Defining the Path Between Social and Economic Factors, Clinical and Lifestyle Determinants, and Cardiovascular Disease

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ABSTRACT

Background: Low socioeconomic status is associated with poorer cardiovascular health.

Objectives: The aim of the present work was to evaluate how social and economic factors influence modifiable cardiovascular disease risk factors and thus, acute coronary syndrome or ischemic stroke presence.

Methods: One thousand participants were enrolled; 250 consecutive patients with a first acute coronary syndrome (83% were male, 60 ± 12 years old) and 250 control subjects, as well as 250 consecutive patients with a first ischemic stroke (56% were male, 77 ± 9 years old) and 250 control subjects. The control subjects were population-based and age-sex matched with the patients. Detailed information regarding their medical records, lifestyle characteristics, education level, financial status satisfaction, and type of occupation were recorded.

Results: After controlling for potential confounding factors, significant inverse associations were observed regarding financial status satisfaction and sedentary/mental type occupation with acute coronary syndrome or stroke presence, but not with the educational level. Nevertheless, further evaluation using path analysis, revealed quite different results, indicating that the education level influenced the type of occupation and financial satisfaction, hence affecting indirectly the likelihood of developing a cardiovascular disease event.

Conclusions: Social and economic parameters interact with modifiable cardiovascular disease risk factors through multiple pathways.

METHODS

Study design and sampling procedure

This is a multicenter, case-control study, with individual age (within ±3 years for the ACS patients), and sex matching [12]. From October 1, 2009 to December 31, 2010, 250 of the 296 consecutive patients with a first ACS event (n = 209 with acute myocardial infarction and n = 41 with unstable angina) and 250 of the 319 consecutive patients with ischemic stroke that entered in the cardiology or pathology clinics or the emergency units of 3 major general hospitals in Greece agreed to participate in the

Low socioeconomic status is associated with poorer health and increased mortality rates [1,2]. In fact most cardiovascular disease (CVD) risk factors are associated with socioeconomic status indicators, such as education level, occupation status, and income [3–7]. Several pathophysiological mechanisms might explain the influence of socioeconomic status on cardiovascular health [8,9]. Furthermore, it should be mentioned that even if the role of socioeconomic factors seems to similarly influence coronary heart disease and stroke development [10,11], the potential pathways of how the modifiable CVD risk factors are affected could differ. Therefore, better understanding of these mechanisms, and more specifically how the modifiable CVD risk factors act as potential mediators of socioeconomic status, could enable more effective, targeted interventions.

Be that as it may, the classic statistical analyses cannot fully explore the complexity of the aforementioned interrelationships. In the attempt to better understand the associations among these variables, other methods, such as path analysis (i.e., structural equation modeling [SEM]) should be applied. SEM is very useful when testing hypotheses consisting of complex pathways with interacting variables, as it overcomes limitations of common statistical methodologies, by revealing the relationships between the underlying concepts of a theory. Nevertheless, this method is not common in the field of cardiovascular epidemiology. Thus, the aim of this work was to evaluate how social and economic factors affect lifestyle CVD risk factors and hence to better clarify the possible pathways explaining the associations between socioeconomic position and acute coronary syndrome (ACS) or ischemic stroke presence using SEM.
study (participation rate 81.3%). All patients were diagnosed by physicians as lacking any suspicion of previous CVD. Patients with chronic neoplasmatic disease or chronic inflammatory disease, as well as individuals with recent changes in their dietary habits were also excluded. For the stroke patients that were unable to communicate, due to speech disorders, aphasia, memory problems, and such, the information was obtained through a valid surrogate respondent (i.e., a first-degree relative, who lived in the same home with the patient and was aware of the participant’s dietary habits and medical history).

Moreover, 500 population-based control subjects (250 age-sex matched 1-for-1 with ACS patients, and 250 age-sex matched 1-for-1 with stroke patients) were selected by the study’s investigators on a volunteer, feasibility basis (e.g., from their working or home places) and from the same catchment area and concurrently with the patients in order to eliminate residual confounding. Control subjects were without any clinical symptoms or suspicions of CVD in their medical history, as this was assessed by a physician.

Based on an a priori statistical power analysis using the logistic regression model, the sample size of 500 patients (250 ACS, 250 stroke) and 500 age- and sex-matched control subjects was adequate to evaluate 2-sided odds ratios equal to 1.20 for 1 SD increase of continuous covariates, achieving statistical power 0.81 at 0.05 significance level (p value).

Bioethics
The study was approved by the ethics committee of the University Hospital of Ioannina and was carried out in accordance with the declaration of Helsinki (1989) of the World Medical Association. Prior to the collection of any information, the participants (or their valid surrogate respondents) were informed about the aims and procedures of the study and provided their signed consent.

Diagnosis of ACS and stroke
Regarding the ACS patients, their clinical symptoms were evaluated at hospital entry and a 12-lead electrocardiogram was performed by a cardiologist. The evidence of myocardial cell death was assessed through blood tests and measurement of the levels of troponin I and the myocardial band fraction of total creatinine phosphokinase [13]. Unstable angina was defined by the occurrence of 1 or more angina episodes at rest within the preceding 48 h, corresponding to class III of the Braunwald classification [14]. Cases were also verified by the angiographic findings. Ischemic strokes were defined through symptoms of neurologic dysfunction of acute onset of any severity, which are consistent with focal brain ischemia and imaging/laboratory confirmation of an acute vascular ischemic pathology [15].

Medical history and clinical status
For all participants, detailed medical history was recorded, including family history of CVD, as well as personal and family history of hypertension, hypercholesterolemia, and diabetes [12].

Social and economic factors
Educational level was measured by years of school. Financial status was evaluated indirectly using a 9-unit scale measuring how “satisfied” participants were from their incomes (i.e., value 1: not at all satisfied, value 9: very satisfied), instead of a question assessing income per se, in order to avoid potential refusal of the participants to reply or misinformation, as well as due to the fact that subjective socioeconomic status might be a more precise measure of social position [16]. Type of occupation was also assessed using a standard 9-unit scale in order to define how physically demanding the occupation was (i.e., value 1: physically demanding/manual, value 9: sedentary/mental) [12].

Lifestyle characteristics
Current smokers were defined as those who smoked at least 1 cigarette per day and former smokers as those who had stopped smoking more than 1 year before the interview; the rest of the participants were defined as noncurrent smokers.

Usual eating practices and dietary habits of the past year were assessed through a 90-item, validated semi-quantitative food-frequency questionnaire that has been previously described [12,17]. Level of adherence to the Mediterranean diet was assessed using a validated 11-item composite index, the MedDietScore (Mediterranean Diet Score) [18]. The theoretical range of the MedDietScore was between 0 and 55. Higher values of this score indicate greater adherence to the Mediterranean diet.

Physical activity was assessed using the International Physical Activity Questionnaire index [19,20]. According to their physical activity levels, participants were classified as inactive or physically active (i.e., engaging in minimal activity or health enhancing physical activity).

Anthropometric characteristics
Weight (in kilograms) and height (in meters) of the participants were recorded. Body mass index (BMI) was calculated as weight (measured in kilograms) divided by standing height (measured in meters squared); overweight and obesity were defined as BMI 25.0 to 29.9 kg/m² and >29.9 kg/m², respectively.

Psychological assessment
Previously translated and validated versions of the Zung Depression Rating Scale (range 20 to 80) [21,22] and the Spielberger Trait Anxiety Inventory (STAI) form Y-2 (range
20 to 80) [23,24] were used for the assessment of depressive symptoms and trait anxiety, respectively.

**Statistical analysis**

Estimations of the relative odds of having ACS or stroke according to social and economic factors were performed through conditional logistic regression analysis, results are presented as odds ratios and the corresponding 95% confidence intervals. Hosmer-Lemeshow statistic was calculated to evaluate model’s goodness-of-fit. All reported p values were based on 2-sided hypotheses. SPSS software (version 18.0, SPSS Inc., Chicago, IL, USA) was used for all the statistical calculations.

**Structural equation modeling analysis**

Furthermore, path analysis was used to reveal the potential influence (mediating effect) of social and economic parameters on modifiable CVD risk factors in relation to the outcome. Path analysis extends the concept of regression analysis by allowing the examination of the causal routes underlying the observed associations and the estimation of the strength of the relationships between them. STATA software (version 12, StataCorp, College Station, TX, USA) was used for the path analysis using the sem command in order to fit the path model, based on the mean- and variance-adjusted weighted least-squares estimation method. The standardized root mean squared residual, and the model versus saturated chi-squared along with its associated degrees of freedom were calculated using estat gof command in order to evaluate model’s goodness—of-fit (a standardized root mean squared residual value <0.10 indicates good model fit and chi-squared/df ratio <3.0 indicates good model fit).

**RESULTS**

**Basic characteristics of the participants**

Basic characteristics of the participants are presented in Table 1. Approximately 23% of ACS patients and 36% of stroke patients were not satisfied by their financial status, compared with only 8% of ACS and 15% of stroke control subjects, respectively. Furthermore, a significant percentage of the ACS and stroke patients, 42% and 55%, respectively, were employed in manual jobs.

**Results from the logistic regression analyses**

Unadjusted analysis showed that parameters indicating higher socioeconomic status were associated with lower likelihood of having an ACS or an ischemic stroke (unadjusted model, Table 2). Further analysis revealed that the association of financial status satisfaction and the type of occupation with the development of ACS or ischemic stroke remained significant, even after controlling for several other potential confounders (Table 2, models 2 and 3). However, insignificant associations were observed regarding the level of education and stroke, even in the unadjusted models, whereas after adjustment for potential confounding factors, insignificant associations were observed with ACS presence, as well.

**Results from path analyses**

In the theoretical models of path analysis it was hypothesized that social and economic factors would influence other lifestyle CVD risk factors (i.e., physical activity, MedDietScore, BMI, STAI, smoking, as well as each other), and thus indirectly affect ACS or stroke development, respectively. Furthermore, all traditional CVD risk factors were estimated to directly influence the studied outcome (Fig. 1). Results from the path analysis are presented in Figures 2 and 3. The standardized root mean squared residual value was 0.07, 95% confidence interval: 0.02 to 0.12, and the chi-squared/df ratio was 1.7, indicating good model fit. Smoking, MedDietScore, STAI, financial satisfaction, type of occupation, hypertension, hypercholesterolemia, diabetes mellitus, family history of CVD, and physical activity had a direct effect regarding ACS presence. The level of education affected the type of occupation and financial status satisfaction, as well as smoking habits, influencing indirectly ACS presence. The type of occupation influenced financial status satisfaction, as well as smoking habits. Financial satisfaction had an impact on STAI and MedDietScore. Regarding ischemic stroke presence, direct influences were observed for financial status satisfaction, STAI, MedDietScore, physical activity, BMI, smoking, hypertension, and family history of CVD. Education years affected the type of occupation, the MedDietScore, physical activity, and smoking habits. Furthermore, the occupation type influenced financial status satisfaction, BMI, and smoking habits, whereas financial satisfaction influenced STAI and physical activity.

Comparing the 2 models, fewer modifiable risk factors (i.e., STAI, MedDietScore, smoking habits) mediated the relationship among socioeconomic factors and ACS presence. Furthermore, regarding ACS, occupation type and financial satisfaction influenced the majority of the modifiable risk factors, whereas for stroke the level of education was the factor that influenced directly the majority of them.

**DISCUSSION**

Results of the present work offer novel information regarding the pathways through which social and economic factors may influence lifestyle-modifiable CVD risk factors and, thus, the development of ACS and ischemic stroke. On the basis of the results of the logistic regression analyses, the complexity of the inter-relationships and hidden pathways regarding the studied factors did not emerge. However, when path analysis was implemented, educational level exerted a significant role, as it affected not only the type of occupation and financial satisfaction, but also lifestyle parameters. The revealed links through path analyses might enable not only better identification of the subjects in-need, but also the CVD risk factors to which
health professionals should focus the most, according to the subject’s characteristics. In this way, the public health costs will be targeted to those who can benefit the most.

It is important to underline that the level of education, the type of occupation, and the personal or family income have been widely used, often interchangeably, for the assessment of socioeconomic position. However, even if these 3 parameters seem to depict similar dimensions, different causal mechanisms are involved [25]. Therefore, it has been suggested that all socioeconomic status parameters should be used, due to the fact that each of them could be either explained by or mediated through the others [26–28]. In the present work, an effort was made to identify the complex interactions of the socioeconomic status parameters and to understand how they influence cardiovascular health. As expected, these parameters were interdependent.

Examining each of the aforementioned parameters separately, education seems to play a crucial role, as it is not only the first to be acquired, but it also determines future occupational position and thus income potential [7,26,28]. Furthermore, the level of education might promote health attitudes and behaviors as well, as subjects with higher educational level are more receptive to health education messages and thus are more capable to implement knowledge into practice, for example, as far as

| TABLE 1. Sociodemographic, lifestyle, and clinical characteristics of the study participants |
|-----------------------------------------------|---------|---------|---------|---------|
| ACS Patients (n = 250) | ACS Control Subjects (n = 250) | Stroke Patients (n = 250) | Stroke Control Subjects (n = 250) |
| Age, yrs | 60 ± 12 | 60 ± 12 | 77 ± 9 | 73 ± 9 |
| Male | 208 (83.2) | 208 (83.2) | 139 (55.6) | 139 (55.6) |
| Smoking habits | | | | |
| Never smoker | 56 (22.4)* | 108 (43.2) | 151 (60.4) | 139 (55.8) |
| Current smoker | 127 (50.8) | 63 (25.2) | 49 (19.6) | 47 (18.9) |
| Former smoker | 67 (26.8) | 79 (31.6) | 50 (20) | 63 (25.3) |
| Physical activity | 150 (64.1)* | 203 (82.5) | 99 (47.1)* | 181 (74.8) |
| Family history of CVD | 81 (36.2)* | 39 (16.7) | 51 (31.3)* | 38 (16.7) |
| Hypertension | 148 (62.2)* | 90 (37.7) | 206 (84.4)* | 137 (56.8) |
| Hypercholesterolemia | 165 (71.4)* | 100 (45.5) | 119 (54.1) | 15 (6.8) |
| Diabetes mellitus | 58 (26.1)* | 29 (12.4) | 71 (32.9) | 50 (21.5) |
| Body mass index, kg/m² | 27.82 ± 4.29 | 27.23 ± 3.50 | 26.72 ± 3.57 | 27.35 ± 4.24 |
| Normal weight, 18.5–24.9 | 57 (24.9) | 63 (26.3) | 79 (33.1) | 73 (30) |
| Overweight, 25–29.9 | 116 (50.7) | 132 (55) | 124 (51.9) | 120 (49.4) |
| Obese, >30 | 67 (28.4) | 45 (18.8) | 36 (15.0) | 50 (20.6) |
| ZUNG-DRS, range 20–80 | 38.50 ± 8.50* | 35.07 ± 7.90 | 46.30 ± 8.23* | 38.01 ± 8.57 |
| 20–49: normal | 203 (89.4) | 233 (94.7) | 121 (57.1)* | 224 (91.8) |
| 50–59: mild depression | 22 (9.7) | 12 (4.9) | 86 (40.6) | 18 (7.4) |
| 60–69: moderate-marked depression | 2 (0.9) | 1 (0.4) | 5 (2.4) | 2 (0.8) |
| 70–80: severe depression | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| MedDietScore, range 0–55 | 30.67 ± 5.02* | 32.50 ± 4.41 | 29.99 ± 3.79* | 32.03 ± 4.08 |
| 1st tertile, 0–29 | 86 (41.1)* | 50 (21.9) | 94 (45.9)* | 60 (26.8) |
| 2nd tertile, 30–33 | 66 (31.6) | 79 (34.6) | 64 (33.7) | 82 (36.6) |
| 3rd tertile, 34–55 | 57 (27.3) | 99 (43.4) | 32 (16.8) | 82 (36.6) |
| Education years | 10 ± 4.3* | 11 ± 5.0 | 8 ± 4.6 | 8 ± 4.9 |
| Financial satisfaction | | | | |
| Not satisfied, range 1–3 | 50 (22.7)* | 19 (8.1) | 74 (35.9)* | 35 (14.6) |
| Satisfied, range 4–6 | 118 (53.6) | 154 (65.3) | 114 (55.3) | 157 (65.7) |
| Very satisfied, range 7–9 | 52 (23.6) | 63 (26.7) | 18 (8.7) | 47 (19.7) |
| Type of occupation | | | | |
| Physically demanding/manual, range 1–3 | 92 (42.2)* | 50 (21.9) | 118 (54.9)* | 79 (36.4) |
| Mixed, range 4–6 | 69 (31.7) | 76 (33.3) | 62 (28.8) | 73 (33.6) |
| Sedentary/mental, range 7–9 | 57 (26.1) | 102 (44.7) | 35 (16.3) | 65 (30) |

Values mean ± SD or n (%).
ACS, acute coronary syndromes; CVD, cardiovascular disease; ZUNG-DRS, Zung Depression Rating Scale.
The p values are derived from Student t-test or the chi-square test: *p < 0.001 or †p < 0.05 compared with the stroke or ACS control group, respectively.
It should be also noted that according to recent findings, the inclusion of education influences CVD prediction scores [29,30]. Financial status satisfaction reflects higher economic security, availability of material resources, and greater control over life circumstances. Low income has been associated with increased CVD risk [30]. Income might translate into better access to quality health care, higher diet quality, and better home environment [7,25], thus providing opportunities for a healthier lifestyle [25]. Finally, it should be mentioned that a subjective measure of financial satisfaction was used, which might reflect better prediction of health compared with other objective measures [31] and aiming to capture income adequacy [16].

Regarding the type of occupation, it has been associated with CVD development, with blue-collar workers or low-level employees having increased mortality [32,33].

### TABLE 2. Results from the multiple logistic regression analysis that was developed to evaluate the likelihood of having an ACS or an ischemic stroke (outcome) according to socioeconomic status parameters, among ACS cases and control subjects, as well as ischemic stroke cases and control subjects.

<table>
<thead>
<tr>
<th></th>
<th>Model 1 Unadjusted</th>
<th>Model 2* Adjusted</th>
<th>Model 3† Adjusted</th>
<th>Model 4‡ Adjusted</th>
<th>Model 5§ Adjusted</th>
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<tbody>
<tr>
<td><strong>Acute coronary syndrome</strong></td>
<td></td>
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<tr>
<td>Model for education years per 1 year</td>
<td>0.95 (0.91—0.99)</td>
<td>0.95 (0.89—1.00)</td>
<td>0.96 (0.91—1.03)</td>
<td>0.98 (0.92—1.05)</td>
<td>0.97 (0.91—1.04)</td>
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<tr>
<td>Model for financial status satisfaction per 1 unit increase</td>
<td>0.82 (0.74—0.91)</td>
<td>0.83 (0.72—0.95)</td>
<td>0.85 (0.74—0.99)</td>
<td>0.92 (0.79—1.07)</td>
<td>0.87 (0.75—1.01)</td>
</tr>
<tr>
<td>Model for occupation type per 1 unit more sedentary</td>
<td>0.80 (0.74—0.87)</td>
<td>0.77 (0.69—0.86)</td>
<td>0.81 (0.72—0.91)</td>
<td>0.83 (0.73—0.93)</td>
<td>0.81 (0.72—0.92)</td>
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<tr>
<td><strong>Ischemic stroke</strong></td>
<td></td>
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<tr>
<td>Model for education years per 1 year</td>
<td>1.00 (0.95—1.04)</td>
<td>0.97 (0.91—1.04)</td>
<td>0.97 (0.90—1.04)</td>
<td>1.00 (0.92—1.09)</td>
<td>1.00 (0.92—1.09)</td>
</tr>
<tr>
<td>Model for financial status satisfaction per 1 unit increase</td>
<td>0.71 (0.62—0.80)</td>
<td>0.71 (0.60—0.85)</td>
<td>0.76 (0.63—0.91)</td>
<td>0.77 (0.63—0.95)</td>
<td>0.78 (0.64—0.95)</td>
</tr>
<tr>
<td>Model for occupation type per 1 unit</td>
<td>0.83 (0.76—0.91)</td>
<td>0.81 (0.71—0.92)</td>
<td>0.83 (0.72—0.96)</td>
<td>0.87 (0.75—1.02)</td>
<td>0.88 (0.75—1.03)</td>
</tr>
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Values are odds ratios (95% confidence intervals) and were obtained from multiple conditional (by age and sex) logistic regression. BMI, body mass index; DM, diabetes mellitus; PA, physical activity; MedDietScore, Mediterranean Diet Score; STAI, Spielberger Trait Anxiety Inventory; other abbreviations as in Table 1.

*Adjusted for PA, smoking, BMI, family history of CVD, hypertension, hypercholesterolemia, DM.
†Adjusted for PA, smoking, BMI, family history of CVD, hypertension, hypercholesterolemia, DM, MedDietScore.
‡Adjusted for PA, smoking, BMI, family history of CVD, hypertension, hypercholesterolemia, DM, MedDietScore, ZUNG-DRS.
§Adjusted for PA, smoking, BMI, family history of CVD, hypertension, hypercholesterolemia, DM, MedDietScore, STAI.

![FIGURE 1. Graphic display of the conceptual path analyses models. ACS, acute coronary syndrome; BMI, body mass index; CVD, cardiovascular disease; MedDietScore, Mediterranean Diet Score; STAI, Spielberger Trait Anxiety Inventory.](image-url)
well as higher likelihood for a coronary [34,35] or a stroke event [36]. As far as blue-collar workers are concerned, they generally have to cope with higher occupational stress and may turn to unhealthier behaviors, such as smoking, as a means for anxiety reduction [37]. It should be noted that occupational stress has been positively associated with CVD [36,38]. In the present work, type of occupation directly affected ACS, but not ischemic stroke, possibly due to the fact that the majority of the stroke cases and control subjects were pensioners.

Comparing the two models regarding ACS and ischemic stroke from the path analyses, several similarities were observed, as socioeconomic parameters tended to affect lifestyle factors such as smoking more consistently. Nevertheless, few differences were also present. Regarding the ACS model, fewer modifiable risk factors mediated the relationship among socioeconomic factors and the outcome. However, concerning the stroke model, not only did more factors mediate the aforementioned relationship, but also the level of education directly influenced the majority of them. This could be explained by the fact that even if the 2 outcomes share many resemblances regarding the potential risk factors [39,40], significant discrepancies are also observed. These findings might also emerge from differences in basic characteristics of the patients, as ACS patients were younger, thus more likely to be employed, whereas the majority of the stroke patients were pensioners. Despite these differences, similar prevention strategies could be implemented for both outcomes, taking into consideration the influence of socioeconomic factors.

All things considered, social and economic factors affect, through numerous and complex ways, the development of CVD. Based on the results of the present work, the ACS and stroke patients were less satisfied by their financial status and engaged in more manual occupation, compared with the control subjects, reflecting a more socioeconomically disadvantaged group. Taking into account the increased rates of unemployment, income reduction, and widening of the social class differences, since the beginning of the Greek economic crisis at the end of 2009, important measures should be implemented in order to alleviate these phenomena and reduce health inequalities [41]. Furthermore, based on the findings of the present work, low socioeconomic groups facing health inequalities, should be targeted not only in low- and middle-income countries, but also in high-income countries.

**Strengths and limitations**

The present work is one of the few in the literature to implement path analysis for the assessment of how social and economic parameters are mediated by modifiable CVD risk factors leading to the development of ACS or ischemic...
stroke. Findings of this study extend the current knowledge, clarifying the potential interactions among socioeconomic and lifestyle parameters.

However, there are some limitations due to the retrospective, observational design of the study, such as the selection and the recall bias and the lack of causal interpretations; thus, only prospective studies can confirm or refute these findings. To minimize the selection bias, only cases with a first event were enrolled. For the dietary evaluation, a food frequency questionnaire was administered. Although this tool may carry more measurement error and be less accurate than a diary (especially in energy and nutrients assessment), special care was taken to reduce these inaccuracies of dietary reporting by using trained dieticians to apply it through face-to-face interviews. Over-/underestimation in reporting may also exist, especially in the measurement of diet, smoking habits (e.g., diseased people usually tend to over report unhealthier habits in order to provide a reason for their condition, or healthy individuals usually report healthier habits when interviewed by specialists) and the onset of CVD risk factors. For the assessment of financial status, economic satisfaction, and type of occupation, indirect, rather than direct, measures were used. These variables, especially financial satisfaction, were chosen to increase the responsiveness of the participants, as well as because subjective measures might be more precise measures of social position [16]. Occupational stress was not evaluated. Regarding the stroke patients, self-reported information was obtained from 76% of the sample, whereas 60 patients (24%) were unable to answer to the interviewer, due to their condition. In these cases, the relevant data were collected by a valid surrogate respondent. These participants were included in the analyses, because they represent the more severe stroke cases. Moreover, the coronary and stroke patients who died at hospital entry or the following day were not included in the study (survivor bias); thus, the results should be generalized only to ACS and stroke survivors. The inclusion of patients and control subjects from only 2 regions may limit the generalization of the findings to the whole country. Nevertheless, Athens metropolitan area and Ioannina city in western Greece collectively represent the majority of the Greek urban and rural population. Finally, like all statistical methods, SEM has its limitations, such as the assumption of normality of latent factors and error terms in the model. Moreover, recent research on causal mediation has demonstrated the importance of accounting for unmeasured confounding of both the exposure-outcome association and the mediator-outcome association to obtain unbiased estimates of direct and indirect effects. Examining multiple mediators in 1 model could increase the chances that these assumptions are violated.
CONCLUSIONS
Social and economic parameters influence lifestyle-modifiable CVD risk factors through multiple pathways. Considering that low socioeconomic groups are more vulnerable, it is of crucial importance to take action through tailored measures for the promotion of a healthy lifestyle to those who are more in need.

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REFERENCES


