Original article

Socioeconomic Status and Health Inequalities for Cardiovascular Prevention Among Elderly Spaniards

Cília Mejía-Lancheros,[a] Ramón Estruch,[b,c] Miguel A. Martínez-González,[d] Jordi Salas-Salvadó,[c,e] Dolores Corella,[c,f] Enrique Gómez-Gracia,[g] Miquel Fiol,[c,h] José Lapetra,[c,i] Maria I. Covas,[c,j] Fernando Arós,[k] Lluís Serra-Majem,[l] Xavier Pintó,[m] Josep Basora,[c,n] José V. Sorlí,[c,o,p] and Miguel A. Muñoz[a,q,*], on behalf of the PREDIMED Study Investigators

[a] Departamento de Pediatría, Obstetricia, Ginecología y Medicina Preventiva, Universitat Autònoma de Barcelona, Barcelona, Spain
[b] Departamento de Medicina Interna, IDIBAPS, Hospital Clínic, Universidad de Barcelona, Barcelona, Spain
[c] CIBER Fisiopatología de la Obesidad y Nutrición (CIBERobn), Instituto de Salud Carlos III (ISCIII), Madrid, Spain
[d] Departamento de Medicina Preventiva y Salud Pública, Universidad de Navarra, Pamplona, Navarra, Spain
[e] Departamento de Nutrición Humana, IISPV, Universitat Rovira i Virgili, Reus, Tarragona, Spain
[f] Departamento de Medicina Preventiva, Universidad de Valencia, Valencia, Spain
[g] Departamento de Medicina Preventiva, Universidad de Málaga, Málaga, Spain
[h] Instituto de Ciencias de la Salud (IUNICS), Universidad de las Islas Baleares, Palma de Mallorca, Baleares, Spain
[i] Departamento de Medicina de Familia, División de Atención Primaria de Sevilla, Centro de Salud Bellavista, Sevilla, Spain
[j] Unidad de Lípidos e Investigación en Epidemiología Cardiovascular, Institut Municipal d'Investigació Mèdica (IMIM), Barcelona, Spain
[k] Departamento de Cardiología, Hospital Universitario Txagorritxu, Vitoria, Álava, Spain
[l] Departamento de Ciencias Clínicas, Universidad de Las Palmas de Gran Canaria, Las Palmas de Gran Canaria, Spain
[m] Unidad de Lípidos y Riesgo Vascular, Medicina Interna, Hospital Universitario de Bellvitge, Hospitalet de Llobregat, Barcelona, Spain
[n] Unidad de Investigación en Atención Primaria de Tarragona, Institut Català de la Salut e IDIAP-Jordi Gol, Tarragona, Spain
[o] Departamento de Medicina Preventiva, Facultad de Medicina, Universidad de Valencia, Valencia, Spain
[p] División de Atención Primaria, Instituto de la Salud de Valencia, Valencia, Spain
[q] Unitat de Suport a la Recerca, División de Atención Primaria de Salud, Institut Català de la Salut e IDIAP-Jordi Gol, Barcelona, Spain

A B S T R A C T

Introduction and objectives: Although it is known that social factors may introduce inequalities in cardiovascular health, data on the role of socioeconomic differences in the prescription of preventive treatment are scarce. We aimed to assess the relationship between the socioeconomic status of an elderly population at high cardiovascular risk and inequalities in receiving primary cardiovascular treatment, within the context of a universal health care system.

Methods: Cross-sectional study of 7447 individuals with high cardiovascular risk (57.5% women, mean age 67 years) who participated in the PREDIMED study, a clinical trial of nutritional interventions for cardiovascular prevention. Educational attainment was used as the indicator of socioeconomic status to evaluate differences in pharmacological treatment received for hypertension, diabetes, and dyslipidemia.

Results: Participants with the lowest socioeconomic status were more frequently women, older, overweight, sedentary, and less adherent to the Mediterranean dietary pattern. They were, however, less likely to smoke and drink alcohol. This socioeconomic subgroup had a higher proportion of coexisting cardiovascular risk factors. Multivariate analysis of the whole population found no differences between participants with middle and low levels of education in the drug treatment prescribed for 3 major cardiovascular risk factors (odds ratio [95% confidence interval]): hypertension (0.75 [0.56-1.00] vs 0.85 [0.65-1.10]); diabetic participants (0.86 [0.61-1.22] vs 0.90 [0.67-1.22]); and dyslipidemia (0.93 [0.75-1.15] vs 0.99 [0.82-1.19], respectively).

Conclusions: In our analysis, socioeconomic differences did not affect the treatment prescribed for primary cardiovascular prevention in elderly patients in Spain. Free, universal health care based on a primary care model can be effective in reducing health inequalities related to socioeconomic status.

© 2013 Sociedad Española de Cardiología. Published by Elsevier España, S.L. All rights reserved.

---

* Corresponding author: Unitat de Suport a la Recerca, Àmbit Atenció Primària Barcelona-Ciutat, ICS-IDIAP-Jordi Gol, Sardenya 375, 08025 Barcelona, Spain.
E-mail address: mamunoz.bcn.ics@gencat.cat (M.A. Muñoz).

Nivel socioeconómico y desigualdades de salud en la prevención cardiovascular de la población española de edad avanzada

R E S U M E N

Palabras clave:
Enfermedad cardiovascular
Factor de riesgo cardiovascular
Tratamiento farmacológico
Desigualdades socioeconómicas
Estilos de vida

Introducción y objetivos: Aunque se sabe que los determinantes sociales pueden ser causa de desigualdades en la salud, se ha evaluado escasamente si hay diferencias socioeconómicas relacionadas con el tratamiento preventivo. El objetivo de este estudio es analizar la relación entre el nivel socioeconómico de una población con alto riesgo cardiovascular y las desigualdades en el tratamiento cardiovascular recibido en un sistema sanitario gratuito y universal.

Métodos: Estudio transversal de 7.447 pacientes con alto riesgo cardiovascular (el 57,5% mujeres; media de edad, 67 años) procedentes del estudio PREDIMED, un ensayo clínico de intervención nutricional para la prevención cardiovascular. El nivel educativo alcanzado se usó como indicador del nivel socioeconómico para evaluar las diferencias en el tratamiento farmacológico contra la hipertensión, la diabetes mellitus y la dislipemia.

Resultados: Los participantes que con mayor frecuencia se encontraban en niveles socioeconómicos inferiores eran mujeres, ancianos, pacientes con sobrepeso y sedentarios y aquellos con peor patrón de adherencia a la dieta mediterránea; sin embargo, eran menos fumadores y consumidores habituales de alcohol. Asimismo, este subgrupo mostró mayor proporción de factores de riesgo cardiovascular. El análisis multivariable ajustado en la población general no mostró diferencias en el tratamiento de fármacos preventivos prescritos para los principales factores de riesgo cardiovascular en relación con el nivel socioeconómico (*odds ratio* [intervalo de confianza del 95%]): participantes hipertensos (0,75 [0,56-1,00] frente a 0,85 [0,65-1,10]); participantes diabéticos (0,86 [0,61-1,22] frente a 0,90 [0,67-1,22]); participantes con dislipemia (0,93 [0,75-1,15] frente a 0,99 [0,82-1,19]).

Conclusiones: No se observaron diferencias en el tratamiento recibido en prevención cardiovascular primaria por los pacientes de edad avanzada en relación con el nivel socioeconómico. Un sistema de salud universal y gratuito basado en un modelo de atención primaria puede ser eficaz en la reducción de las desigualdades en la salud.

© 2013 Sociedad Española de Cardiología. Publicado por Elsevier España, S.L. Todos los derechos reservados.

Abbreviations

CVD: cardiovascular disease
SES: socioeconomic status

INTRODUCTION

Cardiovascular diseases (CVD) continue to be the leading cause of death and disability worldwide, representing 30% of all deaths.[1] The impact of the main risk factors (smoking, hypertension, dyslipidemia, and diabetes mellitus [DM]) on this public health issue is well known. It has been estimated that 972 million people suffer from hypertension[2] and 366 million from DM.[3] The World Health Organization estimates that dyslipidemia is associated with more than half of all cases of ischemic heart disease and more than 4 million deaths per year.[4] It is well known that the elderly population has a higher incidence of CVD and a worse prognosis.[5] The population aged 65 and older in the United States has more than doubled, from 35 million in 2000 to 71 million in 2030, while the worldwide population aged 65 and older is projected to increase from 420 million to 973 million during 2000-2030.[6] Although researchers are increasingly interested in the study of multimorbidity and related determinants in this age group, this population is usually underrepresented in clinical trials.[7,8] Socioeconomic or demographic factors are among the many factors that have been associated with unequal access to health care services, which can produce inequalities in the diagnosis, treatment, and management of CVD risk factors.[9,10] Low socioeconomic status (SES) is directly related to a higher risk of CVD.[11,12] In a previous study carried out in patients with established coronary heart disease, we found no inequalities in cardiovascular prevention related to SES in Spain's health care system, which provides free, universal coverage.[13] The present study aimed to assess the relationship between SES and health inequalities for CVD prevention treatment in patients at high cardiovascular risk who have not yet developed CVD, within the context of a universal, free health care system.

METHODS

Study Design

We conducted a cross-sectional study using baseline data from the PREDIMED study, a trial aimed at assessing the effects of the traditional Mediterranean diet on the primary prevention of CVD. Details of the protocol have been described elsewhere[14] and are available online.[15] Briefly, the PREDIMED study involved long-term follow-up of 7447 participants (55-80 years of age) at high cardiovascular risk, but with no CVD at enrollment. Participants were included during 2003 to 2009, and follow-up ended in December 2010. All patients were assigned to one of 3 diets: traditional Mediterranean diet supplemented with extra-virgin olive oil, traditional Mediterranean diet supplemented with mixed nuts, or a low-fat diet (used as control group receiving advice to reduce dietary fat). Primary endpoints were myocardial infarction and stroke; secondary endpoints were death from any cause, heart failure, DM, major cancers, dementia, or other neurodegenerative disorders. The main inclusion criteria were age (women 60-80 years old and men 55-80 years old) with either type-2 DM or 3 or more cardiovascular risk factors: smoking, hypertension, elevated low-density lipoprotein cholesterol levels, low high-density lipoprotein cholesterol levels, overweight or obesity, or a

family history of premature CVD. A total of 8713 participants were assessed for eligibility, of which 973 (11.1%) declined to participate and 293 (3.3%) were excluded for not meeting inclusion criteria.

PREDIMED participants were selected from the clinical records of primary care centers; eligible subjects were contacted by a health professional and invited to participate.

Researchers explained the study aims and interventions to potential participants. Signed informed consent was obtained. Participants were randomized to one of the 3 diet groups by a computer-generated random number sequence. At baseline, all participants underwent a medical examination; general practitioners were not informed of participants' group assignment. Variables were collected from medical records, clinical evaluation, and face-to-face interviews. Validated questionnaires were administered in order to obtain data on nutritional habits[16,17] and physical exercise.[18] Samples for laboratory tests were obtained. Information regarding pharmacological treatment was obtained by interview and confirmed by consulting electronic medical records. The study protocol was approved by the institutional review board of Hospital Clínic (Barcelona, Spain).The trial is registered.[19]

The present study is a cross-sectional analysis of baseline data from all 7447 PREDIMED study participants. Medical diagnostic criteria for hypertension, DM, and dyslipidemia were applied to identify participants according to these risk factors.

Outcomes Measured

Socioeconomic Status

We considered educational attainment as a socioeconomic indicator because it remains unchanged throughout life, and directly or indirectly affects an individual's adoption of health behaviors and their outcomes.[20] Educational level was grouped into three categories: high level (university education); middle level (secondary education, up to 16–18 years); and low level (no education or only primary school).

Treatment Assessment

We evaluated receipt of the treatment indicated according to the risk factor(s) present (hypertension, DM, dyslipidemia), defined as follows:

- Participants with hypertension: prescribed at least one antihypertensive drug, including angiotensin-converting-enzyme inhibitors, diuretics, calcium channel blockers, angiotensin receptor blockers, beta-blockers, alpha-blockers, or other(s).
- Participants with diabetes: prescribed insulin or/and oral hypoglycemic drugs.
- Participants with dyslipidemia: prescribed statins and/or fibrates.

Table 1
Characteristics of Study Participants (N=7447) According to Educational Attainment

Participant characteristics	High level[a]	Middle level[b]	Low level[c]	P-value	P-trend
Patients	534	1121	5657		
Age, years[d]	64,4±6,3	64,7±6,1	67,6±6,0	.001	—
Sex, women	168 (31.5)	451 (40.2)	3584 (63.4)	.001	.001
Body weight					
Normal (BMI=25)	61 (11.4)	99 (8.8)	390 (6.9)	.001	.001
Overweight (BMI 25-30)	280 (52.4)	571 (50.9)	2466 (43.6)	—	—
Obese (BMI>30)	193 (36.1)	451 (40.2)	2801 (49.5)	—	—
Lifestyle					
Smoking[e]	162 (30.3)	272 (24.3)	800 (14,1)	.001	.001
Low adherence to Mediterranean diet[f]	223 (41.8)	496 (44.2)	2657 (47.0)	.026	.007
Sedentary behavior[g]	144 (27.0)	391 (35.0)	2109 (37.5)	.001	.001
High alcohol intake[h]	43 (8.1)	84 (7.5)	273 (4.9)	.001	.001
Cardiovascular risk factors[i]					
Hypertension	435 (81.5)	924 (82.4)	4682 (82.8)	.737	.453
Diabetes	218 (40.8)	501 (44.7)	2834 (50.1)	.001	.001
Dyslipidemia	397 (74.3)	800 (71.4)	4088 (72.3)	.448	.605
Number of cardiovascular risk factors[i]					
One	105 (19.7)	233 (20.9)	955 (16.9)		
Two	336 (63.2)	651 (58.4)	3394 (60.2)	.001	.001
Three	91 (17.1)	230 (20.6)	1287 (22.8)	—	—

BMI, body mass index
Unless otherwise indicated, data are expressed as no. (%)
 [a] High level: university studies.
 [b] Middle level: secondary studies up to 16–18 years.
 [c] Low level: Up to primary studies.
 [d] Mean ± standard deviation. *P*-value: analysis of variance F-test.
 [e] Smoking: current smoker or former smoker less than 1 year.
 [f] Pattern of adherence to Mediterranean diet, less than 9 points (median) on a scale (0-14).
 [g] Physical activity in leisure time<1000 kcal/week.
 [h] Alcohol consumption more than 280 g/week in men and 170 g/week in women.
 [i] Presence of hypertension, and/or diabetes and/or dyslipidemia.

- Participants with several cardiovascular risk factors: prescribed pharmacological treatment corresponding to the cardiovascular risk factors presented.

Other Variables

Age, sex, smoking habits, body mass index, adherence to the Mediterranean diet pattern, physical activity, and alcohol intake.

Statistical Analysis

Descriptive analysis of categorical variables was expressed as percentages and of quantitative variables as mean (standard deviation). Bivariate analyses included chi square tests for categorical variables and analysis of variance F-test for continuous variables. The crude and adjusted association between the outcomes (treatment received for DM, hypertension, and dyslipidemia) and educational level were performed using logistic regression. Multivariate analysis of treatment received in relation to educational level was performed by "ENTER method" adjusting

for variables with a clinical and epidemiological relationship to receiving treatment in primary cardiovascular prevention and/or to educational level: sex, age, body weight, smoking, physical activity, alcohol intake, hypertension, DM, and dyslipidemia. Due to a lower educational level among women participants compared to men, we evaluated the interaction of educational level and sex related to the treatment received. All statistical tests had an alpha level<0.05 and a 95% confidence interval (95%CI). The Hosmer-Lemeshow test was used to assess the goodness of fit for multivariate models. The Statistical Package for the Social Sciences (SPSS) 17.0 software was used for all analyses.

RESULTS

A total of 7447 patients were included. Mean age was 67.0 (6.2) and 57.5% of the participants were women. Only 7.2% of the participants had attained a university education. At baseline, 81.2% (N=6041) of participants had hypertension; 47.7% (N=3553) DM, and 71.0% (N=5285) dyslipidemia.

Table 2
Pharmacological Treatment Received for Cardiovascular Risk Factors According to Educational Attainment

	High level[a] (N=534)	Middle level[b] (N=1121)	Low level[c] (N=5657)	*P*-value	*P*-trend
Participants with hypertension (N=6041)	435 (100)	924 (100)	4682 (100)	—	—
Treated[d]	355 (81.6)	720 (77.9)	3851 (82.3)	.008	.066
Number of drugs prescribed[e]					
None	80 (18.4)	204 (22.1)	831 (17.7)	.025	.303
One	229 (52.7)	466 (50.4)	2.458 (52.5)	—	—
Two	95 (21.8)	190 (20.6)	1116 (23.8)	—	—
Three or more	31 (7.1)	64 (6.9)	277 (5.9)	—	—
Participants with diabetes (N=3553)	218 (100)	501 (100)	2834 (100)		
Treated[f]	149 (68.3)	324 (64.7)	1889 (66.7)	.572	.954
Number of drugs prescribed[g]					
None	69 (31.7)	177 (35.3)	945 (33.3)	.731	.671
One	140 (64.2)	302 (60.3)	1742 (61.5)	—	—
Two	9 (4.1)	22 (4.4)	147 (5.2)	—	—
Participants with dyslipidemia (N=5285)	397 (100)	800 (100)	4088 (100)		
Treated[h]	224 (56.4)	455 (56.9)	2453 (60.0)	.126	.052
Number of drugs prescribed[i]					
None	173 (43.6)	345 (43.1)	1635 (40.0)	.231	.107
One	214 (53.9)	441 (55.1)	2380 (58.2)	—	—
Two	10 (2.5)	14 (1.8)	73 (1.8)	—	—
Number of cardiovascular risk factors[j]					
One (N=1293)	105 (100)	233 (100)	955 (100)		
Treated	77 (73.3)	161 (69.1)	659 (69.0)	.656	.457
Two (N=4381)	336 (100)	651 (100)	3394 (100)		
Treated	155 (46.1)	307 (47.2)	1704 (50.2)	.163	.063
Three (N=1608)	91 (100)	230 (100)	1287 (100)		
Treated	44 (48.4)	97 (42.2)	579 (45.0)	.570	.962

[a] High level: university studies.
[b] Middle level: secondary studies up to 16-18 years.
[c] Low level: up to primary studies.
[d] Prescribed at least one of following antihypertensive drugs: angiotensin-converting-enzyme inhibitors, diuretics, calcium channel blockers, angiotensin receptor blockers, beta blockers, alpha blockers, or other antihypertensive drugs.
[e] Number of antihypertensive drugs prescribed: none, angiotensin-converting-enzyme inhibitors, diuretics, calcium channel blockers, angiotensin receptor blockers, beta blockers, alpha blockers, or other antihypertensive drugs.
[f] Prescribed at least one of the following drugs: insulin and oral hypoglycemic drugs.
[g] Number of antidiabetic drugs prescribed(none, insulin or/and oral hypoglycemic).
[h] Prescribed at least one the following drugs: Statins and fibrates.
[i] Number of lipid-lowering drugs (Statins and/or fibrates) prescribed.
[j] Presence of hypertension and/or diabetes and/or dyslipidemia.

Among participants with hypertension, 81.4% (n=4922) received antihypertensive drugs; 66.5% of diabetic patients (n=2362) were prescribed insulin or oral antidiabetic agents, and 59.3% of patients with dyslipidemia (n=3132) received lipid-lowering therapy.

Participants in the lower educational level group were more frequently women, older, obese, less physically active, and had a lower adherence to the Mediterranean diet. Participants with a higher educational level were more often smokers and consumed more alcohol. Both the prevalence of DM and the proportion having 3 cardiovascular risk factors were higher in the lower educational level group (Table 1).

Participants with hypertension, DM, and a low educational level had more probability of receiving antihypertensive and lipid-lowering therapy. Participants with a low educational level and at least 2 cardiovascular risk factors were more likely to be treated (P=.063). In participants with dyslipidemia and in those with either 1 or 3cardiovascular risk factors, we observed no relationship between receiving treatment and educational level (Table 2).

Multivariate analysis did not show any relationship between treatment received and educational level (Table 3). Only participants with a middle educational level were less likely to be treated for hypertension (P=.049).

When the analysis was stratified by sex (Table 4), we observed that men with the lowest educational level had a 35% lower probability of receiving treatment for their hypertension than did participants at the highest level (odds ratio [OR]=0.65 [95%CI, 0.46-0.92]).No socioeconomic differences were observed for the other cardiovascular risk factors (DM, dyslipidemia) studied.

Figure presents the adjusted OR (95%CI) for receiving treatment for each of the cardiovascular risks factors. Table 5 shows the probability of receiving treatment depending on number of cardiovascular risk factors.

DISCUSSION

Our study found no overall differences related to SES in the pharmacological treatment prescribed for primary cardiovascular

Table 3
Odds Ratio of Receiving Treatment for Cardiovascular Risk Factors According to Educational Attainment

	High level (N=534)	Middle level (N=1121)	Low level (N=5657)
Participants with hypertension			
Unadjusted OR (95%CI)	1.00 (ref.)	0.79 (0.59-1.06)	1.04 (0.81-1.34)
P-value		.111	.746
aOR (95%CI)[a]	1.00 (ref.)	0.75 (0.56-1.00)	0.85 (0.65-1.10)
P-value		.049	.222
Participants with diabetes			
Unadjusted OR (95%CI)	1.00 (ref.)	0.87 (0.62-1.23)	0.93 (0.69-1.26)
P-value		.434	.651
aOR (95%CI)[b]	1.00 (ref.)	0.86 (0.61-1.22)	0.90 (0.67-1.22)
P-value		.404	.515
Participants with dyslipidaemia			
Unadjusted OR (95%CI)	1.00 (ref.)	0.94 (0.76-1.16)	1.04 (0.87-1.24)
P-value		.570	.684
aOR (95%CI)[c]	1.00 (ref.)	0.93 (0.75-1.15)	0.99 (0.82-1.19)
P-value		.499	.875
Number of cardiovascular risk factors			
One	1.00 (ref.)		
Unadjusted OR (95%CI)	1.00 (ref.)	0.82 (0.49-1.38)	0.80 (0.51-1.26)
P-value		.463	.339
aOR (95%CI)[d]	1.00 (ref.)	0.79 (0.47-1.33)	0.70 (0.44-1.12)
P-value		.368	.138
Two			
Unadjusted OR (95%CI)	1.00 (ref.)	1.05 (0.08-1.36)	1.18 (0.94-1.48)
P-value		.731	.151
aOR (95%CI)[d]	1.00 (ref.)	1.02 (0.78-1.33)	1.07 (0.84-1.35)
P-value		.888	.645
Three			
Unadjusted OR (95%CI)	1.00 (ref.)	0.77 (0.47-1.25)	0.85 (0.56-1.31)
P-value		.291	.471
aOR (95%CI)[d]	1.00 (ref.)	0.77 (0.47-1.26)	0.80 (0.52-1.24)
P-value		.296	.311

95%CI, 95% confidence interval; aOR, adjusted odds ratio; OR, odds ratio; ref., reference.
[a] Adjusted by sex, age, body weight, smoking, adherence to the Mediterranean diet, physical activity, alcohol intake, diabetes, and dyslipidemia.
[b] Adjusted by sex, age, body weight, smoking, adherence to the Mediterranean diet, physical activity, alcohol intake, hypertension and dyslipidemia.
[c] Adjusted by sex, age, body weight, smoking, adherence to the Mediterranean diet, physical activity, alcohol intake, hypertension and diabetes.
[d] Adjusted by sex, age, body weight, smoking, adherence to the Mediterranean diet, physical activity, alcohol intake.

Table 4

Odds Ratio of Receiving Treatment for Cardiovascular Risk Factors According to Educational Level, Stratified by Sex

	Women			Men		
	High level	Middle level	Low level	High level	Middle level	Low level
Patients, No.	168	451	3584	366	670	2073
Participants with hypertension						
aOR (95%CI)[a]	1.00 (ref.)	0.95 (0.60-1.50)	1.31 (0.87-1.98)	1.00 (ref.)	0.69 (0.47-1.01)	0.65 (0.46-0.92)
P-value		.820	.194		.059	.014
Participants with diabetes						
aOR (95%CI)[b]	1.00 (ref.)	1.23 (0.64-2.38)	1.35 (0.75-2.42)	1.00 (ref.)	0.76 (0.51-1.14)	0.76 (0.53-1.09)
P-value		.540	.316		.182	.141
Participants with dyslipidemia						
aOR (95%CI)[c]	1.00 (ref.)	0.97 (0.68-1.39)	1.11 (0.81-1.52)	1.00 (ref.)	0.93 (0.72-1.21)	0.94 (0.74-1.18)
P-value		.883	.525		.603	.578
Number of cardiovascular risk factors	1.00 (ref.)					
One						
aOR (95%CI)[d]	1.00 (ref.)	1.27 (0.52-3.11)	1.35 (0.62-2.93)	1.00 (ref.)	0.68 (0.36-1.29)	0.63 (0.36-1.12)
P-value		.597	.445		.237	.118
Two						
aOR (95%CI)[d]	1.00 (ref.)	0.95 (0.61-1.48)	1.10 (0.75-1.63)	1.00 (ref.)	1.11 (0.79-1.55)	1.06 (0.79-1.42)
P-value		.828	.630		.550	.720
Three						
aOR (95%CI)[d]	1.00 (ref.)	1.81 (0.71-4.62)	2.00 (0.85-4.72)	1.00 (ref.)	0.56 (0.31-1.03)	0.57 (0.33-0.96)
P-value		.217	.112		.060	.036

95%CI, 95% confidence interval; aOR, adjusted odds ratio; ref., reference.

[a] Adjusted by age, body weight, smoking, adherence to the Mediterranean diet, physical activity, alcohol intake, diabetes, and dyslipidemia.
[b] Adjusted by age, body weight, smoking, adherence to the Mediterranean diet, physical activity, alcohol intake, hypertension, and dyslipidemia.
[c] Adjusted by age body weight, smoking, adherence to the Mediterranean diet, physical activity, alcohol intake, hypertension, and diabetes.
[d] Adjusted by age body weight, smoking, adherence to the Mediterranean diet, physical activity, and alcohol intake.

prevention in an elderly population with high cardiovascular risk. Educational level was selected as an indicator of SES because it remains unchanged throughout life, influencing the adoption of lifestyles and the related health outcomes.[20] The greater proportion of women and of older participants with the lowest educational levels may be due to the particular historical situation of Spain. University access was limited until the last third of the 20th century, especially for women.[21] Higher tobacco and alcohol consumption observed at the upper educational levels in our sample is consistent with other studies in Spain, and is likely due to historical cultural patterns in this age group; these patterns are changing in younger populations.[22] The lower physical activity, less healthy dietary patterns, higher prevalence of DM and obesity, and larger number of cardiovascular risk factors observed in participants with lower educational levels also agrees with previous studies from Spain and other countries.[23–26]

Only a few studies have analyzed inequalities in preventive cardiovascular treatment depending on SES. with controversial results that vary depending on the country and population studied.[27,28] Results of the present study concur with our previous analysis of a general population aged 34 to 75 years, in which we did not observe differences related to SES in preventive treatment for CVD.[29] Reasons for such homogeneity could be that patients with CVD are more highly monitored or, as has been shown in other studies,[30] that men with lower SES received less treatment for their hypertension because they use primary care services less often than women.

Although the health of a population is not only determined by use of health services, the type of coverage may contribute to SES-related health inequalities in CVD prevention (eg, access to medical services at different levels).[9,10,31] Health care systems based on strong primary care models could be more effective in reducing inequalities for socioeconomically disadvantaged people because resources are better distributed according to population needs.[32] The day-to-day tasks of primary care include the provision of specific care for patients with chronic diseases through the implementation of systematic preventive programs. In the Spanish health care system, patients can visit their general practitioner as often as needed, and during the study period most retired people did not pay for their prescriptions (a "copayment" was implemented in July 2012). We did not find inequalities in preventive treatment based on SES in the elderly population studied, probably due to the higher utilization of primary care services by the population with lower educational levels, as reported by other studies.[33,34]

Strengths and Limitations

The design of our study does not allow causal inferences. However, its cross-sectional approach permits the assessment of whether prescription differences exist in a population at high CVD, within the frame of a universal health care model.

One strength of our study is the large sample size used and the careful conduct of all measurements using standardized protocols. A potential limitation could be the possibility that some participants used private health care services and therefore were not fully evaluated by their assigned general practitioner. However, this possibility is slight because most of the included population had a low SES. Eligible participants who declined to participate may have had a different distribution of educational level; however, while this may affect the distribution of
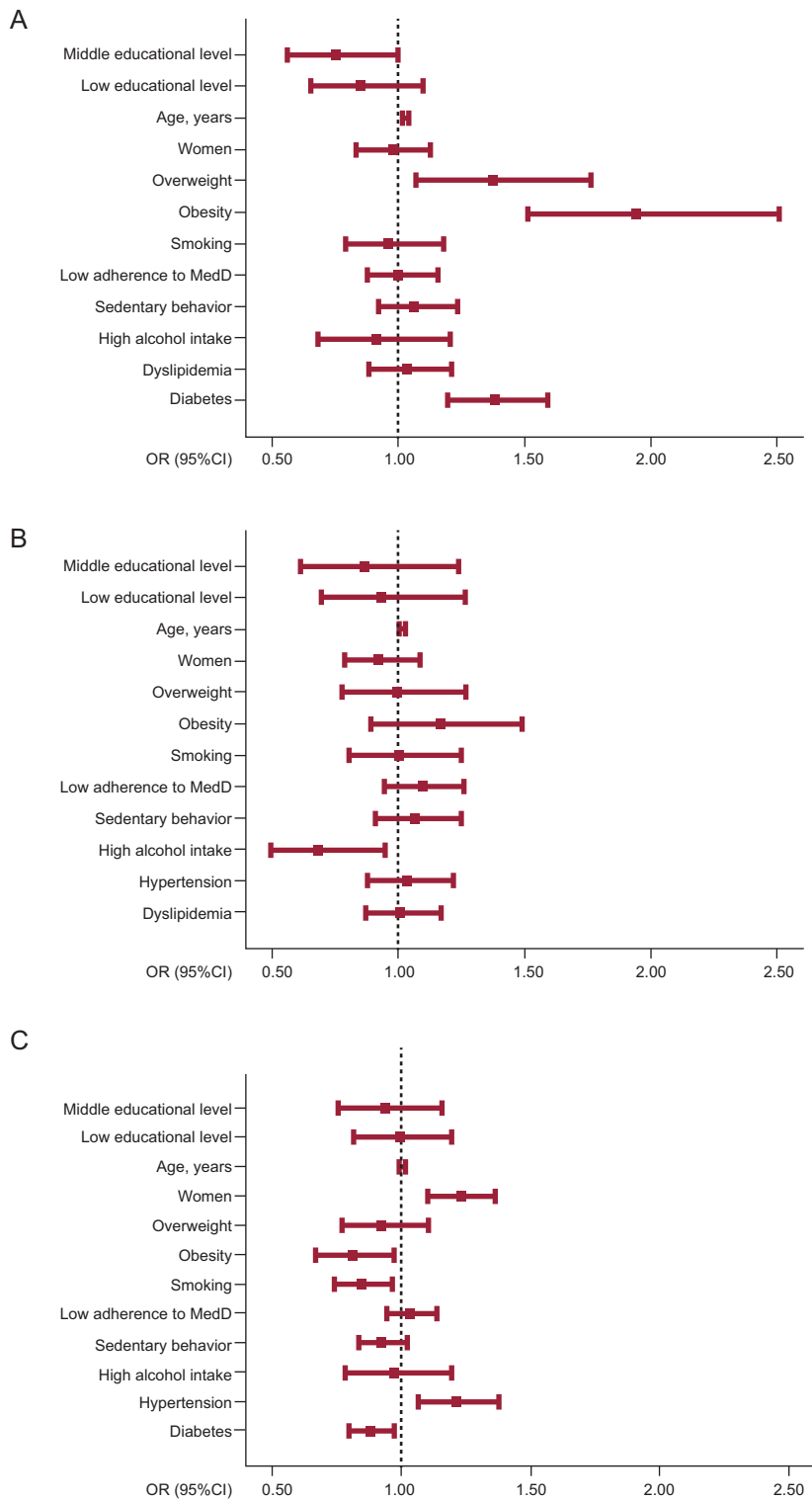
Figure. Adjusted odds ratios for all participant characteristics of receiving treatment, for each cardiovascular risk factor. A: hypertension. B: diabetes. C: dyslipidemia. Squares represent odds ratios of receiving pharmacological treatment. Horizontal lines indicate 95% confidence intervals. Vertical lines signify odds ratio=1. The following were the reference categories for the variables tested in different models: educational attainment, high level; sex, men; body weight, normal weight. Reference categories for lifestyle were non-smoking, high adherence to Mediterranean diet, physically active, and low alcohol intake, and for cardiovascular risk: no hypertension, no diabetes, and no dyslipidemia. 95%CI, 95% confidence interval; MedD, Mediterranean diet; OR, odds ratio.

participants according to educational level it should not affect the comparison between groups. On the other hand, it is important to highlight that socioeconomic conditions in Spain have changed significantly in recent years. We do not consider this factor to have influenced the measure of SES used in our study because educational level is one of the more stable social determinants during adulthood. Changes in prescription "copayment" policies have occurred in Spain because of the financial crisis, but these

Table 5

Adjusted Odds Ratio for All Participant Characteristics of Receiving Treatment, by Number of Cardiovascular Risk Factors

	Number of cardiovascular risk factors,[a] OR (95%CI)		
	One (N=105)	Two (N=233)	Three (N=955)
Educational attainment			
High level	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
Middle level	0.79 (0.47-1.33)	1.02 (0.78-1.33)	0.77 (0.47-1.26)
Low level	0.70 (0.44-1.12)	1.07 (0.84-1.35)	0.80 (0.52-1.24)
Age, years	1.04 (1.02-1.06)[b]	1.02 (1.01-1.03)[b]	1.01 (0.99-1.02)
Men	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
Women	0.83 (0.63-1.09)	0.94 (0.82-1.07)	1.14 (0.91-1.43)
Body weight			
Normal (BMI<25)	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
Overweight (BMI 25-30)	1.13 (0.70-1.83)	0.95 (0.75-1.21)	1.06 (0.72-1.54)
Obese (BMI>30)	1.57 (0.96-2.55)	1.10 (0.87-1.40)	1.09 (0.75-1.58)
Lifestyles			
Nonsmoking	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
Smoking	1.09 (0.82-1.45)	0.94 (0.78-1.12)	0.88 (0.63-1.21)
High adherence to Mediterranean diet	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
Low adherence to Mediterranean diet	0.93 (0.73-1.19)	1.06 (0.94-1.19)	1.16 (0.95-1.42)
Physically active	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
Sedentary behavior	1.23 (0.94-1.61)	0.98 (0.87-1.12)	0.77 (0.62-0.95)[b]
Low alcohol intake	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
High alcohol intake	0.68 (0.44-1.07)	0.93 (0.71-1.21)	0.93 (0.56-1.55)

95%CI, 95% confidence interval; BMI, body mass index; OR: odds ratio; ref., reference.
Received corresponding pharmacological treatment considering their cardiovascular risks factors presented. Multivariate analysis including all variables into the entry mode for each number of cardiovascular risk factor presented.
  [a] Presence of hypertension, and/or diabetes or/and dyslipidemia.
  [b] *P*-value Wald Test <.05.

were implemented after the study had concluded. Finally, the results of our study can only be extrapolated to the elderly population at high cardiovascular risk.

CONCLUSIONS

Our study did not find that socioeconomic differences affected the treatment received for primary cardiovascular prevention in elderly patients in the context of a universal health care system based on a primary care model.

ACKNOWLEDGMENTS

FUNDING

CONFLICTS OF INTEREST

Dr. Estruch reports receiving lecture fees from FIVIN (*Fundación para la Investigación del Vino y Nutrición*) and serving on its scientific advisory board; receiving research grants from the *Fundación Cerveza y Salud* and serving on its scientific advisory board; and receiving lecturer fees from Sanofi-Aventis Laboratories. Dr. Salas-Salvadó reports receiving research funding from the International Nut and Dried Fruit Council, serving on its scientific advisory board, and receiving consultancy fees from Danone. Dr. Serra-Majem reports serving on the scientific advisory board of *Fundación Dieta Mediterránea* and *Fundación Cerveza y Salud.* No other co-authors have reported any potential conflict of interest relevant to this article.

REFERENCES

1. Mendis S, Puska P, Norrving B, editors. Global Atlas on cardiovascular disease prevention and control.. Geneva: World Health Organization; 2011.
2. International Society of Hypertension. Background information on high blood pressure (hypertension) [internet] [accessed 2012 Jun 20]. Available at: http://www.ish-world.com/default.aspx?BackgroundInformation
3. Unwin N, Whiting D, Guariguata L, Ghyoot G, Gan D, editors. IDF Diabetes Atlas. 5th ed. Brussels: International Diabetes Federation; 2012 [internet] [accessed 2012 Jul 3]. Available at: http://www.idf.org/diabetesatlas
4. Quantifying selected major risks to health. In: The World Health Report 2002—Reducing risks, promoting healthy life. Geneva: World Health Organization; 2002. p. 47-97.

5. Albert X, Sala J, Masiá R, Marrugat M; investigadores del REGICOR. Incidencia y pronóstico del infarto agudo del miocardio después de los 75 años en un registro poblacional. Rev Esp Cardiol. 1996;49 Suppl 3:84.

6. Centers for Disease Control and Prevention (CDC). Trends in aging-United States and worldwide. MMWR Morb Mortal Wkly Rep. 2003;52:101–6.

7. Le Reste JY, Nabbe P, Manceau B, Lygidakis C, Doerr C, Lingner H, et al. The European General Practice Research Network presents a comprehensive definition of multimorbidity in family medicine and long term care, following a systematic review of relevant literature. J Am Med Dir Assoc. 2013;14:319–25.

8. Jackson CF, Wenger NK. Enfermedad cardiovascular en el anciano. Rev Esp Cardiol. 2011;64:697–712.

9. Starfield B, Gérvas J, Mangin D. Clinical care and health disparities. Annu Rev Public Health. 2012;33:89–106.

10. Andrulis DP. Access to care is the centerpiece in the elimination of socioeconomic disparities in health. Ann Intern Med. 1998;129:412–6.

11. González-Zobl G, Grau M, Muñoz MA, Martí R, Sanz H, Sala J, et al. Posición socioeconómica e infarto agudo de miocardio. Estudio caso-control de base poblacional. Rev Esp Cardiol. 2010;63:1045–53.

12. Stringhini S, Berkman L, Dugravot A, Ferrie JE, Marmot M, Kivimaki M, et al. Socioeconomic status, structural and functional measures of social support, and mortality: The British Whitehall II Cohort Study, 1985-2009. Am J Epidemiol. 2012;175:1275–83.

13. Munoz MA, Rohlfs I, Masuet S, Rebato C, Cabañero M, Marrugat J, et al. Analysis of inequalities in secondary prevention of coronary heart disease in a universal coverage health care system. Eur J Public Health. 2006;16:361–7.

14. Estruch R, Ros E, Salas-Salvadó J, Covas MI, Corella D, Arós F, et al. Primary prevention of cardiovascular disease with a Mediterranean diet. N Engl J Med. 2013;368:1279–90.

15. PREDIMED Study Group. Main Protocol [internet]. PREDIMED Study. [accessed 2012 June 4] Available at: www.predimed.org.

16. De la Fuente-Arrillaga C, Vázquez Z, Bes-Rastrollo M, Sampson L, Martinez-González MA. Reproducibility of a Food Frequency Questionnaire (FFQ) validated in Spain. Public Health Nutr. 2009;13:1364–72.

17. Martínez-González MA, Fernández-Jarne E, Serrano Martínez M, Wright M, Gomez-Gracia E. Development of a short dietary intake questionnaire for the quantitative estimation of adherence to a cardioprotective Mediterranean diet. Eur J ClinNutr. 2004;58:1550–2.

18. Elosua R, Marrugat J, Molina L, Pons S, Pujol E. Validation of the Minnesota Leisure Time Physical Activity Questionnaire in Spanish men. The MARATHOM Investigators Am J Epidemiol. 1994;139:1197–209.

19. Current Controlled Trials. Effects of Mediterranean diet on the primary prevention of cardiovascular disease (PREDIMED study). International Standard Randomised Controlled Trial Number Register: ISRCTN35739639 [accessed 2012 June 4]. Available at: http://www.controlled-trials.com/ISRCTN35739639.

20. Galobardes B, Shaw M, Lawlor DA, Lynch JW, Davey Smith G. Indicators of socioeconomic position (part 1). J Epidemiol Community Health. 2006;60:7–12.

21. Muñoz-Repiso Izaguirre M, Muñoz-Victoria F, Baquero-Santander B, Buckhard Martínez E, Calzón-Álvarez J, García del Ordi B, et al. Informe: Las desigualdades en la educación en España. Madrid: Centro de Publicaciones del Ministerio de Educación y Ciencia (CIDE); 1992: p. 14–66.

22. Artazcoz L, Moya C, Vanaclocha H, Pont P. La salud de las personas adultas. Gac Sanit. 2004;18 Supl 1:56–68.

23. Redondo A, Subirana I, Ramos R, Solanas P, Sala J, Masiá R, et al. Tendencias en la práctica de actividad física en el tiempo libre en el periodo 1995-2005 en Girona. Rev Esp Cardiol. 2011;64:997–1004.

24. Mullie P, Clarys P, Hulens M, Vansant G. Dietary patterns and socioeconomic position. Eur J Clin Nutr. 2010;64:231–8.

25. Agardh E, Allebeck P, Hallqvist J, Moradi T, Sidorchuk A. Type 2 diabetes incidence and socio-economic position: a systematic review and meta-analysis. Int J Epidemiol. 2011;40:804–18.

26. Hoeymans N, Smit HA, Verkleij H, Kromhout D. Cardiovascular risk factors in relation to educational level in 36 000 men and women in The Netherlands. Eur Heart J. 1996;17:518–25.

27. Manderbacka K, Keskimäki I, Reunanen A, Klaukka T. Equity in the use of antithrombotic drugs, beta-blockers and statins among Finnish coronary patients. Int J Equity Health. 2008;7:16.

28. Reid FD, Cook DG, Whincup PH. Use of statins in the secondary prevention of coronary heart disease: is treatment equitable? Heart. 2002;88:15–9.

29. Redondo A, Benach J, Subirana I, Martinez JM, Muñoz MA, Masiá R, et al. Trends in the prevalence, awareness, treatment, and control of cardiovascular risk factors across educational level in the 1995-2005 period. Ann Epidemiol. 2011;21:555–63.

30. Savageu JA, McLoughlin M, Ursan A, Bai Y, Collins M, Cashman SB. Characteristics of frequent attenders at a community health center. J Am Board Fam Med. 2006;19:265–75.

31. Lalonde M. A new perspective on the health of Canadians—a working document. Otawa: Ministery of Supplay and Services of Canada; 1974.

32. Starfield B. Atención primaria, una creciente e importante colaboradora en la eficacia. La equidad y la eficiencia de los servicios de salud. Informe SESPAS 2012. Gac Sanit. 2012;Supl 26:20–6.

33. Crespo-Cebada E, Urbanos-Garrido RM. Equity and equality in the use of GP services for elderly people: the Spanish case. Health Policy. 2012;104:193–9.

34. Regidor E, Martínez D, Astasio P, Ortega P, Calle ME, Domínguez V. Asociación de los ingresos económicos con la utilización y la accesibilidad de los servicios sanitarios en España al inicio del siglo XXI. Gac Sanit. 2006;20:352–9.