



Socioeconomic determinants of non-communicable-diseases among the Cypriot population: questionnaire study

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DECLARATIONS

Competing interests

None declared

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Ethical approval

Ethical approval was not required for this study. Following review of the protocol by the Cyprus National Bioethics Committee it was considered that the study, being an opinion survey and non-interventional, did not require bioethical assessment.

Guarantor

NK

Contributorship

All authors had full access to all of the data (including statistical reports and tables) in the study and can take

Summary

Objective To investigate the extent to which the socioeconomic status of Cypriots is associated with the lifetime prevalence of self-reported non-communicable disease (NCDs), with emphasis on those accounting for most Death and Disability-adjusted Life Years (DALYs) among the population, including cardiovascular disease (CVD), metabolic risks and neuropsychiatric disorders.

Design A nationally based survey conducted through personal interviews, using a structured questionnaire design.

Setting Cyprus rural and urban areas (excluding Turkish-occupied areas).

Participants Four hundred and sixty-five Cypriot adults of an average age of 53 years.

Main outcome measures Lifetime prevalence of self-reported NCDs.

Results Most self-reported NCDs were shown to have significant associations with socioeconomic status, defined for this study by level of education and family income. Education was significantly inversely associated with CVD (18.1% at elementary education level (EE); 2.7% at high school education level (HE); and 1.7% at University/College education level (UE)), hypertension (23.4% at EE; 8.6% at HE; and 2.6% at UE), hypercholesterolaemia (12.8% at EE; 7.1% at HE; and 5.2% at UE), obesity (10.7% at EE; 4.7% at HE; and 3.5% at UE), diabetes (13.8% at EE; 2.4% at HE; and 0.9% at UE), and drug addiction (7.6% at EE; 1.6% at HE; and 0.0% at UE). Depression was more frequent amongst middle level graduates (3.2% at EE; 5.1% at HE; and 2.6% at UE). Income was significantly negatively associated with CVD ($r = -0.130$, $p = 0.005$), stress ($r = -0.103$, $p = 0.028$) and drug addiction ($r = -0.117$, $p = 0.012$), and significantly positively associated with the 'no problems' statement ($r = 0.201$, $p = 0.000$) which was reported by almost two fifths of the population. Worth noting is stress which, demonstrating no socioeconomic discrimination, was reported by high percentages of the population (17.2% of the sample).

responsibility for the integrity of the data and the accuracy of the data analysis. NK planned and designed the survey and the questionnaire, and planned the data analysis. AC was the adviser of the research from its inception. ET acted as a consultant to NK throughout the process. EP provided statistical support and undertook the data analysis. NK wrote the first draft of the paper. All authors contributed to further drafts and critical revisions and approved the final version. All had final responsibility for the decision to submit the publication

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Reviewer

Tha Han

Conclusions Although with some limitations, this study has provided initial evidence for the existence of socioeconomically determined health inequalities, which may have potentially important implications for understanding the deeper aetiology of common NCDs and for informing public policies. More research in this area is required to reveal the magnitude of NCDs–socioeconomic relation.

Introduction

Serious concerns have been raised during the last two decades concerning the rapidly rising incidence of non-communicable diseases (NCDs)¹, increasingly occurring at lower ages and among the most deprived groups of the population.^{1,2} Research demonstrates the multifactorial aetiology of NCDs,^{3,4} which appears to be related to the complex multidimensional interactions between individuals and their environment, including their socioeconomic status and their opportunities for promoting health.^{2,3,5,6} Closely following international trends, Cyprus appears to have a relatively high proportion of chronically ill people and a very low healthy life expectancy (HALE).⁷ Cypriots lose about 10 years (12.5%) of their lives to illness, which is about two years more than the World Health Organization European Region average.⁷ NCDs account for 90% of all deaths,⁷ with cardiovascular disease (CVD) being the main cause of death^{8–10} and accounting for most Death and Disability-adjusted Life Years (DALYs) among men.⁷ Hypertension, hypercholesterolaemia, diabetes and obesity (collectively known as the metabolic syndrome) affect high percentages of the Cypriot population, often above European Union (EU) averages: more than a third of Cypriots (40.5%) have high blood pressure,⁸ while hypercholesterolaemia affects 62.9% of Cypriot men and 46% of women.¹¹ Diabetes accounts for 7% of all deaths in Cyprus,⁸ which has the highest percentage of diabetic people in Europe – about a tenth (9.1%) of its population aged 20–79 years of age – while the EU average is 6.5%.¹² Over a quarter of the population (25.5%) are obese, while the majority (58.8%) are overweight.^{8,13} In line with European trends,¹⁴ Cyprus has a relatively high percentage of people with neuropsychiatric disorders, which are shown by evidence to be the second highest cause of disability among Cypriots, accounting for 19.4% of total DALYs for women and 15.8% for men.⁷ In

addition, over a quarter (26.5%) of Cypriots over 15 years of age smoke an average of 21 cigarettes daily,¹⁵ and only a minority (less than a fifth) walks or exercises daily.^{15,16}

In spite of the above alarming facts, little is known about their association, if any, with the socioeconomic status of Cypriots. This study aimed to investigate the extent to which there exists a socioeconomic element in the lifetime prevalence of NCDs, with emphasis on those accounting for most DALYs among the population, such as CVD, metabolic risk factors (hypertension, hypercholesterolemia, obesity and diabetes) and common neuropsychiatric disorders such as depression, stress and drug addiction. Socioeconomic parameters evaluated were education and family income, as those are frequently being examined as elements of socioeconomic status in international research.

Methods

Questionnaire design

The questionnaire was designed and developed in Greek language on the basis of a number of research questions related to the aims of the survey. The 28 questions of the questionnaire were classified in two categories: Part A: Demographic data (questions 1–14): which focused on personal, dietary and lifestyle data; and Part B: Methods of prevention and treatment of chronic health problems (questions 15–28): focusing on how they perceive their chronic health problems, the methods they use to address them (medical, nutritional and alternative), the extent of success of treatment and the degree of satisfaction with their doctors. All questions were clearly defined and mutually exclusive, so that respondents could find exactly what they wanted to answer in one of the choices, and were critically compared and contrasted with the research questions. Several alterations were made until a satisfactory

questionnaire was formed with a good potential to obtain answers to all research questions. Coding, numbering, listing of questions, type and sequence of answers, etc. were clearly designed so that answers could be easily converted to variables and effectively subjected to statistical analysis. Three pilot studies were conducted, which led to further modifications on the basis of the feedback obtained.

Data collection

This door-to-door survey was fielded from October 2008 to December 2008, resulting in 465 completed interviews. Interviewing was conducted by the Center for European and International Affairs of the University of Nicosia. All interviews were carried out by 18 interviewers working throughout the areas under the control of the Republic of Cyprus (urban and rural). Eligible respondents were household members, men or women, aged between 18 and 88 years old. Respondents were selected using the most recent birthday method. There was no substitution of respondents within household. Data on the population were taken by the latest census (2002).

The study used a classic cluster sample design. The objective of this design was to provide an estimation of household views/opinions across the island. The sample was designed to specifically represent the adult population residing in occupied residential housing units and, by definition, excluded residents of institutions and group housing. As a consequence of this sampling design, the objective was to obtain a confidence level of 95% and a confidence interval of $\pm 4.5\%$. Based on the target population size, the sample size was estimated to be 474 people. In order to control and ensure that the sample selection process resulted in a representative selection of primary sampling units (PSUs), the sample frame, consisting of all residential units, was stratified by district (5 districts under the control of the Republic [Famagusta's urban area is not under the control of the Republic]) and urban/rural areas. Therefore, given the criteria above, the sample was divided into nine strata. The goal was to perform six interviews in each PSU. As a result, we had 79 PSUs allocated based on the population in each stratum. Starting points (SPs) in each PSU were selected at random using postal codes. After the

selection of the SPs, a selected walking list was supplied to each interviewer, along with a map showing the exact location (streets, addresses, etc.). In addition, a set of instructions were also given to them on how to approach each interviewee and on how to perform the interview. The overall response rate for this study was 61.26%.

Data analysis

The data were analysed with the use of SPSS 16. Both descriptive statistics (means, standard deviations and percentages) and inferential statistics (Pearson correlations) were used for the analyses. After evaluation of the results provided by the statistical analysis, further analysis was carried out in order to obtain deeper insights from the survey. A number of variables were subjected to cross tabulation. This paper was based on the part of the results related to socioeconomic parameters and variables.

Results

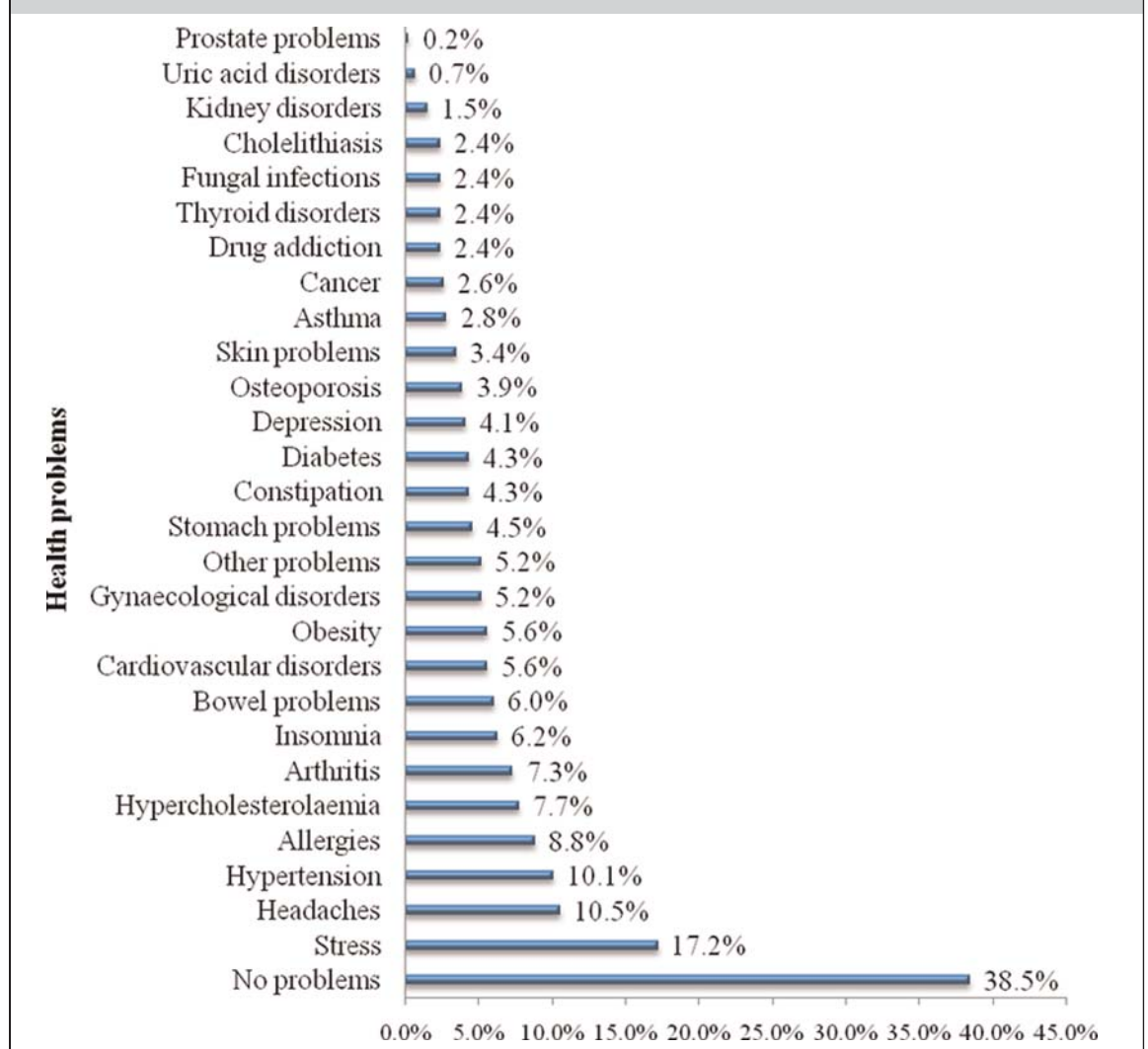
The sample was composed of 465 adults, average age 53 years (SD = 15.52), of which 43.2% were men and 56.8% were women. In terms of education, 54.8% of participants were middle-level (high-school) graduates, 24.9% university/college graduates and 20.2% had elementary education.

	Age		Gender	
	Mean	n	Males (%)	Females (%)
Family income				
€0–€1000	59.33	39	41.0	59.0
€1001–€2000	47.88	160	41.3	58.8
€2001–€3000	46.41	117	43.6	56.4
€3001–€4000	48.68	35	45.7	54.3
€4001–€5000	52.70	20	30.0	70.0
€5001 and above	39.70	84	51.2	48.8
Education				
Elementary	59.33	94	18.41	21.59
High school	40.84	255	59.70	51.14
College/university	35.78	116	21.89	27.27
Place of residence				
Rural	42.25	137	41.6	58.4
Urban	49.42	328	43.9	56.1

Age was determined with 2012 as a reference.

Figure 1

Health problems and percentages of the population reporting as suffering now (or in the past) from a health problem



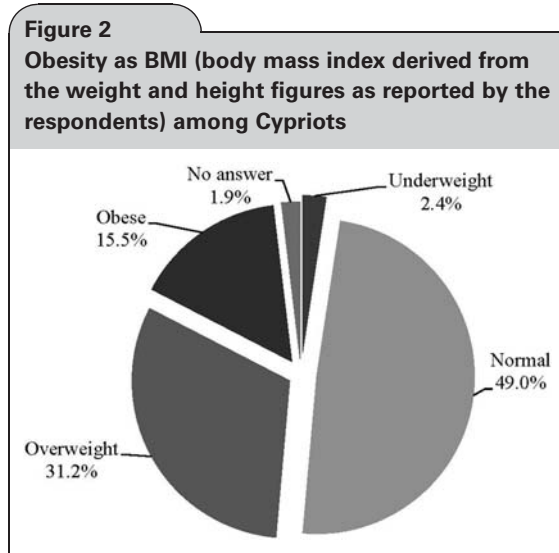
To the question: 'Do you suffer now, or in the past, from any of the following health problems?', the majority of the participants (61.5%) reported that they do suffer or have suffered in the past from at least one health problem. Stress was the most frequently reported problem (17.2%), followed by headaches (10.5%), hypertension (10.1%), allergies (8.8%), hypercholesterolaemia (7.7%), arthritis (7.3%), insomnia (6.2%), bowel problems (6.0%), cardiovascular disorders (5.6%) and obesity (5.6%) (Figure 1). Replying to questions on exercise and smoking, more than two-thirds of the population (71.6%) stated

that they never exercise, with only 15.1% of them stating that they exercise at least three times a week, while 29.6% of those who replied stated as active smokers and 46.9% as passive smokers.

Furthermore, almost half of the Cypriot population (47.6%) was found to be overweight (31.2%) or obese (15.5%) (Figure 2).

Tables 1 and 2 show a breakdown of the percentages of self-reported health problems by level of education (Table 1) and family income (Table 2).

Several problems were shown to have an inverse relationship with level of education



(Table 1), with higher levels of education reporting some health problems less frequently. The gaps were larger in some cases such as hypertension, CVD, diabetes and drug addiction, and smaller but significant in other cases such as hypercholesterolaemia and obesity. Arthritis occurred at a very high frequency at elementary level, compared with the other two levels, and the same was true for osteoporosis. College/university graduates complained more frequently for headaches, constipation and asthma, while stress was reported at exceptionally high levels by all categories. Those at high-school level had more frequent allergies and depression. None of the college/university graduates reported drug addiction (Table 1). There was a statistically significant negative correlation between family income and arthritis ($r = -0.135$, $P = 0.004$) and CVD ($r = -0.130$, $P = 0.005$). Additional statistically significant negative correlations were found between family income and drug addiction ($r = -0.117$, $P = 0.012$), cancer ($r = -0.106$, $P = 0.024$), stress ($r = -0.103$, $P = 0.028$) and skin problems ($r = -0.098$, $P = 0.037$). It should also be noted that the strongest correlation found was a positive association between family income and having no health problems ($r = 0.201$, $P = 0.000$), indicating that individuals with higher family incomes more frequently reported that they had no health problems, compared with individuals with lower income (Table 2).

Discussion

This study suggests a strong association between the socioeconomic status of Cypriots, defined by education and family income, and the lifetime prevalence of most of the NCDs included in the administered questionnaire. This discussion focuses particularly on those diseases which appear in official reports as accounting for most DALYs among the Cypriot population, namely CVD, the neuropsychiatric disorders, stress, depression and drug addiction, and the metabolic risks, hypertension, diabetes, hypercholesterolaemia and obesity.

Cardiovascular disease

CVD, the number one cause of death in Cyprus,⁸⁻¹⁰ was found to be associated with both parameters of socioeconomic status of Cypriots investigated in this study, appearing at significantly higher levels among the most deprived groups of the population. Education was shown to be an important determinant of CVD. From a tiny 1.7% among college/university graduates, the lifetime prevalence of CVD doubles at high-school level, further rising steeply to almost a fifth of those of elementary education. The association between deprivation and CVD was further supported by the statements of participants with lower family incomes who reported significantly higher CVD lifetime prevalence than those with higher incomes. These results are in line with research in other areas of the world. Studies in the USA showed a strong inverse association between socioeconomic status (as a combination of income and education) and cardiovascular risk for both men and women,¹⁷ as well as a higher burden of CVD among persons with less than high-school education, regardless of race and ethnicity.¹⁸ Another study in Australia demonstrated that women with lower education had a worse profile of biomarkers for CVD.¹⁹

Metabolic syndrome

Similarly, this study showed the four metabolic risks, hypertension, hypercholesterolaemia, obesity and diabetes to have a strong socioeconomic element. (The questionnaire did not

Table 1
Education and health problems

Health problem	Elementary (%)	High school (%)	College/university (%)
Stress	17.0	17.3	17.2
Headaches	9.6	9.5	13.9
Hypertension	23.4	8.6	2.6
Allergies	7.4	9.4	8.6
Hypercholesterolaemia	12.8	7.1	5.2
Arthritis	17.0	4.7	5.2
Insomnia	7.4	5.8	6.0
Bowel problems	8.5	4.7	6.9
Obesity	10.7	4.7	3.5
Cardiovascular disorders	18.1	2.7	1.7
Other problems	8.6	3.6	6.1
Gynaecological disorders	7.5	4.3	5.2
Stomach problems	6.4	3.9	4.3
Diabetes	13.8	2.4	0.9
Constipation	2.1	4.3	6.0
Depression	3.2	5.1	2.6
Osteoporosis	12.9	1.6	1.7
Skin problems	1.0	4.3	3.4
Asthma	3.2	2.0	4.3
Thyroid disorders	3.5	2.2	2.8
Drug addiction	7.6	1.6	0.0
Cholelithiasis	4.3	2.0	1.8
Fungal infections	3.2	1.6	3.5
Cancer	3.0	2.2	2.4
Kidney disorders	2.1	1.2	1.7
Uric acid disorders	2.0%	0.4	0.0
Prostate problems	0.0	0.4	0.0

Percentages in each category stating as suffering now, or in the past, from a specific health problem

distinguish between diabetes type I and II; however, in view of the fact that the average incidence of diabetes I to the total diabetes cases is only between 10–15%,¹² it was considered that the results are not significantly affected.) Another important finding, if one takes into consideration that one-third of Cypriots suffer with hypertension,⁸ is that the majority of men and almost half of women have hypercholesterolaemia,¹¹ almost one-tenth of the population are diabetic,¹² and the majority are overweight or obese.^{8,13} Education appeared to be an important determinant of all risks, which were reported by very low percentages among college/university graduates, rising significantly at the high-school

level and reaching much higher levels among people with elementary education. The gap between educational levels was particularly large in the case of hypertension and diabetes. The numbers of hypertensive individuals at elementary level were about three times as much as those at high-school level and nine times as much as those at college/university. In the case of diabetes the rise was even steeper, with elementary-level diabetics being almost six times as much as those at high-school level and over fifteen times as much as those of college/university level. Differences in obesity levels were moderate between high-school and college/university levels; however, numbers more than doubled between those at elementary education and the other two categories. A more moderate rise was evident in the case of hypercholesterolaemia. None of the metabolic risks, being important intermediate risks for CVD, were found to have any significant associations with total family income. The inconsistency of this finding with the previous one, which demonstrated a significant inverse association between income and CVD, could be attributed to the limitations of a questionnaire survey (discussed below). Previous research in the USA found socioeconomic status (as a combination of income and education) strongly inversely associated with metabolic risk in women,¹⁷ while education was shown as an independent predictor of the incidence of metabolic syndrome, defined as the clustering of obesity, dyslipidaemia, hypertension and impaired glucose metabolism.²⁰ Another study in Australia found an inverse relation between income and both blood glucose levels and high-density lipoprotein.¹⁹

Neuropsychiatric diseases

Neuropsychiatric diseases, representing as a group the second-highest cause of disability among the Cypriot population,⁷ were also found by this study to have a strong socioeconomic element. Stress was the most frequently reported problem by all categories of the population, with the exception of the elementary education group; within which stress, although still at high levels, ranked below hypertension and CVD. Within the educational domain, it is worth noting the high

Table 2
Family income and health problems

Health issue	Pearson correlation	Significance (2-tailed)	Conclusion
No problems	0.201	0.000	Yes at 0.01 level
Arthritis	-0.135	0.004	Yes at 0.01 level
Cardiovascular disorders	-0.130	0.005	Yes at 0.01 level
Other problems	-0.145	0.002	Yes at 0.01 level
Stress	-0.103	0.028	Yes at 0.05 level
Skin problems	-0.098	0.037	Yes at 0.05 level
Drug addiction	-0.117	0.012	Yes at 0.05 level
Cancer	-0.106	0.024	Yes at 0.05 level
Allergies	-0.007	0.088	No
Asthma	-0.046	0.328	No
Constipation	0.017	0.711	No
Insomnia	-0.082	0.079	No
Gynaecological disorders	0.008	0.865	No
Diabetes	-0.086	0.066	No
Bowel problems	-0.071	0.129	No
Thyroid disorders	-0.037	0.430	No
Depression	-0.074	0.115	No
Fungal infections	-0.028	0.550	No
Kidney disorders	0.074	0.116	No
Osteoporosis	-0.060	0.202	No
Uric acid disorders	-0.044	0.351	No
Obesity	-0.041	0.378	No
Cholelithiasis	-0.046	0.328	No
Hypertension	-0.082	0.081	No
Headaches	-0.020	-0.020	No
Prostate problems	-0.064	0.171	No
Stomach problems	0.000	0.988	No
Hypercholesterolaemia	-0.061	0.197	No

percentage of elementary-level graduates reporting drug addiction, as well as the higher lifetime prevalence of depression among high school graduates. None at the college/university level reported drug addiction. Family income was significantly negatively associated with both stress and drug addiction, but no significant relation to depression was found. This finding is in line with previous research in other areas of the world, which found income to have no effect on the incidence of depression,²¹ but to be significantly

associated with psychological distress^{22,23} as well as with substance or drug abuse.²²⁻²⁴ Education was also shown to be an important negative determinant of drug or substance addiction²⁴ and psychological distress.²⁵

This survey has also shown that Cypriots have adopted very unhealthy and sedentary lifestyles which, comparing with results from previous studies, appear to worsen year by year. In the Cypriot Ministry's of Health Annual Report in 2001, it was shown that 32.2% of the population had a totally sedentary lifestyle.¹¹ Two years later, the Ministry's Health Survey in 2003 demonstrated that 63.8% never exercise and the majority of the rest do some kind of light exercise.¹⁶ In our survey, substantially more than two-thirds (71.6%) reported as never exercising, with only just above a seventh (15.1%) of the population exercising at least three times a week. The same trend is true for smoking. Previous studies had shown that 23.9% of the population smoked daily,^{11,16} whereas the present survey found that 29.6% of Cypriots are now active smokers, while 46.9% state passive smokers. In addition, levels of obesity within the Cypriot population, particularly among men, have reached an epidemic level and are significantly higher among other Europeans. In 2001, 44.3% of men and 29.7% of women were obese or overweight,¹¹ while more recent studies reveal that one in two adults and at least one in four preadolescent children are overweight or obese.^{1,13} The present survey also showed that almost half of the Cypriot population are overweight or obese. These trends may explain the large gaps shown within the income and educational domains, particularly in diseases demonstrated to be generally addressed by dietary and lifestyle changes or managed by 'pharmacological management protocols'.^{26,27} Those belonging to the most deprived groups of the population are more likely to have inadequate knowledge/access to healthy diets or limited access to medical healthcare. This last possibility is further supported by the absence of an efficient healthcare system to cover the entire population in Cyprus.¹⁵ It is worth noting is that the Cypriot government spends only 5.8% of its gross domestic production (GDP) on health, while the EU average is 8.3%.^{12,15} The majority of the population resort to the private sector which is expensive and not accessible for the most deprived.

Limitations

As with all questionnaire surveys which rely on self-perceptions rather than objective data, this survey had a number of limitations; including possible participant response biases, such as low reported symptoms and total family income. Under-reporting is evident in many of the participants' replies if one compares official statistics with statements. Significant gaps between data and statements, related to this paper, were shown in the cases of hypercholesterolaemia, hypertension, obesity and diabetes. In most of these cases, only a fraction of those shown by actual official data report the disease. The response biases could explain the fact that although a significant negative association was evident between income and CVD, this association was not shown between income and the intermediate metabolic risks, hypertension, hypercholesterolaemia, obesity and diabetes, which are among the most under-reported health problems in this study. A possible reason for this could be the fact that most of these problems are often managed by 'pharmacological management protocols' particularly in patients who fail to comply with recommended dietary and lifestyle guidelines.^{26,27} As this survey has also shown, this could be the case for many Cypriots^{15,16} (data above on smoking, exercise and obesity). A further limitation of this study relates to the risk of the level of under-reporting being different for different categories of the population, which again may be related to available means and methods of prevention, symptom suppression or cure in each category.

Conclusions

In spite of the limitations, this survey has provided initial evidence for the existence of a socioeconomic element in the lifetime prevalence of chronic disease in Cyprus and highlighted the need for more research in this area on the basis of more objective data, in order to evaluate the magnitude of this association. In line with international research, our study has demonstrated that the causes of chronic disease may be located beyond the narrow boundaries of the traditional health sector, thereby highlighting the crucial

role the state needs to play. With the European Union's White Paper statement in mind that 'the population's health is not an issue for health policy alone',²⁸ and in order to reduce the health inequalities observed in this survey, evidence-based and integrated public health policies are needed to tackle social, economic and other wider determinants of health, such as smoking and unhealthy lifestyles.^{1,29} In addition, the burden on NCD such as CVD, cancer, metabolic syndrome and neuropsychiatric disorders has been rising,^{8,10,13} and its cost on individuals and the state could be enormous. According to the European Commission the economic burden of coronary heart disease in the EU amounts to 1% of GDP and of mental disorders to 3–4% of GDP.²⁸ Cyprus is shown to be among the top three countries of the EU estimated to have the strongest population growth within the next few decades. Cypriots aged 65 and over are expected to more than double, and those over 80 to more than triple by the year 2060,³⁰ skyrocketing demand for healthcare. Therefore, we call for urgent political commitment and leadership to embed, across government departments, policies that help to limit the consequences.

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