

Trends in cardiovascular risk factors in Greece before and during the financial crisis: the impact of social disparities

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Background: Economic crises may have a significant impact on public health. The objective of this study was to assess trends in health-related behaviours and cardiovascular risk factors within Greece before, at the beginning and during the current financial crisis by comparing data from three waves of the Greek cross-sectional household ‘Hellas Health’ surveys. **Methods:** Data from three waves were analysed. The first wave was conducted in 2006 ($n = 1005$), the second in 2008 ($n = 1490$) and the third in 2011 ($n = 1008$). Samples were representative of the Greek adult population in terms of age and residency. Smoking status, height, weight and fruit and vegetable consumption were self-reported. Physical activity levels were assessed with the International Physical Activity Questionnaire. **Results:** The prevalence of smoking in Greece decreased from 42.6 to 38.1% during the crisis period 2008–11 ($P = 0.026$), but not during 2006–8. The prevalence of high levels of physical activity increased among Greek adults (from 21.9 to 31.7%, $P < 0.001$) in all socio-economic and demographic groups, with the exception of the highest socio-economic status (SES) group. On the contrary, the consumption of at least five portions of fruit and vegetables per day significantly decreased during the crisis among those of lower SES (from 9.0 to 4.1%, $P = 0.006$). Prevalence of obesity did not show significant trends. **Conclusions:** During the economic crisis, fruit and vegetable consumption alarmingly decreased, especially among those of lower SES, whereas trends in smoking prevalence and physical activity levels seem favourable. These results indicate that the economic crisis may unequally impact cardiovascular risk factors among different socio-economic groups.

Introduction

Smoking, low fruit and vegetable consumption, high body mass index (BMI) and physical inactivity are responsible for a great proportion of cardiovascular diseases and for >20% of the total global burden of disease.¹ The influence of social and economic conditions on these lifestyle risk factors has long been recognized.² In 2008, Greece entered a grave economic crisis that has affected the country’s social, political and financial stability.³ Since then, 5 consecutive years of economic recession have led to a decrease in the real gross domestic product (GDP) per capita by >15%,⁴ and unemployment rates have sharply increased, from 7.8% in October 2006 to 18.2% in October 2011. Decreasing wages and increased taxation have placed additional burden on the population, while the health care sector (including primary care and preventive activities) has faced successive budget cuts and reforms.^{5–7}

Economic crises have complex consequences on population health, including decreases in tobacco use and road traffic accidents, increases in suicides and cardiovascular disease outcomes and an ambiguous effect on overall mortality.^{8,9} The effects of a crisis might vary depending on factors such as income, unemployment and welfare systems.¹⁰ The potential health implications of the current Greek financial crisis are still under investigation; however, evidence suggests that communicable disease outbreaks have increased, as has the prevalence of depression, while poorer self-rated health has also been reported.^{11–15}

However, to date, there is little evidence of how the financial crisis may have influenced determinants of cardiovascular and other non-communicable diseases such as smoking, diet, physical activity and obesity.

Thus, the objective of the present study was to assess the change in prevalence of these risk factors among different social strata in Greece before and during the economic crisis.

Methods

Data from three waves of the Greek national household ‘Hellas Health’ surveys were analysed. ‘Hellas Health I’ was conducted before the financial crisis, in October 2006; ‘Hellas Health II’ in June 2008, as the crisis was beginning; and ‘Hellas Health IV’ in October 2011, in the current midst of the economic crisis.

Sampling methodology

The designed survey samples consisted of individuals aged >18 years (Hellas Health I $n = 1005$, Hellas Health II $n = 1490$ and Hellas Health IV $n = 1008$). The surveys covered urban (2000 or more inhabitants) and rural (<2000 inhabitants) areas of the country and each of the 13 geographical regions. Participants were fluent speakers of the Greek language and residents of the aforementioned coverage area. In all three surveys, respondents were selected by means of a three-stage proportional-to-size sampling design based on the 2001 Population Census of the National Statistical Service of Greece. At

the first stage, a random sample of building blocks was selected proportionally to size. At the second stage, in each selected area of blocks, the households to be interviewed were randomly selected by means of systematic sampling. Any person or group of persons living in a separate housing unit was considered as a 'household' unit. At the third stage, in each household, a sample of individuals aged >18 years was selected by means of simple random sampling. Effective response rate reached 51.0% in 2006, 44.1% in 2008 and 45.8% in 2011. The samples were representative of the Greek adult population in terms of age and residency (Supplementary table S1). Interviews were conducted according to the European Society for Opinion and Market Research (ESOMAR) code of practice by trained interviewers. Ethical approval was given by the Ethics Committee of the Medical School of the National and Kapodistrian University of Athens.

Definitions

All individuals were asked to report their gender, age, marital status, level of education and place of residence. Respondents were classified in three groups according to their educational level (low, middle and high), age (18–34, 35–54 and >54 years) and marital status (single, married and widowed/divorced). They were also classified into three groups of socio-economic status (SES), according to the ESOMAR scale (high = A/B–C1, middle = C2 and low = D/E). The ESOMAR scale assigns a socio-economic level to an individual, based on the occupation and education of the main income earner of the household.¹⁶ Participants were also asked if they smoke daily, less than daily or not at all. People who smoked daily or less than daily were characterized as current smokers. Self-reported data of height and weight were used to calculate each individual's BMI, and the World Health Organization's (WHO) cut-off points for overweight (≥ 25 kg/m²) and obesity (≥ 30 kg/m²) were applied to classify participants as normal weight, overweight and obese. Physical activity levels were assessed with the International Physical Activity Questionnaire (IPAQ).¹⁷ IPAQ incorporates all types of physical activity (walking, moderate and vigorous) to classify individuals aged 18–69 years into three activity levels: low, middle and high. Individuals in the moderate and higher IPAQ levels roughly satisfy WHO's recommendations for

physical activity. Total Metabolic Equivalent of Task–minutes (MET–min) per week for each participant were calculated (calculations were made for an average weight of 60 kg). Finally, fruit and vegetable consumption was also self-reported. Respondents were asked to separately report the number of fruit and vegetable portions they consume daily; the relevant questions included examples of fruit and vegetable quantities that constitute one portion, so as to avoid misreporting. The same questions, with identical wording, were used in all three surveys, with the exception of IPAQ, which was not included in the 2008 wave of the survey.

Statistical analysis

Categorical variables are presented with absolute and relative frequencies. Outcome-specific trends and differences between surveys were assessed by using linear coefficients in a binary logistic regression model; polynomials were developed to account for variations in time between survey years, and results were adjusted for gender and age. All *P* values reported are two-tailed. Statistical significance was set at 0.05 and analyses were conducted using Stata 12.0.

Results

Fruit and vegetable consumption

The proportion of Greek adults who report daily consumption of at least five portions of fruit and vegetables declined rapidly from 2006 to 2011 (21.2% vs. 7.1%, $P < 0.001$) (table 1). There was a substantial decrease between 2006 and 2008 (21.2% to 9.1%, $P < 0.001$), whereas the change between 2008 and 2011 was borderline, not statistically significant ($P = 0.080$). However, while this 5-year downward trend was universal across all demographic groups, during the economic crisis (2008–11), a significant decrease in fruit and vegetable consumption was noted among those aged >55 years ($P = 0.015$), residents of rural areas ($P = 0.001$) and individuals of lower SES ($P = 0.009$) (table 1). From 2006 to 2011, the average consumption of fruit fell from 2.09 to 1.56 portions per day ($P < 0.001$) and of vegetables from 1.97 to 1.26 per day ($P < 0.001$). The proportional decline in average consumption was similar in all socio-economic

Table 1 Proportion of Greek adults who reported consumption of at least five portions of fruit and vegetables per day, by demographic and socio-economic variables

	Hellas Health I (2006)	Hellas Health II (2008)	Hellas Health IV (2011)	2006–8		2008–11		2006–11	
	% [95% confidence interval (CI)]	% (95% CI)	% (95% CI)	% change ^a	<i>P</i> *	% change ^b	<i>P</i> *	% change ^c	<i>P</i> *
Gender									
Male	23.2 (19.4–27.0)	8.4 (6.3–10.4)	5.6 (3.5–7.6)	–63.86%	<0.001	–33.33%	0.073	–75.91%	<0.001
Female	19.3 (15.9–22.7)	9.8 (7.7–11.9)	8.6 (6.2–11.0)	–49.48%	<0.001	–12.08%	0.450	–55.58%	<0.001
Age									
18–34 years	21.1 (16.4–25.8)	6.4 (4.1–8.7)	5.7 (3.0–8.4)	–69.61%	<0.001	–11.54%	0.699	–73.12%	<0.001
35–54 years	22.0 (17.5–26.4)	9.1 (6.6–11.6)	9.0 (6.0–11.9)	–58.41%	<0.001	–1.75%	0.953	–59.13%	<0.001
≥55 years	20.5 (16.4–24.7)	11.3 (8.6–14.0)	6.4 (3.9–9.0)	–44.99%	<0.001	–43.19%	0.015	–68.74%	<0.001
Socio-economic status									
Higher	27.0 (20.2–33.7)	8.0 (5.2–10.7)	8.4 (4.7–12.1)	–70.43%	<0.001	+5.23%	0.961	–68.79%	<0.001
Middle	18.1 (14.5–21.6)	9.8 (7.5–12.1)	8.9 (6.2–11.5)	–45.68%	<0.001	–9.58%	0.640	–50.89%	<0.001
Lower	22.4 (18.1–26.6)	9.0 (6.5–11.6)	4.1 (2.0–6.2)	–59.63%	<0.001	–54.82%	0.009	–81.76%	<0.001
Residence									
Rural	17.9 (13.2–22.7)	13.3 (10.1–16.4)	5.4 (2.7–8.1)	–26.10%	0.097	–59.25%	0.001	–69.88%	<0.001
Urban	22.3 (19.3–25.3)	7.3 (5.7–8.9)	7.8 (5.9–9.8)	–67.31%	<0.001	+7.28%	0.717	–64.93%	<0.001
Total	21.2 (18.6–23.7)	9.1 (7.6–10.6)	7.1 (5.6–8.7)	–57.01%	<0.001	–21.54%	0.080	–66.27%	<0.001

a: % change between 2006 and 2008, over the prevalence in 2006.

b: % change between 2008 and 2011, over the prevalence in 2008.

c: % change between 2006 and 2011, over the prevalence of 2006.

*Test for linear trend (binary logistic regression, $P < 0.05$), adjusted for gender and age.

P-values in bold indicate statistically significant changes ($P < 0.05$). Hellas Health surveys, 2006–11.

Table 2 Proportion of Greek adults who reported that they smoke every day or occasionally, by demographic and socio-economic variables

	Hellas Health I (2006)	Hellas Health II (2008)	Hellas Health IV (2011)	2006–8		2008–11		2006–11	
	% (95% CI)	% (95% CI)	% (95% CI)	% Change ^a	<i>P</i> *	% Change ^b	<i>P</i> *	% Change ^c	<i>P</i> *
Gender									
Male	52.4 (47.9–56.8)	48.5 (44.8–52.2)	45.7 (41.2–50.1)	–7.37%	0.160	–5.89%	0.299	–12.83%	0.028
Female	34.5 (30.4–38.6)	37.1 (33.7–40.5)	31.1 (27.1–35.1)	+7.69%	0.331	–16.21%	0.039	–9.77%	0.219
Age									
18–34 years	51.7 (46.0–57.3)	51.0 (46.4–55.7)	46.8 (41.0–52.6)	–1.26%	0.833	–8.25%	0.246	–9.41%	0.175
35–54 years	55.0 (49.6–60.3)	53.0 (48.7–57.3)	45.9 (40.8–51.0)	–3.60%	0.602	–13.36%	0.033	–16.48%	0.012
≥55 years	25.7 (21.2–30.1)	25.4 (21.7–29.1)	23.2 (18.8–27.6)	–1.13%	0.920	–8.67%	0.520	–9.70%	0.475
Socio-economic status									
Higher	48.8 (41.3–56.4)	48.9 (43.8–54.0)	39.7 (33.2–46.3)	+0.20%	0.864	–18.79%	0.095	–18.62%	0.076
Middle	44.4 (39.8–48.9)	44.0 (40.1–47.9)	43.9 (39.3–48.5)	–0.81%	0.640	–0.25%	0.845	–1.06%	0.557
Lower	38.9 (34.0–43.9)	35.9 (31.7–40.2)	29.5 (24.6–34.3)	–7.73%	0.751	–18.01%	0.009	–24.35%	0.023
Residence									
Rural	36.9 (30.9–42.8)	35.8 (31.4–40.2)	38.5 (32.8–44.2)	–2.82%	0.821	+6.94%	0.711	+4.42%	0.903
Urban	45.2 (41.6–48.8)	45.5 (42.5–48.5)	38.0 (34.4–41.5)	+0.69%	0.988	–16.61%	0.003	–16.04%	0.003
Total	43.1 (40.0–46.1)	42.6 (40.0–45.1)	38.1 (35.1–41.1)	–1.23%	0.749	–10.46%	0.026	–11.56%	0.014

a: % change between 2006 and 2008, over the prevalence in 2006.

b: % change between 2008 and 2011, over the prevalence in 2008.

c: % change between 2006 and 2011, over the prevalence of 2006.

*Test for linear trend (binary logistic regression, $P < 0.05$), adjusted for gender and age.

P-values in bold indicate statistically significant changes ($P < 0.05$). Hellas health surveys, 2006–11.

levels over the 5-year period. Notably though, people of higher SES consumed significantly more fruit and vegetables compared with those of lower SES in 2006 (4.83 vs. 3.94 portions per day) and, as a result, a larger proportion remained above the cut-off of five portions per day even after the substantial decline of the 5-year period that followed the first wave of the survey. During the period of economic crisis (2008–11), the average consumption fell significantly only in those of low SES (2.92 vs. 2.61 portions per day, $P = 0.012$).

Smoking

The prevalence of smoking decreased from 43.1 to 38.1% ($P = 0.014$) (table 2), but the trends differed by gender. Prevalence among males showed a steady decrease throughout the 5-year study period (52.4% in 2006 vs. 48.5% in 2008 vs. 45.7% in 2011, $P = 0.028$), whereas smoking prevalence among females peaked at 37.1% in 2008 before decreasing to 31.1% in 2011. The decline between 2008 and 2011 was statistically significant in women ($P = 0.039$), but it did not reach statistical significance in men, owing to the larger drop noted during the 2006–8 period ($P = 0.160$). Respondents of both low (38.9% vs. 29.5%, $P = 0.023$) and high (48.8% vs. 39.7%, $P = 0.076$) SES showed a decrease in smoking prevalence, mostly during the 2008–11 period ($P = 0.009$ and $P = 0.095$, respectively), whereas prevalence in the middle of the socio-economic spectrum remained stable. Respondents aged 35–54 years also reported a significant decrease in smoking prevalence throughout the study period (table 2).

Physical activity

Physical activity was assessed only in 2006 and 2011. The proportion of Greek adults who were classified in the high or moderate level of activity, according to IPAQ, increased significantly from 58.7% in 2006 to 70.7% in 2011 ($P < 0.001$) (table 3). The increase was statistically significant in all population subgroups, with the exception of the high socio-economic group, within which a non-significant increase was noted ($P = 0.157$). The median value of total physical activity increased from 933 to 1422 MET-min per week ($P < 0.001$). Mild activity increased from 396 to 495 MET-min per week ($P < 0.001$) and moderate activity from 120 to 240 MET-min per

Table 3 Proportion of Greek adults aged 18–69 years who reported high or moderate level of physical activity (according to IPAQ), by demographic and socio-economic variables

	Hellas Health I (2006)	Hellas Health IV (2011)	2006–11	
	% (95% CI)	% (95% CI)	% Change ^a	<i>P</i> *
Gender				
Male	64.7 (59.9–69.5)	75.1 (70.9–79.2)	+19.42%	<0.001
Female	53.3 (48.5–58.1)	66.5 (62.1–70.9)	+21.81%	0.001
Age				
18–34 years	65.4 (59.8–70.9)	78.6 (73.8–83.5)	+20.18%	0.001
35–54 years	58.1 (52.7–63.6)	69.7 (65.0–74.4)	+19.97%	0.002
≥55 years	50.7 (43.9–57.5)	62.4 (56.1–68.7)	+21.62%	0.016
Socio-economic status				
Higher	65.5 (57.7–73.3)	71.6 (65.3–77.9)	+10.66%	0.157
Middle	58.2 (53.2–63.2)	70.4 (66.0–74.8)	+22.44%	0.001
Lower	56.1 (50.3–61.8)	70.5 (64.9–76.0)	+23.02%	<0.001
Residence				
Rural	63.1 (56.3–69.9)	77.3 (72.0–82.7)	+22.77%	0.002
Urban	57.4 (53.4–61.3)	68.2 (64.6–71.8)	+19.39%	<0.001
Total	58.7 (55.3–62.1)	70.7 (67.7–73.7)	+20.49%	<0.001

a: % change between 2006 and 2011, over the prevalence in 2006.

*Test for change in a binary logistic regression model, adjusted for gender and age.

P-values in bold indicate statistically significant changes ($P < 0.05$). Hellas health surveys, 2006–11.

week ($P = 0.007$). The median value of MET-min per week for vigorous physical activity was zero in both surveys, which means that at least half of the population did not engage in vigorous activity at all.

Obesity

The prevalence of obesity did not change significantly from 2006 to 2011. It was estimated at 18.4% in 2006, 18.9% in 2008 and 18.2% in

Table 4 Proportion of Greek adults who are obese, by demographic and socio-economic variables

	Hellas Health I (2006)	Hellas Health II (2008)	Hellas Health IV (2011)	2006–8		2008–11		2006–11	
	% (95% CI)	% (95% CI)	% (95% CI)	% Change ^a	P*	% Change ^b	P*	% Change ^c	P*
Gender									
Male	15.9 (12.7–19.2)	18.1 (15.2–20.9)	18.6 (15.1–22.1)	+13.24%	0.309	+3.05%	0.767	+16.69%	0.256
Female	20.7 (17.2–24.2)	19.7 (16.9–22.5)	17.8 (14.5–21.0)	–4.69%	0.706	–9.99%	0.287	–14.21%	0.175
Age									
18–34 years	8.3 (5.2–11.5)	10.7 (7.8–13.5)	9.6 (6.1–13.0)	+27.97%	0.293	–10.23%	0.636	+14.89%	0.682
35–54 years	19.3 (15.1–23.6)	17.8 (14.5–21.1)	19.3 (15.3–23.3)	–8.01%	0.570	+8.43%	0.583	–0.26%	0.922
≥55 years	25.7 (21.2–30.1)	26.9 (23.1–30.6)	23.7 (19.3–28.2)	+4.71%	0.683	–11.68%	0.281	–7.52%	0.468
Socio-economic status									
Higher	14.9 (9.5–20.3)	15.9 (12.1–19.6)	20.6 (15.1–26.0)	+6.52%	0.570	+29.72%	0.244	+38.17%	0.135
Middle	18.6 (15.1–22.2)	15.6 (12.8–18.4)	13.1 (10.0–16.2)	–16.07%	0.305	–16.26%	0.263	–29.72%	0.047
Lower	19.7 (15.7–23.8)	25.5 (21.7–29.4)	23.3 (18.8–27.8)	+29.30%	0.199	–8.58%	0.643	+18.20%	0.527
Residence									
Rural	19.6 (14.7–24.5)	23.3 (19.4–27.2)	20.9 (16.1–25.6)	+18.82%	0.257	–10.47%	0.578	+6.37%	0.719
Urban	18.0 (15.3–20.7)	17.0 (14.7–19.3)	17.1 (14.4–19.9)	–5.56%	0.708	+0.71%	0.864	–4.89%	0.606
Total	18.4 (16.0–20.8)	18.9 (16.9–20.9)	18.2 (15.8–20.5)	+2.82%	0.686	–4.15%	0.585	–1.41%	0.838

a: % change between 2006 and 2008, over the prevalence in 2006.

b: % change between 2008 and 2011, over the prevalence in 2008.

c: % change between 2006 and 2011, over the prevalence of 2006.

*Test for linear trend (binary logistic regression, $P < 0.05$), adjusted for gender and age.

P-values in bold indicate statistically significant changes ($P < 0.05$). Hellas health surveys, 2006–11.

2011 ($P = 0.838$) (table 4). The proportion of participants classified as overweight ($25 \text{ kg/m}^2 \leq \text{BMI} < 30 \text{ kg/m}^2$) similarly remained unchanged throughout this period (40.2% vs. 40.3% vs. 42.3%). The mean BMI among males was 26.5 kg/m^2 in 2006, 26.7 kg/m^2 in 2008 and 26.9 kg/m^2 in 2011 and among females was 25.8 kg/m^2 , 26.0 kg/m^2 and 26.0 kg/m^2 , respectively.

Clustering of lifestyle cardiovascular risk factors

Finally, more than one-fourth of the general population had at least three of the four lifestyle risk factors that were assessed. The proportion of individuals at high risk, defined by having at least three risk factors, was 30.6% in 2006 and 36.8% in 2011, a difference that was statistically significant ($P = 0.008$). An analysis by SES showed that there was a statistically significant increase in the proportion of high-risk individuals only in the low SES (from 25.9 to 39.5%, $P < 0.001$).

Discussion

The comparison of three waves of the nationwide Hellas Health survey showed that from 2006 to 2011, consumption of fruit and vegetables declined, possibly increasing health risks, whereas physical inactivity and smoking prevalence decreased significantly among Greek adults; the prevalence of overweight and obesity remained unchanged. Trends in fruit and vegetable consumption and in smoking were not the same before and during the economic crisis. In the period of the crisis—after 2008—socio-economic disparities in trends of fruit and vegetable consumption were documented, especially among those of lower SES, whereas smoking declined dramatically.

High fruit and vegetable consumption is one of the Mediterranean diet's most distinct characteristics and, together with moderate ethanol consumption, may contribute the most to the reduction of total mortality among people who adhere to the Mediterranean diet.¹⁸ Several recent studies have indicated that the consumption of fruits and vegetables in Greece was higher than in any other European country, despite the small number of people who follow a strictly vegetarian diet,^{19–21} which may partly explain why Greece

still has one of the highest life expectancies in the world.¹⁹ Our study reveals that there has been a rapid decline in fruit and vegetable consumption since 2006; as a result, only 7.1% of the adult population consumed at least five portions of fruit and vegetables per day in 2011. There have been indications, even before the crisis, that the younger population may not adhere to the Mediterranean diet as much as the older^{22,23} and, as a result, a decline in the mean consumption of fruit and vegetables may be expected. It is important to note that most of this decline occurred during the 2006–8 period, thus this decline may not be solely attributed to the economic crisis. During the crisis, from 2008 to 2011, the proportion of people who reported adequate consumption of fruit and vegetables declined from 9.1 to 7.1%. However, during the 2008–11 period, the consumption of fruit and vegetables has almost halved among disadvantaged populations, such as older people or individuals of low SES. This downward trend has additional implications, as there was only a modest increase of 12.5% in fruit and vegetable prices between 2006 and 2011, whereas other essential food groups such as grains and fish had significantly greater price increases (25 and 24%, respectively) with potentially even greater reductions in consumption, and thus health ramifications.²⁴ However, this hypothesis needs to be concurred by additional studies, which could compare current consumption with data from previous years.^{22,25}

Tobacco use has been found to decrease during times of economic downturn.⁹ Our results seem to confirm this finding. The significant decline in smoking prevalence among the general population, which is documented for the first time in decades in Greece,²⁶ happened almost exclusively between 2008 and 2011. This decline has been accompanied by increases in intention to quit and decreases in tobacco use among current smokers.²⁷ It is possible though that this decrease in consumption may not be solely due to financial austerity measures, although augmented through it, as since 2009, a number of national tobacco control legislations were enforced, including restrictions on outdoor advertising, smoke-free areas and price increases; between 2006 and 2011, the price of tobacco products rose by 37%.^{24,28} It is well-documented that both price increases²⁹ and smoking bans contribute to the reduction of tobacco use.³⁰ Therefore, it is likely that tobacco control measures

may have interacted synergistically with the decline in disposable income. Additionally, the contrast between males and females in tobacco prevalence trends should not come as a surprise. They are consistent with trends observed during the third stage of the tobacco epidemic, in which Greece seems to be at the moment.³¹ Higher-income groups are usually the first to quit smoking at this stage, but our study also demonstrated that there was a decrease in the prevalence of tobacco use among both high and low socio-economic strata. It is possible that austerity may have been a driving force in the decline among low-income individuals, along with the other public health measures. Further research is needed to assess these factors. Despite the decline, Greece still has one of the highest proportions of regular smokers in the world.³²

Another encouraging indicator of improved health was the significant increase in physical activity among Greek adults during this 5-year period. This trend is in contrast with data from 2001 to 2006, which showed declining levels of physical activity.³³ Increases were greater in types of activities that are considered as moderate and among participants of low and middle socio-economic groups. During the same period, data from the Hellenic Statistical Authority show that fuel costs rose by 78% and public transportation costs by 72%, whereas car sales dropped by 66%.²⁴ Possibly, Greeks, who cannot afford to use their cars much, may have turned to walking or biking for everyday transportation. There is no published evidence of such a change; therefore, this is a hypothesis that needs to be tested. Previous research has indicated that lower GDP is associated with higher levels of physical activity, even though it is not clear if a sudden change in GDP would cause such an effect.³⁴ It is important to note, however, that physical activity levels in the Greek population are still quite low, when compared with countries similar in terms of income and geographical location.³⁵

No significant changes in the overall prevalence of overweight and obesity were documented in the present study. The prevalence of obesity in Greece is higher than the European Union's and the Organisation for Economic Co-operation and Development (OECD) OECD's average,³² but longitudinal data on national obesity trends are scarce. Household surveys, such as the current, in which no anthropometric measurements are conducted, are likely to underestimate the prevalence of obesity, especially in women,³⁶ but they should be able to evaluate any underlying trends. Thus, it seems that changes in socio-economic conditions, diet and physical activity patterns in Greece may have not significantly affected the distribution of BMI among the adult population.

Strengths and limitations

In the present study, we used data from three waves of a cross-sectional nationwide survey, conducted before and during the economic crisis. The consistent sampling methodology allows us to compare the prevalence of risk factors over time and report trends in the general population, although this should be done with caution, considering that the samples were relatively small. With the exception of physical activity, we can also identify trends that were present before the crisis and thus draw more informed conclusions on possible effects of the crisis on those risk factors. However, the cross-sectional design and the relatively low response rate may pose limitations in the comparisons between surveys, while self-reported data can produce misclassification bias. Even when a causal association between the economic crisis and trends in risk factors seems reasonable, we cannot exclude unmeasured confounding, which would provide alternative explanations for the observed trends. Additionally, because the crisis has deepened since the last survey (2011), the results might not fully reflect the current situation in Greece. Finally, there are several important cardiovascular risk factors, such as blood lipid levels, hypertension and alcohol consumption, that were not assessed in these surveys.

Conclusion

Our data showed that during the economic crisis in Greece, fruit and vegetable consumption dramatically declined, whereas trends in smoking and physical activity were favourable. We also found evidence of socio-economic disparities in fruit and vegetable consumption, physical activity and smoking. The economic crisis is a natural experiment at the population level that can inform policymakers in Greece and in other nations. Taxes and pricing policies can be used to solidify positive trends and to finance interventions against social disparities that seem to have emerged in Greece during the current economic crisis. The majority of Greek adults support price increases in tobacco products, especially if allocated to the health care system.³⁷ Therefore, this may be a realistic policy option in the context of the crisis and could be combined with other financial (e.g. subsidies), educational and environmental interventions to improve population health. Additionally, this may be an opportune moment for a primary care reform that will strengthen essential health services and contain cost.⁷ It is evident that economy largely influences the population's health behaviour; therefore, data from the first few years of the crisis should inform public health policies in the near future.

Supplementary data

Supplementary data are available at *EURPUB* online.

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Conflicts of interest: None declared.

Key points

- During the economic crisis (2008–11), the prevalence of smoking declined significantly in Greece.
- Consumption of fruit and vegetables also declined, especially among the lower socio-economic level.
- Levels of physical activity significantly increased between 2006 and 2011, whereas the prevalence of obesity did not change.
- Trends in cardiovascular risk factors differed between socio-economic and demographic groups.

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