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Socio-demographic factors and self-reported funtional status: the significance of social support

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Abstract

Background: The aim of the present work was to investigate the relative importance of socio-demographic and physical health status factors for subjective functioning, as well as to examine the role of social support.

Methods: A cross-sectional health survey was carried out in a Greek municipality. 1356 adults of the general population were included in the study. Personal interviews were conducted with house-to-house visits. The response rate was 91.2%. Functioning has been measured by five indexes: '*The Social Roles and Mobility*' scale (**SORM**), '*The Self-Care Restrictions*' scale (**SCR**), '*The Serious Limitations*' scale (**SL**), '*The Minor Self-care Limitations*' scale (**MSCR**) and '*The Minor Limitations in Social Roles and Mobility*' scale (**MSORM**).

Results: Among the two sets of independent variables, the socio-demographic ones had significant influence on the functional status, except for MSORM. Allowing for these variables, the physical health status indicators had also significant effects on all functioning scales. Living arrangements and marital status had significant effects on four out of five indexes, while arthritis, Parkinson's disease, past stroke and kidney stones had significant effects on the SCR and SL scales.

Conclusions: These results suggest that socio-demographic factors are as important as physical health variables in affecting a person's ability to function normally in their everyday life. Social support appears to play a significant role in explaining differences in subjective functioning: people living alone or only with the spouse, particularly the elderly, seem to be in greater risk for disability problems and should be targeted by preventive programs in the community.

Background

Over the last years, the strong proportional growth of the oldest age groups and the prevalence of chronic diseases, have raised two important issues for contemporary societies: coping with disability and ameliorating people's quality of life until the latest years of their lifespan. Understanding the factors that contribute to disability, may help clinicians and all those who participate in community care in preventing it or mitigating its impact and controlling the consumption of costly health care services.

Previous findings, based mainly on the assumptions of the Andersen model, have widely confirmed that functional status is one of the physical status variables leading to the use of health services [1,2]. It has been shown that functional status is a very important factor for a person's evaluation of each overall health status as 'good' or 'bad' and it constitutes in many cases the key concept for individuals, especially the old, prior to their decision to use health services [3–5].

'Functioning' – and/or 'functional status' – refers to a person's ability to perform the usual activities of everyday life. It is usually summarizing the concepts of 'disability' and 'social handicap' [6], as they were defined by the three levels of the "International Classification of Impairments, Disabilities and Handicaps" (ICIDH) scheme, i.e. impairment, disability and social handicap or disadvantage, in order to better understand the consequences of disease [7]. 'Impairment' is any reduction in physical or mental capacities and mainly reflects disturbances at the organ level. 'Disability' refers to deficiencies or restrictions of expected activity performance and behaviour, i.e. the individual loses its ability to perform a function in a manner considered normal for a human being. Finally, a person is considered 'socially handicapped' when he/she has lost its ability to perform normal social roles.

Because of the fact that functioning is a multi-dimensional concept, different measurement tools have been created through the years, depending primarily on the scope of the study and the conceptual model used [6]. Some of the most widely used indices are the 'BADL' and 'IADL' scales. The 'BADL' (basic Activities of Daily Living) scales assess an individual's ability to perform 'primary biological activities', i.e. eating or dressing ability, and are more relevant for institutionalized patients and/or elderly individuals with severe disabilities [6,8,9]. In addition, in order to assess for example the ability of an old person with minor health problems to live independently in the community, the 'IADL' indexes (Instrumental Activities of Daily Living) are preferred to the previous ones. These measurement tools include more typical activities of daily living, e.g. gross mobility, home chores, role performance and, this way, cover partially the 'handicap concept' [6,10,11].

It must also be noted that functional status does not always reflect the physician-related health state of the individual. The existence of diseases and/or physical impairments are not sufficient causes for disability and/or social handicap or do not lead to the same levels of disability. As Siegel pointed out, less than half of older people over the age of 65, with medically diagnosed declining health, reported restrictions in their activities [12]. On the other hand, in spite of the absence of a chronic disease or

impairment some individuals are – or feel – disabled in some ways and have difficulty in performing some 'BADL' or 'IADL' tasks [12,13]. Thus 'subjective functioning' or 'self-perceived functional status', i.e. a person's evaluation about its functional abilities, is a key issue in our understanding of the path from early symptomatology to disability and plays an important role in the decision making process that leads to the use of health services.

Therefore, factors that go far beyond an individual's state of physical health, may also influence functioning. Different conceptual models, in addition to the widely used ICIDH scheme, have been developed, in order to better analyze the disablement process and the factors influencing it [14,15]. It appears that, demographic and psychosocial variables mediate the relationship between health status and activities of everyday life. In particular, demographic characteristics have an impact on levels of daily functioning and seem to play a role even after controlling for a variety of health variables [16–21].

There is also a general consensus among researchers that social support plays a positive role for mental and physical health, in spite of different theoretical or methodological approaches [22–33]. Additionally, different patterns of living arrangements seem to have an impact on functional status and health in general [34–37]. Particularly in Greece, no information exists on how different social support patterns affect self-perceived functional status. It is, however, believed that the strong social ties among family and community members cover efficiently the needs of people, especially in small communities, suggesting that living arrangements do not play a major role and thus do not affect in a significant way health status and self-perceived functional status in particular.

The assessment of a person's ability to function normally in the community requires information not only on the level of disability, but also on other predisposing and environmental factors or the quantity and quality of social support that may be available. The aim of this study was to identify socio-demographic factors that seem to contribute to a better understanding of the disability process and to distinguish groups of people, who, because of certain characteristics, are at greater risk for disability and social handicap. The main objectives were the following: a) to test if there is an association between functioning and the use of health services, b) to investigate the importance of some socio-demographic factors for the functional status of individuals and in particular the social support variables, c) allowing for the influence of socio-demographic factors, what would be the relative effect of the physical health factors on functioning, d) to identify those variables that may better explain variations in functioning, e) to identify possible differences in the relative importance

of socio-demographic and need factors in predicting different levels of functioning.

Methods

Sample and research setting

The data used in this paper derived from a cross-sectional health survey carried out in Archanes, a medium size municipality of Crete, Greece. The broader aim of this survey was to describe and analyze the use of health services by the inhabitants of the community. The district of Archanes was divided in ten sectors (based on the municipal ordnance plan of house addresses) and a sample of 65–70 houses was drawn from each sector using tables of random numbers. Ten interviewers visited all the housing units, one interviewer for each sector. A total of 678 houses were visited; in 57 of them the inhabitants either refused to participate or were 'unavailable'. In 3 houses it was impossible to contact the inhabitants, even after two repeated visits at different hours during the day. The response rate based on the selected households was 91.2%. The final sample comprised 2097 persons of all ages. Only the 1356 adults, aged 17 years or older, were included in the present analysis.

Measures

Data were obtained through personal interviews with the adults of the household, using a questionnaire specially designed for this study (see Additional file 1: Questionnaire.pdf). A pilot survey preceded the main survey in order to detect and correct different problems of the questionnaire and its administration. This pilot study was carried out in a smaller sample of another municipality presenting similar socio-demographic characteristics to those of Archanes. The interviews were conducted by specially trained interviewers and 35 minutes on average were needed in order to complete all the questions. According to the main objectives of the present study, three groups of factors might be related with functioning: socio-demographic factors, physical health variables and use of health services.

Functioning

Functioning was defined as a person's ability to perform his/her everyday typical activities. More particularly, subjective functioning was measured by using two questions on the performance of usual social roles, i.e. housework/work (Q1) and social contacts (Q2) and three questions on physical disability (gross body movements and self-care), i.e. independence in moving inside and outside the house (Q3), in dressing (Q4) and in eating (Q5). For the three functional disability questions the individual was asked not whether he/she 'can' perform the activity, nor what he/she 'does' do, but instead whether he/she 'has any difficulty doing it'. This intermediate phrasing was preferred in order to overcome possible biases related to

the 'capacity' and/or the 'performance' wording [10]. As it has been emphasized by previous research, an index using the fist phrasing (can you do the activity) may overestimate the healthiness of the respondent, i.e. the individual may think that he can do the activity, while he cannot. On the contrary, when a person is asked if he does do the activity, he may answer negatively because of reasons not related exclusively to health problems, such as psychological and/or external circumstances etc. Usually scales using the 'performance' phrasing underestimate the healthiness of the respondent [6]. Responses for each of the five questions were given on a four-point scale: 'no restrictions', 'minor restrictions', 'severe restrictions' and 'completely restricted'. The two last categories were regrouped in one, because very few respondents of the sample were 'completely restricted'.

Socio-demographic characteristics

Socio-demographic variables included: gender, age, level of education, employment status, profession, marital status, total number of persons living in the house and living arrangements. The last three variables were used as potential measures of social support. The different patterns of living arrangements describe the relationship of the individual with the 'head of the household'. Also, in order to make the distinction between 'active' and 'non active' members of the community, the six employment status categories were regrouped in two broader categories: 'employed' and 'unemployed'. As for marital status, the 'divorced/separated', represented only by six persons, were omitted from the final analyses.

Physical health

Physical health status was measured by general health indicators and specific health measures. The generic health indicators included the assessment of general health status in the last 12 months, existence of chronic disease, limitations due to the chronic condition, reported acute morbidity and restriction in daily activities because of acute illness. As specific health indicators, a list of some of the most frequent medical conditions or diagnoses was given. Also the person was asked if he/she had experienced in the past some of the following conditions: stroke, cardiac infractus, asthma crisis or G.I. ulcer crisis. Other measures of physical status were 'surgery in the last 3 years' and a list of 24 symptoms present during the last two weeks.

Use of health services

Utilization was measured by 'visits to the doctor during the last two weeks', 'use of medicines in the last two weeks', 'use of a group of health services during the last year' and 'hospitalization during the last three years'. To each one of these health services the respondent had to give a 'yes'/'no' answer.

Table 1: Descriptive Statistics of Study Variables (%)

	Men	Women	Total
Age groups			
17–25	14.5	15.9	15.3
26–44	30.7	33.0	32.0
45–54	18.2	14.4	16.1
55–64	16.3	14.8	15.5
65+	20.3	21.7	21.1
Marital status			
Single	18.1	13.5	15.6
Married	79.2	71.6	75.0
Widowed	2.5	14.2	9.0
Divorced	0.2	0.7	0.4
Education levels			
1 (< 6 years)	20.7	24.4	22.7
2 (6 years)	48.7	42.9	45.5
3 (9 years)	11.2	12.5	11.9
4 (12 years)	12.7	15.1	14.0
5 (higher education)	6.7	5.1	
Employment status			
Employed	79.6	31.2	52.8
Living arrangements			
Parents/others of head[a]	2.5	5.3	4.0
Children of head	17.0	12.1	14.5
Lives only with spouse	20.0	18.3	19.0
Lives alone	0.2	8.0	4.5
Lives with spouse + children	58.9	52.6	55.5
'Head' without spouse and living with others	1.5	3.5	2.5
Self-rated health			
Excellent	25.7	15.5	20.1
Good	46.3	41.5	43.7
Fair	21.4	31.6	27.0
Poor	6.5	11.4	9.2
Chronic disease	33.9	47.3	41.3
Limited because of chronic disease	54.1	58.1	56.6
Acute illness	9.2	17.5	13.9
Limited because of acute illness			
not at all	31.4	36.2	34.8
minor restrictions	29.4	27.6	28.1
restricted at home	21.6	13.4	15.7
restricted in bed	17.6	22.8	21.3
Past surgery	44.0	54.4	49.7
Chronic dis. Index[b]	55.4	68.6	62.7
Physician visits[c]	12.6	20.6	17.0
Use of medicines[c]	37.2	57.0	48.1
Hospitalization[d]	7.1	11.5	9.5
Use of health services Index[e]	67.1	81.6	75.0

[a]head of the household, [b]declared at least one disease from the list of chronic conditions [c]last two weeks, [d]last three years, [e]at least one health service from a given list during the last year

Statistical analyses

Principal Component Analysis

"Principal Component Analysis" (PCA) [38,39] was used in order to identify a smaller number of underlying factors, which may have generated the dependence structure and the variation in the responses to the initial set of questions on functioning. The number of extracted factors were determined by the magnitude of eigenvalues (should exceed 1.0). Factors were subjected to Varimax rotation [38,39]. Questions were considered as contributing to a

Table 2: Distribution of functioning questions by sex (% of those who reported any restriction – level 2,3 and 4*)

	Males	Females	Total
Main activity (Q1)	24.8	35.8	30.8
Social contacts (Q2)	16.1	24.9	20.9
Mobility (Q3)	13.9	21.7	18.2
Dressing (Q4)	6.3	9.5	8.0
Eating (Q5)	4.3	5.3	4.8

*level 1 = no restriction, level 2 = minor restrictions level 3 = severe restrictions level 4 = completely restricted

factor if their factor loadings were greater than 0.40. Two PCAs were carried out. The first on the five questions on functioning with their initial three-point scales (1 = 'no restrictions', 2 = 'minor restrictions' and 3 = 'severe restrictions'), and the second with the variables transformed to binary (each question transformed to two binary representing 'minor restrictions' and 'severe restrictions', respectively). Although the two methods are similar, the second was used in order to study further relationships between categories of variables as well as relationships between variables.

Analysis of Variance and analysis of covariance
The Analysis of Variance was used to find out if there were statistically significant differences of functioning (in terms of the functioning indexes provided by the two PCA methods) between the groupings of the factors in our hypothesis. [40,41]. Standard assumptions of normality and constant variance were tested by the Shapiro-Wilk statistic and Levene homogeneity-of-variance test, respectively. Differences between more than two groups were further assessed by the Neuman-Keuls multiple comparison test [40]. Also, in order to account for possible age and sex effects on these differences between functioning and the other groups of factors, we controlled for these two variables using Analysis of Covariance [40,41].

Multiple Regression Analysis
In order to reveal the variables constituting the best predictors of changes on functioning scales, we used the 'stepwise' (backward elimination) method of multiple regression analysis [40,41]. Therefore, socio-demographic and physical health status characteristics were the independent variables with dependent variables the functioning indexes of the two PCA methods. Categorical independent variables were transformed in binary (dummy) variables: a categorical variable with k values was transformed into $k - 1$ dummy variables. For such a transformed variable all dummy variables were included or excluded in the regression as a block. A separate regression was applied in order to find out the relative importance of

each set of variables in explaining the variance of the five indexes; in particular, the importance of physical health status variables having allowed for the influence of a series of socio-demographic indicators. This was carried out allowing the sets of variables to sequentially enter the regression model as a block. Four sets of variables were processed: 1st = sex and age; 2nd = education and employment status; 3rd = the social support variables; and 4th = the physical health status variables. Standard assumptions regarding the distribution of errors were tested by examination of residuals [40,41].

Results
Description of the sample
Table 1 presents the distributions of some of the socio-demographic, physical health status and use of health services variables. 44.6% of the sample were men and 55.1% women. Most of the people of the sample were married (75%). Also, 68.2% of the participants had at best finished primary school. Only a small percentage (4.5%) was living completely alone; these were almost exclusively women. A significant part of the overall sample reported suffering from at least one chronic disease (41.3%) and this percentage was more pronounced among the elderly (76.1%). 17% of the study sample reported visiting a physician during the two weeks prior to the interview. Additionally, 48.1% of the sample used at least one medicine during the same period.

Also, in Table 2 are presented separately the distributions of the five functioning questions. 30.8% of the respondents reported restrictions on their main activity due to health reasons and 20.9% on social activities. Females have more problems than males and these differences between the two genders remain important in all age-groups (see Additional file 2: Functioning.pdf). Only for the elderly (65 and over) disparities in functioning between the two sexes are minor.

Table 3: Principal component analysis of functioning variables by two methods. Varimax rotation. All factor loadings are shown, those greater than 0.40 are typed in bold

I. *First method (raw variables)*

Questions on functioning	Index 1 (SORM)	Index 2 (SCR)	Communality
Q1. *Work and /or housework*	**0.906**	0.200	0.860
Q2. *Social contacts*	**0.873**	0.277	0.838
Q3. *Mobility*	**0.749**	0.391	0.803
Q4. *Dressing*	0.348	**0.917**	0.871
Q5. *Eating*	0.221	**0.866**	0.888
% of total variance explained	68.7	16.4	

II. *Second method (binary variables)*

Questions on functioning	Index 1 (SL)	Index 2 (MSCR)	Index 3 (MSORM)	Communality
Q1. *Work and/or housework*[a]	**0.604**	0.393	0.079	0.614
Q2. *Social contacts*[a]	**0.709**	0.368	-0.126	0.737
Q3. *Mobility*[a]	**0.716**	0.329	-0.144	0.717
Q4. *Dressing*[a]	**0.856**	-0.056	0.002	0.735
Q5. *Eating*[a]	**0.784**	-0.215	0.052	0.663
Q1. *Work and/or housework*[b]	-0.007	-0.078	**0.754**	0.580
Q2. *Social contacts*[b]	0.014	0.139	**0.839**	0.723
Q3. *Mobility*[b]	0.017	0.283	**0.765**	0.665
Q4. *Dressing*[b]	0.012	**0.853**	0.162	0.755
Q5. *Eating*[b]	0.064	**0.792**	0.139	0.650
% of total variance explained	33.1	22.2	13.2	

a. 1 = serious limitation, 0 = otherwise   b. 1 = minor limitation, 0 = otherwise

Principal component analyses

Two functioning indexes were yielded by the first method (Table 3); they both had eigenvalues greater than 1.0 and explained 85.1% of the total variance (of the five functioning variables). The communalities and factor loadings, after Varimax rotation, are shown in Table 3. The first index was characterised by high loadings of the functioning questions 1, 2 and 3 ('social roles and mobility scale' (SORM)), while the second index was loaded on the other two questions, 4 and 5 ('the self-care scale' (SCR)). All functioning questions had high communalities (> 0.80). Higher scores on both scales suggest increasing functioning problems and/or increasing seriousness of activity restrictions.

The second method yielded three indexes (Table 3), all with eigenvalues greater than 1.0 and explaining 68.5% of the total variance. The communalities and factor loadings, after Varimax rotation, are shown in Table 3. Note that the first index grouped the serious limitations in all five activities, while the other two factors grouped only minor restrictions, in self-care (second index) and in social roles

and gross mobility (third index). Therefore the three corresponding scales represent 'the serious limitations scale' (SL), 'the minor self-care limitations scale' (MSCR) and 'the minor limitations in social roles and mobility scale' (MSORM). Higher scores on the 'SL' scale suggest serious problems in functioning, while higher scores on the other two scales suggest minor restrictions in daily activities.

Functioning and use of health services

Analysis of variance indicated a strong correlation between the functioning indexes and the four 'use of health services' variables (Table 4). Again, in all analyses both hypotheses of normality and homogeneity of variance were accepted (p > 0.10). On all five indexes those who responded positively had significantly higher mean scores from those who answered not using these services. In some cases the magnitude of the difference between the mean scores of 'yes' and 'no' answers was quite large. For example, the mean scores on 'SL' and 'MSCR' scales are almost 8 times higher for those who used medicines 'during the last two weeks,' as opposed to those who responded negatively. Similar large differences were also observed

Table 4: Means (Analysis of Variance) and Adjusted means (Analysis of Covariance with control variables age and gender) of the 'use of health services variables' for the 5 functioning indexes

Variables	SORM		SCR		SL		MSCR		MSORM	
	Mean	Adj. mean	Mean	Adj. mean	Mean	Adj. mean	Mean	Adj. mean	Mean	Adj. mean
Physician visits										
Yes	5.13***	4.94***	2.45***	2.41*	0.75***	0.68***	0.17***	0.15*	0.71***	0.65***
No	3.88	4.07	2.18	2.21	0.25	0.32	0.07	0.09	0.34	0.40
Use of medicines										
Yes	4.87***	4.51***	2.37***	2.28*	0.61***	0.45***	0.16***	0.11*	0.68***	0.57***
No	3.33	3.70	2.06	2.15	0.07	0.23	0.01	0.06	0.14	0.26
Hospitalization										
Yes	5.40***	5.16***	2.60***	2.55**	0.81***	0.71***	0.22***	0.19**	0.82***	0.74***
No	3.95	4.19	2.18	2.23	0.28	0.38	0.07	0.10	0.36	0.44
Use of health serv. Index										
1+	4.34***	4.07***	2.27**	2.21^{NS}	0.41 ***	0.30^{NS}	0.11 ***	0.08^{NS}	0.50***	0.41***
0	3.33	3.60	2.08	2.21	0.09	0.20	0.01	0.05	0.10	0.19

*** $p \leq 0.001$, ** $p \leq 0.01$, * $p \leq 0.05$, NS = non statistically significant

between those who used 'one or more health services' during the last year than those who did not ('use of health services index'). Almost all of these differences, in all five scales, remained statistically significant even after adjusting for the effect of age (Table 4).

Functioning and socio-demographic variables
The relationship between functioning and socio-demographic characteristics was studied next. Results of analysis of variance and analysis of covariance are presented in Table 4. Again, in all analyses both hypotheses of normality and homogeneity of variance were accepted (p > 0.10).

Sex, age, education and employment
Female participants reported more function problems and increasing seriousness of activity restrictions than their male counterparts. Only for the two indexes related to self-care restrictions (SCR and MSCR), the differences in mean scores between men and women were not significant. Furthermore, functioning is deteriorating progressively with age, with the highest mean scores for the fourth and fifth age groups. However, differences in mean scores between the elderly and the other age-groups are not so prominent for the 'SCR' index, as it is the case for the 'MSCR' scale.

Education differentiated the mean scores on all indexes at a statistically significant level. Those who did not finish primary school (1st level) had the worst functioning profile contrary to those who had completed the highest level of education (5th level). Between these two groups, mean scores decrease from the lower to the higher education

levels, although this decrease is not gradual from one level to the other. After controlling for age and sex, differences between mean scores remained statistically significant for all indexes, except the 'MSORM'.

Similarly, employment status correlated significantly with functioning. There is a clear difference in mean scores on all scales between those who were employed and those who were 'unemployed' (non active), with the former reporting less problems in their daily functioning. It is worth noting that for index 4 (MSCR) the mean score is 17 times higher for the 'unemployed' compared to the 'employed'. The analysis of covariance corroborated the previous observations, although score differences between the two groups were decreased.

The social support variables
The analysis of variance showed that, all three social support variables (marital status, living arrangements and size of household), were significantly associated with functioning (p < 0.001). After controlling for age and sex differences, marital status and living arrangements still contributed significantly to the variability of functioning scores. In particular, the 'unmarried' and more the 'widowed' had more problems in self-care restrictions (SCR and MSCR), and more serious limitations in all five activities of daily living (SL). Also, among the different living arrangements, the '*living alone*', '*the couples living alone*' and '*the parents of the head of the household*' were the three groups with the poorest MSCR functioning and serious limitations (SL). Size of household was the only factor that did not influence functioning indexes at a statistically

Table 5: Means (Analysis of Variance) and adjusted means (Analysis of Covariance with control variables age and gender) of the socio-demographic variables for the 5 functioning scales

Variables	SORM		SCR		SL		MSCR		MSORM	
	Mean	Adj. mean	Mean	Adj. mean	Mean	Adj. mean	Mean	Adj. mean	Mean	Adj. mean
Gender										
Male	3.90**		2.20NS		0.26**		0.07NS		0.32***	
Female	4.25		2.24		0.40		0.10		0.47	
Age groups										
17–25	3.18***		2.11***		0.01***		0.00***		0.04***	
26–44	3.40		2.05		0.06		0.01		0.19	
45–54	3.83		2.14		0.20		0.03		0.30	
55–64	4.63		2.20		0.43		0.07		0.69	
65 +	5.60		2.64		1.01		0.31		0.84	
Marital status										
Single	3.30***	4.40NS	2.15***	2.38*	0.07***	0.52*	0.01***	0.13**	0.06***	0.44NS
Married	4.11	4.13	2.19	2.18	0.32	0.33	0.07	0.07	0.44	0.45
Widowed	5.24	4.11	2.61	2.39	0.86	0.41	0.30	0.18	0.70	0.31
Education										
1st	5.11***	4.24**	2.52***	2.32***	0.80***	0.48***	0.23***	0.13**	0.72***	0.45NS
2nd	3.90	3.72	2.10	2.06	0.23	0.17	0.05	0.03	0.41	0.35
3rd	3.73	3.85	2.15	2.18	0.24	0.29	0.07	0.08	0.29	0.32
4th	3.56	4.10	2.21	2.33	0.09	0.29	0.02	0.08	0.14	0.30
5th	3.43	3.83	2.02	2.11	0.10	0.25	0.02	0.07	0.02	0.15
Employm. status										
employed	3.53***	3.92**	2.06***	2.12**	0.12***	0.27**	0.01***	0.05***	0.21***	0.34**
unemployed	4.69	4.29	2.38	2.32	0.57	0.42	0.17	0.13	0.61	0.49
Living arrangements										
Parents/others of 'head'	5.14***	4.54*	2.47***	2.33NS	0.89***	0.67***	0.22***	0.16***	0.62***	0.39NS
Children of 'head'	3.24	4.65	2.12	2.44	0.03	0.56	0.00	0.13	0.04	0.57
Lives only with spouse	5.23	4.80	2.40	2.29	0.80	0.64	0.23	0.19	0.77	0.61
Lives alone	5.47	4.66	2.70	2.54	0.93	0.63	0.41	0.34	0.77	0.46
Couple with children	3.72	4.30	2.11	2.24	0.15	0.37	0.02	0.07	0.32	0.54
'Head' without spouse living with others	4.31	4.17	2.54	2.51	0.54	0.49	0.08	0.07	0.46	0.40
Size of the household										
1	5.40***	4.48NS	2.68**	2.52NS	0.90***	0.55NS	0.40***	0.55NS	0.75***	0.31***
2–4	4.10	4.40	2.22	2.27	0.34	0.45	0.08	0.45	0.41	0.11
5 +	3.85	4.47	2.17	2.28	0.23	0.48	0.04	0.48	0.33	0.11

*** $p \leq 0.001$, ** $p \leq 0.01$, * $p \leq 0.05$, NS=non statistically significant

significant level when controlled for age and sex differences.

Functioning and physical health status
All general health indicators were significantly correlated to the functioning indexes (see Additional file 3:Physical health 1.pdf). Accounting for age and sex differences did not change the results for three indexes (SORM, SL and MSORM) for most of the generic physical health status variables (see Additional file 3:Physical health 1.pdf). The most severely limited were those who had a stroke in the past, followed by the 'Parkinson', 'asthma' and 'kidney stones' sufferers (see Additional file 4:Physical health

2.pdf). Moreover, the analysis of covariance revealed that differences in the 'SL' scale between 'prevalent' and 'healthy' status of almost all 15 medical conditions of our list were significant; (see Additional file 3:Physical health 1.pdf).

Socio-demographic and physical health status variables as predictors of functioning
Results of the multiple regression analyses are presented in Tables 6 and 7. In both analyses all standardised residuals were not significant and the plots did not indicate any deviation from the standard assumptions. Living arrangements and marital status were among the most im-

Table 6: Multiple Regression Analysis ('Stepwise-backward elimination') with dependent variables the 5 functioning scales (only significant regression coefficients (β) are shown)[a]

Independent variables	SORM	SCR	SL	MSCR	MSORM
Age	0.257*				
Education 1			0.802*		
Education 3		-0.377*			
Education 4			-0.609*		
Unemployed	0.859*			0.221*	
Parents of 'head'	1.799*				1.324***
Children		-2.117**	-2.967**		
Lives alone	2.505**	1.458***	1.137*	0.323*	
Lives with spouse		0.532**	0.565*		-2.434*
Couple with children					-2.528**
Widowed	2.630***	2.632***	3.725***		3.114***
Married		-2.057***	-2.851***		
Self-rated health	0.056*				
Limited: chronic disease	0.135*				
Limited: acute illness				0.047*	
Asthma					0.384*
Arthritis	1.094**	0.870***	0.977***		
Parkinson's disease	1.337*	0.695**	1.396***		0.496*
Stroke in the past		1.332***	1.056*		
Hypertension		-0.796***	-0.493*		
Kidney stones		0.309**	0.376**		
Varices/Phlebitis		-0.441**	-0.498*		
'Other' disease	0.883*				
Psych. distress symptoms		-0.121*			
General/card. symptoms					0.067*
R^2	0.424	0.575	0.501	0.136	0.220

[a]A positive coefficient (β) of 1.458 (scale 'SCR' and 'living alone') means that those who live alone scored higher by 1.458 on the scale (worse functioning) from those who were 'head of the household' (baseline). A negative coefficient means better health compared each time to the baseline group. Thus 'baseline' for education was 'education level 5', for living arrangements 'head of the household', for marital status 'the unmarried' group.
*** $p \leq 0.001$, ** $p \leq 0.01$, * $p \leq 0.05$

portant socio-demographic predictors of functioning. In particular, 'living alone' was the only variable that 'explained' significantly the variance of four indexes, and its positive sign indicates more problems in social roles and mobility (SORM), in self-care restrictions (SCR and MSCR), and more serious limitations in all five activities of daily living (SL) (Table 6). It was also one of the three variables that contributed to the variance of the 'minor self-care limitations' index (MSCR) the other two being 'unemployed' and 'limited because of acute illness'. Among the marital status categories, the 'widowed' and the 'married' were very strongly correlated with the 'SCR' and 'SL' indexes. The widowed had worse functioning profile (β positive) compared to the 'unmarried' participants, while the married had the best. From the other socio-demographic variables, age had a significant effect only on the 'SORM' scale (older people tend to have more functioning problems); education on the 'SCR' and 'SL'

scales (lower education associated with more problems); and employment status on the 'SORM' and 'MSCR' scales (unemployed status associated with more problems). Among the physical health status variables, 'arthritis', 'Parkinson's disease', 'past stroke' and 'kidney stones' had significant effect on the 'SCR' and 'SL' scales (their prevalence is associated with more functioning problems and more serious limitations in all five activities of daily living (SL).

According to the results of the regression with all independent variables included in the model, physical health status variables and socio-demographic factors, the overall results yielded significant amount of variances explained for the functioning indexes, ranging from 32.6% to 63.9% (Table 7). The socio-demographic factors alone (allowed first in the model), explained significant amounts of variance for all functioning indexes except MSCR (15.1%), ranging from 21.7% to 37.1%. The phys-

Table 7: Amount of variance (R^2) in functioning explained by socio-demographic variables and physical health status variables (multiple regression analysis with sequential order of entered variables)

Models	SORM	SCR	SL	MSCR	MSORM
Socio-demographic	32.5***	37.1***	34.8***	15.1	21.7**
Sex / age	18.5	9.4	11.1	6.1	0.8
Education/employment	5.7	5.1	5.4	5.0	5.9
Social support	8.3	22.4	18.2	3.9	14.9
Physical health status	17.2*	26.8***	24.2***	17.5*	19.9*
Total R^2	49.7**	63.9***	59.0***	32.6*	41.6***

***p ≤ 0.001, ** p ≤ 0.01, * p ≤ 0.05

ical health status variables (allowed second in the model) increased significantly the explained variance of all functioning indexes, but by different amounts. That is, allowing for socio-demographic influences, physical health variables had larger effect on the SCR and SL indexes, than the SORM, MSCR and MSORM.

Discussion

Self-perceived functional limitations constitute a central determinant leading to the utilization of health services. The principal goal of this cross-sectional study was to identify factors that are associated with subjective functional status variations in the adult population of a Greek semi-rural community. Moreover, we investigated the relative importance of two sets of variables, socio-demographic and physical health status variables, in influencing functional status. As mentioned above, the present findings were derived from a cross-sectional study and the observed relationships between the studied variables and functional status are valid for the social and demographic context of this small community of Archanes. They can possibly be generalized only for the similar rural/semi-rural population of Greece. However, this analysis, referring at a single point in time, is an initial approach in understanding which factors, other than disease and physical impairments, affect subjective functioning and contribute to disability.

Firstly, we examined the relationship between health services use and functioning. It was confirmed by our data (Table 4) that those who reported poorer self-perceived functional status, were also more frequent users of health services. However, very few among the general and/or specific physical health status indices were important in explaining functional status variations. 'Self-perceived health', for example, is considered as a sensitive reflection of the threat that an individual feels about illnesses, affecting also its motivation to perform daily tasks [42]. In previous research 'subjective health' was one of the strong

predictors of functional decline [43,44]. In the present study, it had a marked effect (just failing to be significant) only on 'the Social Roles and Mobility' index (p = 0.0563). Additionally, among the chronic conditions of our list, those predicting significantly more problems and serious limitations in functioning were the most disabling chronic illnesses, e.g. Parkinson's disease, arthritis, past stroke and kidney stones.

Although our results suggest that age, education, employment status and the three social support measures – marital status, size of the 'inner' family and living arrangements – are associated with different levels of functioning, there are differences between these socio-demographic variables with regard to their effect on functional status. It is of note that gender was not included in the group of strong predictors of functioning status and age had only a significant effect on the 'social roles and mobility' index (older people tend to have more functioning problems of this type). Education had a significant effect only on two indexes: the 'self-care' and the 'serious limitations' index, with lower education associated with more problems. Similarly, participation in the workforce affects positively functional status. In fact, employment status was one of the strong predictors of variance in functioning for two scales: the 'social roles and mobility' and the 'minor self-care limitations' index.

From the three proxy social support measurements, marital status was one of the strong predictors of variations in functioning levels. Among the five functioning indexes, marital status was significantly correlated with the 'SORM', 'SCR', 'SL' and 'MOSCR' indexes. More particularly, the 'single/unmarried' group had worse functioning profile than the 'married', whereas the 'widowed' were the least advantaged. In order to better clarify the above finding, we repeated the comparison among the three family status categories only for the older individuals, so as to avoid any distortion due to the small number of 'wid-

owed' among the younger age groups. The results were similar, indicating that among the older people, being widowed in this Greek community has more disadvantages for health and functional status than being married, suggesting the existence and support of the broader social network (e.g. spouse, children). Other possible explanations for the worst functioning profile of the widowed compared to the married among the elderly could be the loss of support (e.g. after spouse's death) and the additional negative effect of living alone.

Although the above findings need further investigation they are similar to those of other studies, where the widowed and the never married reported worse health profile than the married. In general, it has been shown that people who live with a partner have lower morbidity rates than those who live alone [45]. Moreover, in previous studies relating marital status with the progression of functional limitations in patients suffering from disabling diseases, the rate of progression of functional disability was generally higher among unmarried participants compared to married patients [46]. Additionally, the size of the 'inner circle' of the family network – number of persons in the house – was not among the variables having significant effect on functioning for none of the indexes. This result is consistent with those of past researchers, who stated that the quality and not the quantity of social support is probably the main factor with a positive impact on health [47].

The functional status of those living in different living arrangements was also studied. After controlling for age and sex, the patterns of living arrangements are related significantly with the 'SL' and 'MSCR' indexes, indicating both serious disability problems. Also those who live alone, mainly older women, presented the worst functional status from all the other groups and this variable had a significant effect on functioning for four out of the five indexes. It appears that in this sample the 'living alone' group is the most vulnerable or perceives itself as the most vulnerable among the other living arrangements. Previous studies have not found any association of this group with poor psychological well-being and/or social isolation [35,37]. Moreover Sarwari found that, unless severely physically impaired, women living independently have less deterioration in functional health when compared with peers living with spouses or nonspouse others [36].

One explanation of the 'vulnerability' of the living alone in the present study might be that, even if they confront the same medical conditions as others, the absence of another adult on a daily basis makes it more difficult for them to cope with the incapacitating effects of illness. An additional reason might be that, in this small Greek community being old and cohabiting with the family is more

socially acceptable than being old and alone. Therefore, this pattern of living arrangement probably magnifies one's disability problems. Another interesting finding was that the couples living in a household without children or others ranked equally high, very close to those who live alone. This pattern of living arrangement was among the strong predictors of the variance of the 'self-care scale' and the 'serious limitations scale'. It seems that the disadvantages of the cohabitation outweigh the advantages when we compare individuals of older age groups.

On the contrary, being 'head of the family without the presence of a spouse', does not necessarily mean poor functional status, as Anson suggested [34]. The absence of a spouse may be compensated by the support of other family members, such as older parents, children in adulthood, relatives. Additionally, being a lone-parent in this community probably results, not from personal preferences, but from previous life events, widowhood being the most frequent. Thus, it is a socially accepted pattern of living arrangement that may benefit from the support of the whole community. It is also possible that, because strong positive evaluation of health is necessary for keeping a lone-parent family, some functional problems may be underestimated and underreported.

In conclusion, we found that the group of socio-demographic factors was an important predictor of the variation in functioning levels in addition to the physical health status variables. Within the first group, the social support variables accounted for a large proportion of the variance of all functional scales, except the 'MSORM'; the latter index had the lowest overall proportion of explained variance (Table 7). Furthermore, many of the socio-demographic variables were retained as significant in the overall stepwise regressions (Table 6) and in particular two of the three social support measures (marital status and living arrangements) had significant effects on most scales. With respect to living arrangements, space, facilities and quality of relationships were not measured in the present study. However, even if we had included more qualitative data might improve our level of understanding, their absence does not diminish the strength of the association observed. Among the variables assessing physical health status, generic measures of health needs, such as suffering from a chronic condition or having reported 'poor self-perceived health', did not contribute significantly to the understanding of the variability in functioning scales. On the contrary, the existence of a serious disabling chronic condition, such as Parkinson's disease, was more important for functional status. We did not include in our model psychological factors that, undoubtedly, play an important role in offsetting or exacerbating disability [49]. An index referring to possible psychological distress symptomatology during the two

last weeks had a significant (negative) effect only on the 'SCR' scale.

Conclusions

These findings support the theory that socio-demographic factors are as important as serious physical health needs, in affecting the ability of individuals to function normally in their daily life. As a result they should be taken seriously into consideration, when planning interventions for the prevention of disability in the community. Additionally, even in a medium size semi-rural community as this one, where social ties remain still strong among its members, the 'live alone' or the 'live only with the spouse' patterns of living arrangements were identified as high-risk groups for disability. In Greece, a country with a fast growing elderly population, more consistent and coordinated measures of community care should be considered in the future in order to meet effectively the needs of those groups.

Authors' Contributions

SK participated in the design of the study, carried out the study and drafted the manuscript, IGV participated in the design of the study, performed the statistical analysis and drafted the manuscript, AP conceived of the study and participated in its design and coordination.

Competing interests

None declared

Additional material

Additional File 1
Questionnaire.pdf: a shortened form of the questionnaire used.
Click here for file
[http://www.biomedcentral.com/content/supplementary/1472-6963-2-20-S1.pdf]

Additional File 2
Functioning.pdf: histograms of the distribution of the five functioning questions by sex and age.
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Additional File 3
Physical health 1.pdf: Table A shows the 'Means and adjusted means (analysis of variance and analysis of covariance) of the generic physical health status variables for the five functioning scales'. Table B presents the 'Adjusted means (analysis of covariance) of the specific diseases (only the positive answers) for the five functioning scales'.
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Additional File 4

Physical health 2.pdf: histograms for the mean scores (analysis of variance) of the three indexes (SL, MSCR, MSORM) by disease.
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