SES in respect to education, income and occupation (manual workers), so the health benefit of ethnicity possibly declined after SES was considered. Ethnicity even though it was hypothesized to have a profound impact on HRQoL, its effects were possibly limited by the socioeconomic discrepancies of this subgroup (Bilanakis et al. 1995). The integration of immigrants in the Greek society suffers considerably and the socioeconomic policies taken for this subpopulation are often limited. Nevertheless, Albanians often consider their immigration to Greece as an opportunity for better quality of life and not as a loss of better lifestyle. The placement of most immigrants in the lower socioeconomic strata confines them under the effects of SES rather than the variability of their ethnicity. Ethnicity has not been adequately studied in Greece and further research is needed in order to identify the health disparities among ethnic groups with an aim of extending such a research to other immigrant ethnicities of Greece, therefore filling the existing gap in the Greek bibliography.

Some of the limitations in our study concerned first of all the limited number of immigrants participating in the study and the inevitable focus to the Albanian ethnic group. The sample is unequally distributed towards the Albanians because during the last two decades, most Greek immigrants come from East Europe and the Eastern Soviet Union countries in search of a job. Also, most of the immigrants were reluctant to participate; therefore, the interviews were limited to the individuals given to us by the immigration office and these were mostly of Albanian ethnicity. It is important though to study ethnic disparities in HRQoL as a whole considering various ethnic groups, so as to identify the contributing factors of these disparities and in order to determine whether ethnicity or other factors influence changes in HRQoL over time. In addition, the role of health behaviors, early social conditions and other factors has been previously documented to have an impact on HRQoL and could prove valuable measures for the investigation of the underlying pathways that contribute to health, facilitating in that way the development of policies that could support the reduction of health inequalities overall.

In summary, we have found that SES is an independent predictor of HRQoL with ethnicity and place of residence exhibiting only a weak impact. According to other studies, ethnicity and place of residence are two factors that influence HRQoL, and they have not been fully studied in Greece. Such an investigation is very important since it attempts to identify the factors and the underline mechanisms of impaired HRQoL, offering the information needed for health policies that could elucidate the risks of poor health in disadvantaged groups.

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