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Socio-economic status and prevention of cardiovascular disease in Italy: evidence from a national health survey

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Background: Cardiovascular disease (CVD) is the leading cause of death and disability in the world. Many cardiovascular risk factors can be prevented. We assessed whether socio-economic factors are associated with individual preventive behaviours in Italy. **Methods:** A cross-sectional analysis of a nationally representative sample of 47 391 adults aged 40–69 years was undertaken using 2004–05 National Health Interview Survey data. Logistic regression models were developed to assess the association between socio-economic status (SES) and regular monitoring of blood pressure, cholesterol, body mass index and glycaemia. SES was estimated according to education and occupation. **Results:** SES was significantly associated with regular monitoring of risk factors for CVD. The most educated were more likely to monitor cholesterol levels than those with less education [men odds ratio (OR) 1.64, 95% confidence interval (CI) 1.46–1.86; women OR 1.36, 95% CI 1.19–1.55]. Individuals in the highest occupational class controlled weight more frequently than those disadvantaged with an OR of 1.24 (95% CI 1.04–1.49) for men and an OR of 1.26 (95% CI 1.12–1.42) for women. **Conclusion**: Socio-economic disparities in the prevention of risk factors for CVD were clearly observed among Italian adults, generally favouring higher socio-economic groups.

Keywords: cardiovascular risk factors, preventive behaviours, socio-economic factors

Introduction

Cardiovascular disease (CVD) is the leading cause of death and disability in the world. Although many forms of CVD can be treated or prevented, it is estimated that 17 million people die globally of CVDs. In Italy 28% of deaths in the age range 35–74 years are due to CVD. Evidence from national and local research in Italy shows that mortality increases linearly with social disadvantage, and that poorer and less-educated people have inadequate access both to primary prevention and early diagnosis.[1]

Smoking, hypertension, hypercholesterolemia, diabetes, obesity and physical inactivity are factors which increase the risk of CVD.[2,3] These risk factors can be prevented, if identified early or controlled through regular monitoring and the adoption of healthy lifestyles.

Therefore, prevention and health promotion have become a priority for many governments. Limiting cardiovascular mortality through the detection of risk factors such as hypertension and hypercholesterolemia is among the goals of Public Health Service's Healthy People 2010, which is a set of health objectives that States or communities aim to achieve over the first decade of the new century.[4] The Canadian Task Force on Preventive Health Care recommends physicians to counsel patients on nutritional habits, physical activity, smoking cessation and to offer blood pressure monitoring for all adults.[5]

In Italy, a National Prevention Plan (NPP) recommends regular monitoring of blood pressure, cholesterol and glycaemia for adults aged 40–69 years through a 'Cardiovascular Risk Chart'.[6] This chart allows to estimate the likelihood of experiencing a first cardiovascular event over the following 10 years, once the values of six risk factors (sex, history of diabetes, smoking, age, systolic blood pressure and total serum cholesterol) are known.

Although the monitoring of hypertension and hypercholesterolemia can substantially reduce the future risk of CVD and mortality, an increasing body of evidence has revealed the presence of socio-economic disparities in the use of preventive services.[7–11]

Equal access to health prevention was targeted by the 'Health For All' agenda[12] and restated by several countries of the Organization for Economic Cooperation and Development such as Canada and France.[13,14] In the UK, interventions to reduce socio-economic disparities by improving the health status of the less affluent groups, were set as an important priority.[15,16] According to this international scenario, also the Italian National Health System (INHS) set equal access to health care as one of the main goals of the public agenda.[17]

In Italy several studies have shown the role of socio-economic determinants of inequalities in incidence and mortality for CVD.[18,19] Moreover, an inverse association between the prevalence of major cardiovascular risk factors and socio-economic status (SES) was observed.[20] In particular, an increasing trend of serum cholesterol and body weight was found among women with low educational level.[21] These findings appeared as indirect indicators of differences in access to preventive health care related to socio-economic

factors.[1] Recently published national reports showed that adults with higher educational levels were more likely to adopt preventive behaviours than those with lower levels, even though the magnitude of the inequality did not appear to be large.[22,23]

The aim of this study is to evaluate the association between SES and the adoption of cardiovascular preventive behaviours, such as regular measurement of cholesterol, glycaemia, blood pressure and body weight.

Methods

We used the interview data from a national survey on 'Health conditions and health care services use' conducted by the Italian National Centre for Statistics (Istat) in 2004–05, which provides comprehensive information about health-care use. This survey was based on a random sample of ~120 000 individuals, stratified by geographical area, municipality and household size.[22] The questions about health status and health-care use were collected through face to face interviews, whereas the questions related to lifestyle and prevention use were recorded through a self-administered questionnaire. In the case of missing values, the survey used an automatic procedure of data imputation on the basis of the following variables: gender, age, occupation, education, municipality size, and geographic area of residence.[24]

In order to evaluate individuals with a potentially high cardiovascular risk, we restricted the analysis to the age group 40–69 years, according to the information provided by the 'Cardiovascular Risk Chart' ($n = 50\,736$). We excluded those respondents ($n = 3345$) who reported CVDs (myocardial infarction, angina, other hearth diseases and stroke) at the time of interview or in the past. The final sample consisted of 47 391 subjects: 22 715 men and 24 676 women.

Periodic controls of cholesterol, glycaemia, blood pressure and weight were identified as dependent variables. In accordance with national and international recommendations and guidelines, the frequency of preventive action was considered 'appropriate' if there was at least one measurement of cholesterol serum level every 5 years and one measurement of glycaemia, blood pressure and weight every year.[25–28]

As independent variables we used two indicators of SES: education and occupational class. Education was measured based on the highest successfully completed qualification. We classified education in the following three levels: High school and over (upper secondary education diploma or university degree); Secondary school (lower secondary education diploma) and Primary school or less. Occupational class was measured using a modified version of the UK National Statistics Socio-economic Classification.[29] Four classes were considered: High (managerial and professional occupations); Medium (intermediate occupations, small employers and own account workers); Low (routine and manual occupations); Not working (never worked and long-term unemployed). Classes were created by combining data on occupation and employment status (whether an employer, self-employed or employee; whether a supervisor, manager, etc).

Statistical analyses

We used multiple logistic regressions to assess the effect of SES (education and occupational class) on preventive behaviours, adjusting for potential confounding factors. We controlled for patient characteristics like age, region of residence, marital status, self-assessed health status and cardiovascular risk conditions as hypertension, diabetes, smoking status (cigarettes) and overweight or obesity [according to body mass index (BMI)]. Analyses were stratified by sex, in order to assess whether the relationship between socioeconomic status and the outcome variables were modified by sex.

The odds ratio (ORs) and corresponding 95% confidence intervals (CIs) were used as measure of effect. All statistical analyses were performed using SPSS 16.0 and Stata 10.1 for Windows software. We used sampling weights in all of the analyses, to reflect the multistage sampling design of the survey.[22]

Results

Table 1 describes the characteristics of the sample by sex. About half of the sample had a regular check of glycaemia and blood pressure, while almost 80% of the respondents measured cholesterol at least one every 5 years both for women and for men. Regular check of weight was more frequent among women (59.9%) compared with men (43.2%).

Table 2 shows age standardized prevalence rates of regular check of cholesterol, glycaemia, blood pressure and weight by level of education and occupational class, stratified by sex. Among men, regular control of cholesterol was more

Table 1 Characteristics of the sample[a] ($n = 47\,391$; men = 22 715, women = 24 676)

	Men		Women	
	n	%	*n*	%
Age groups				
40–49	9167	40.4	9591	38.9
50–59	7785	34.3	8404	34.1
60–69	5763	25.4	6681	27.1
Region of residence				
Central Italy	4158	18.3	4509	18.3
North-western Italy	5003	22.0	5628	22.8
North-eastern Italy	4673	20.6	4986	20.2
Southern Italy	6367	28.0	6813	27.6
Italian Islands	2514	11.1	2740	11.1
Level of education				
Primary school or less	5739	25.3	8385	34.0
Secondary school	7854	34.6	7610	30.8
High school and over	9122	40.2	8681	35.2
Occupational class				
Not working	893	3.9	7055	28.6
Low	8593	37.8	7457	30.2
Medium	6540	28.8	7508	30.4
High	6689	29.4	2656	10.8
Risk factors				
Hypertension	4059	17.9	4962	20.1
Diabetes	1232	5.4	1105	4.5
Former smoker	7467	32.9	3945	16.0
Current smoker	6737	29.7	4696	19.0
Pre-obese ($25 \leq$ BMI < 30)	11 282	49.7	7459	30.2
Obese (BMI ≥ 30)	3071	13.5	2814	11.4
Self Assessed Health Status				
Good/very good	14 257	62.8	12 835	52.0
Fair	7663	33.7	10 405	42.2
Very poor/poor	795	3.5	1436	5.8
Marital status				
Single	2593	11.4	2146	8.7
Widowed	461	2.0	2304	9.3
Divorced/separated	1602	7.1	1899	7.7
Married	18 059	79.5	18 327	74.3
Preventive behaviours				
Cholesterol check at least every 5 years	17 924	78.9	20 345	82.4
Glycaemia check at least once a year	12 716	56.0	14 686	59.5
Blood pressure check at least once a year	15 279	67.3	17 787	72.1
Weight check at least once a year	9814	43.2	14 770	59.9

a: Italian National Health Interview Survey, 2004–05

Table 2 Age standardized prevalence rates (95% CI) of regular check of cholesterol, glycaemia, blood pressure and weight by sex (Italy, 2004–05)

	Cholesterol[a]	Glycaemia[b]	Blood pressure[b]	Weight[b]
Men				
Level of education				
Primary school or less	0.75 (0.73–0.76)	0.55 (0.53–0.57)	0.63 (0.61–0.65)	0.34 (0.32–0.35)
Secondary school	0.79 (0.78–0.80)	0.57 (0.55–0.58)	0.68 (0.67–0.70)	0.42 (0.40–0.43)
High school and over	0.83 (0.82–0.84)	0.59 (0.58–0.60)	0.70 (0.69–0.71)	0.51 (0.50–0.52)
Occupational class				
Not working	0.74 (0.71–0.77)	0.54 (0.50–0.58)	0.64 (0.60–0.67)	0.37 (0.33–0.41)
Low	0.77 (0.76–0.78)	0.56 (0.55–0.57)	0.67 (0.66–0.68)	0.39 (0.37–0.40)
Medium	0.82 (0.81–0.83)	0.58 (0.57–0.60)	0.69 (0.68–0.71)	0.46 (0.44–0.47)
High	0.82 (0.81–0.83)	0.58 (0.57–0.60)	0.69 (0.68–0.70)	0.49 (0.48–0.51)
Women				
Level of education				
Primary school or less	0.81 (0.79–0.82)	0.61 (0.59–0.62)	0.72 (0.71–0.74)	0.54 (0.53–0.56)
Secondary school	0.82 (0.81–0.83)	0.60 (0.58–0.61)	0.72 (0.71–0.74)	0.61 (0.60–0.63)
High school and over	0.85 (0.84–0.86)	0.60 (0.59–0.61)	0.73 (0.72–0.74)	0.67 (0.65–0.69)
Occupational class				
Not working	0.82 (0.81–0.83)	0.60 (0.59–0.61)	0.71 (0.69–0.72)	0.55 (0.53–0.56)
Low	0.81 (0.80–0.82)	0.59 (0.57–0.60)	0.73 (0.72–0.74)	0.60 (0.59–0.61)
Medium	0.85 (0.84–0.86)	0.61 (0.60–0.63)	0.74 (0.73–0.75)	0.66 (0.64–0.67)
High	0.86 (0.84–0.87)	0.62 (0.60–0.64)	0.74 (0.72–0.76)	0.65 (0.63–0.67)

a: Cholesterol check: at least one measurement every 5 years
b: Glycaemia, blood pressure, weight check: at least one measurement every year

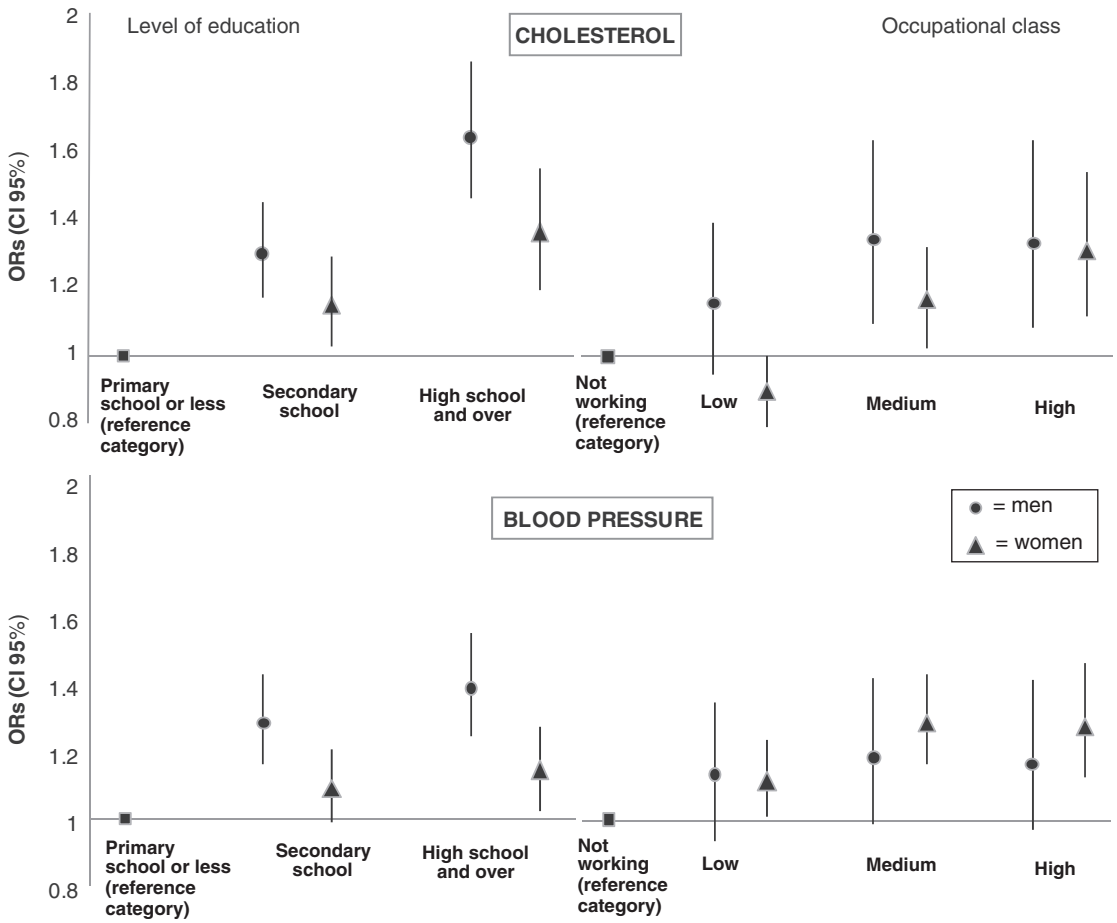

Figure 1 OR of regular cholesterol and blood pressure checks by level of education and social class adjusted for age, region of residence, cardiovascular risk (hypertension, diabetes, smoking status, BMI), marital status and self-assessed health status. Filled circle: men; filled triangle: women

frequent in the more advantaged groups. Men with lower SES controlled less frequently their glycaemia and blood pressure compared with men with higher SES. A strong association was observed between SES and the likelihood of having a regular check of weight, both for men and for women. No clear socioeconomic differences were apparent among women for glycaemia and blood pressure control. Among women regular check of cholesterol was less frequent in the more disadvantaged groups.

Figures 1 and 2 show the ORs of having regular check of cardiovascular risk factors by level of education and social class, separately by sex, adjusting for age, region of residence,

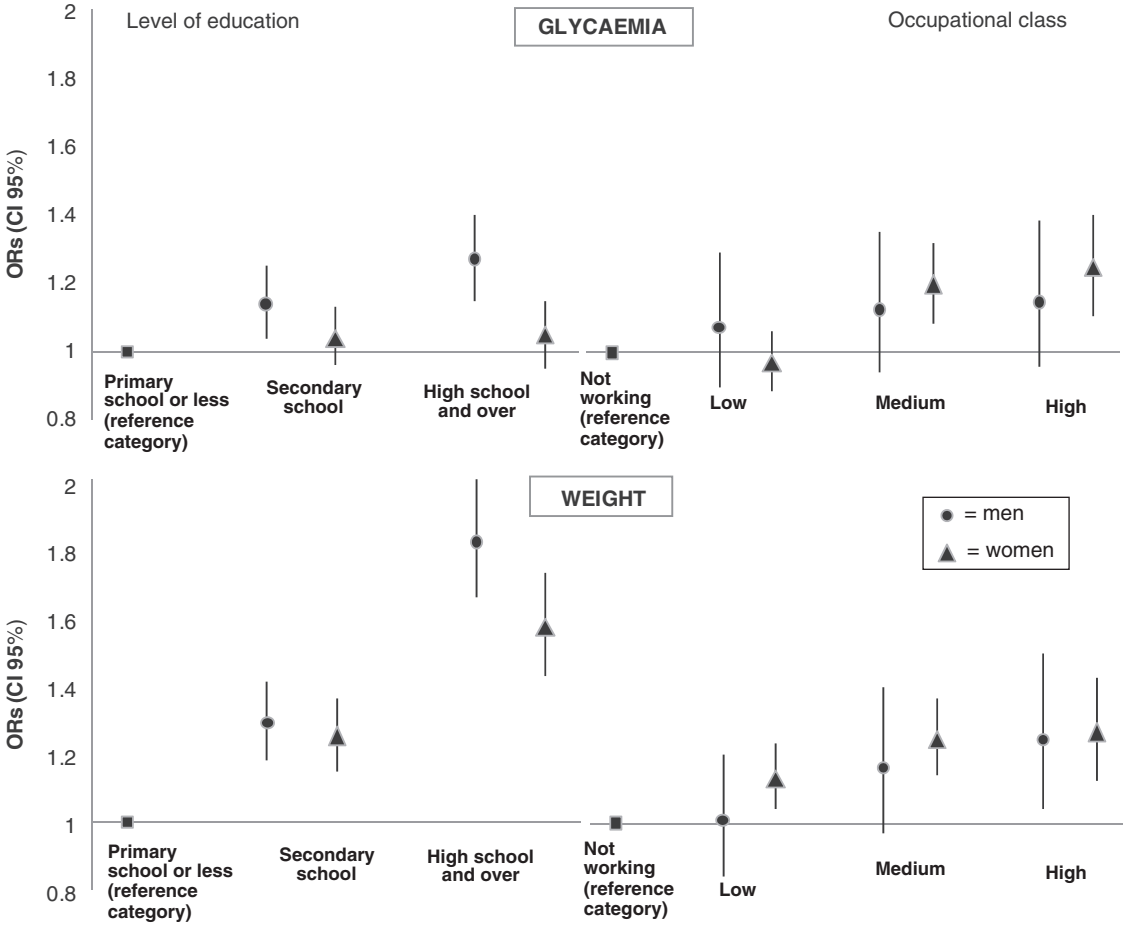

Figure 2 OR of regular glycaemia and weight checks by level of education and social class adjusted for age, region of residence, cardiovascular risk (hypertension, diabetes, smoking status, BMI), marital status and self-assessed health status. Filled circle: men; filled triangle: women

cardiovascular risk conditions (hypertension, diabetes, smoking status, BMI), marital status and self-assessed health status. The most educated individuals had a higher likelihood of having regular check of all cardiovascular risk factors than those with a lower level of education both for men and women. This association was stronger for men than for women. Men with the highest educational level were more likely to have their cholesterol controlled than those with a lower level with an OR of 1.64 (95% CI 1.46–1.86). Women with the highest level of education checked their cholesterol with an OR of 1.36 (95% CI 1.19–1.55) compared with the least educated.

Individuals of the upper occupational class had a higher odds of blood pressure control than those in the lowest class with an OR of 1.16 (95% CI 0.97–1.40) for men and an OR of 1.27 (95% CI 1.12–1.45) for women. The likelihood of having a regular weight check was higher for individuals in advantaged occupational class with an OR of 1.24 (95% CI 1.04–1.49) for men and an OR of 1.26 (95% CI 1.12–1.42) for women. Differences by socio-economic group were also found for glycaemia control, although their magnitude was generally smaller compared with the other risk factors.

Discussion

We explored disparities in the adoption of preventive behaviours by SES, defined on the basis of individual education and occupation. Individuals with higher level of education or upper occupational class have a higher likelihood of regularly monitoring cholesterol, glycaemia, blood pressure and weight.

Previous studies on cardiovascular prevention focused on racial and ethnic disparities. Stewart and Silverstein[8] showed that health insurance and usual source of care are important contributors to racial and ethnic disparities in blood pressure and cholesterol measurement in the USA. A number of studies found that older age, female sex and having regular medical doctor are associated with a higher likelihood of receiving cardiovascular screening.[5,30]

Data available from a local population-based screening programme for CVD in UK showed a lower likelihood of screening among women and individuals of South Asian origin.[31] Shah and Cook[32] found that living alone and low social support were more important than economic circumstances in explaining a lack of regular monitoring of hypertension. Sambamoorthi and McAlpine[33] reported that the US women of higher SES, as measured by educational levels, were significantly more likely to receive Pap tests, blood pressure checks, mammograms and cholesterol tests than women with lower education level. Preliminary reports based on the Istat survey showed higher rates of some cardiovascular preventive behaviours as cholesterol, glycaemia and blood pressure control in people with higher levels of education.[22,23]

In our study, the level of education was strongly associated with the adoption of all cardiovascular preventive behaviours. These findings may indicate that individuals with a lower education may have limited resources (e.g. motivation or financial resources) to take up preventive services.[5] Several studies suggest that chronic disease prevention requires individuals to adopt a proactive stance in gathering information, whereas disadvantaged people tend to seek help only when a

need emerges.[34] The benefits of prevention, in terms of reduced future morbidity and mortality, may not be correctly perceived or may be underestimated. Moreover, adults with cardiovascular risk factors are often unaware of recommended health-care services and their eligibility criteria.[35]

Occupational class was associated with preventive behaviours, but less clearly than education. This result may reflect the fact that the adoption of preventive behaviours is strongly influenced by knowledge and awareness of health risks, which are in turn more strongly associated with educational attainment than with occupation.[20]

Our estimates of the prevalence of preventive behaviours are smaller than those reported in previous studies.[22,23] This may be due to differences in the characteristics of the sample. Based on our inclusion criteria, we selected a generally healthier population compared with other studies.

The socio-economic disparities in the prevalence of preventive behaviours observed in this study may be associated with variations in the supply of health-care services, as well as with differences in the demand for prevention in different socio-economic groups. In Italy, primary care services (density of general practitioners and density of pharmacies) are distributed equally[36] throughout the country, without marked geographic or financial barriers. Given the fact that health care (included prevention) is free and there is a universal coverage of the population, it is likely that demand-side factors have a larger impact on the adoption of cardiovascular preventive behaviours than supply-side factors. However, on the basis of the available data, it is virtually impossible to discern the relative contribution of each of those factors.

Our study has some potential limitations. Relying on self-reported data for measuring the use of preventive services can lead to under- or over-reporting of chronic conditions and preventive behaviours with regard to cardiovascular risk factors. Moreover, self-reported data may be subject to recall bias.

Strengths of our study include the use of a large national population-based sample. This rich dataset provides detailed and up-to-date measures of health status and preventive behaviours. The use of multivariable logistic regression analysis allowed us to obtain a meaningful estimate of the effect of the two socio-economic variables, simultaneously adjusting for several confounders.

Our findings support the view that the prevention of cardiovascular risk factors should be a public health priority and preventive interventions should focus on socially disadvantaged groups. Despite comprehensive health insurance coverage, important disparities do exist in the Italian NHS.

The NPP recently developed in Italy recommends routine monitoring of blood pressure, cholesterol and glycaemia for adults aged 40–69 years. In addition, following the WHO European strategy 'Gaining Health: European Strategy for the Prevention and Control of Noncommunicable Diseases',[37] a programme called 'Guadagnare salute' was launched in 2007.[38] This framework programme aims to promote healthy lifestyles through improved nutritional habits, physical activity, reduced smoking and alcohol abuse. The programme combines population-level interventions with individual action on risk factors and their underlying determinants to strengthen the health system's prevention capabilities. However, these programmes do not provide any quantitative target regarding socio-economic inequalities, nor indicators related to prevention policies.

In conclusion, we showed that lower educational level and occupational class are associated with underutilization of cardiovascular preventive behaviours. Primary care physicians may play a crucial role in order to contrast this phenomenon, both in promoting healthy behaviours, according to national recommendations, and in meeting health demands from low socio-economic individuals. The development of specific health prevention strategies may reduce inequalities in the use of preventive care along with a systematic surveillance of cardiovascular risk factors in disadvantaged groups. Better understanding and awareness of disparities in health related to SES may support public health professionals in developing preventive programmes, targeting interventions of health promotion to lower socio-economic classes.

Conflicts of interest: None declared.

Key points

- While in Italy many studies have shown the role of socio-economic determinants of inequalities in incidence and mortality for CVD, no results have been published on the influence of occupational class and educational level on the adoption of cardiovascular preventive behaviours.
- Results from this study show that marked inequalities in cardiovascular preventive behaviours exist.
- Systematic surveillance of cardiovascular risk factors in disadvantaged groups and interventions of health promotion targeting to lower socio-economic classes may reduce inequalities in the use of preventive care.

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