Social Patterning of Myocardial Infarction and Stroke in Sweden: Incidence and Survival

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Cardiovascular disease morbidity and mortality rates show marked social patterning in industrialized countries. The aim of this study was to analyze if not only incidence but also survival after acute myocardial infarction (AMI) and stroke differ among socioeconomic groups. Within the framework of the population-based World Health Organization's Multinational Monitoring of Trends and Determinants in Cardiovascular Disease (MONICA) Project, all first-ever AMI (ages 25–64 years) and stroke (ages 25–74 years) events were recorded in northern Sweden during the period 1985–1994. The numbers of first-ever AMI and stroke patients included in the study were 3,466 and 4,215, respectively. Incidence rates for both AMI and stroke showed a distinct social pattern, with high rates in workers and self-employed nonprofessionals and low rates in professionals. The pattern was similar in men and women. In men, early survival after an AMI follows the same socioeconomic pattern, whereas it is less clear if socioeconomic differences in survival contribute to explain differences in mortality in AMI among women and mortality in stroke (both sexes). The high case fatality among male workers and self-employed professionals with AMI is, in turn, attributed to a very marked increase in the risk for sudden death. Am J Epidemiol 2000;151:283-92.

Cardiovascular disease morbidity and mortality rates show wide variation among different socioeconomic groups in industrialized countries (1–6). The majority of studies on socioeconomic status and cardiovascular disease have been on coronary heart disease; studies on stroke are sparse. Survival and recovery after cardiovascular disease in relation to socioeconomic status have only occasionally been studied, and the differences among socioeconomic groups do not appear as clear as for mortality and event rates (7–14).

Several possible explanations for the variations in cardiovascular disease among socioeconomic groups have been discussed. The levels of conventional risk factors for cardiovascular disease are more favorable in groups with high socioeconomic status, and adjusting for these diminishes, but does not eliminate, all observed differences in morbidity and mortality (6, 15–17). Misclassification of social class and downward social mobility because of ill health have also been discussed as explanations for health inequality (4).

In the present study, we analyze the social patterning of acute myocardial infarction (AMI) and stroke incidence rates in seven different socioeconomic groups, using data from the strictly population-based Northern Sweden Multinational Monitoring of Trends and Determinants in Cardiovascular Disease (MONICA) Project. Further, both short- and long-term case fatality rates after first-ever AMI and stroke among socioeconomic groups are compared.

MATERIALS AND METHODS

Within the framework of the World Health Organization's MONICA Project, a population-based AMI and stroke registry in the two northernmost counties in Sweden was established in 1985 (18). In both men and women, all cases of AMI (ages 25–64 years) and stroke (ages 25–74 years) in the population during 1985–1994 were registered. Methods for case-finding, classification, and data quality control are described in detail elsewhere (18–23). For hospitalized cases, hospital admission and discharge records and general practitioners' reports were routinely collected for suspected AMI and stroke events and validated by the MONICA Project criteria. For information on fatal cases, death certificates were screened for
acute events and validated according to the MONICA Project criteria. For both AMI and stroke, one event could potentially last 28 days, after which the event was classified as nonfatal or fatal. Fatal cases were persons who died within 28 days from disease onset. Multiple events occurring within 28 days of the onset of the first attack were considered as one event.

Only first-ever AMIs and strokes were considered in this study. An event was recorded as first-ever if the medical records for the current event had one of the following statements: the patient has no previous history of AMI or stroke; the patient has never had symptoms like those of the present event more than 28 days before the onset; the patient has had no serious illnesses or has never been in the hospital or has been previously healthy; or the patient has had certain illnesses or operations without any mention of AMI or stroke among them. Cases with missing or inconclusive information on the history of prior AMI or stroke event (1.5 percent of all verified events during 1985–1994) were not included in this study.

Validation of AMI events was based on information on medical history, symptoms, electrocardiogram, cardiac enzymes, and, in some cases, general practitioners’ reports. In fatal cases, information was also obtained from death certificates and necropsy reports. Cases were classified into one of the following categories: “definite infarction,” “possible infarction or coronary death,” “ischemic cardiac arrest with successful resuscitation not fulfilling criteria for definite or possible myocardial infarction,” “unclassifiable infarction,” or “not infarction” (19).

Nonfatal cases defined as “definite” met one of following criteria: unequivocal serial electrocardiogram progression (defined by the Minnesota codes), or cardiac enzyme levels more than twice the upper limit of normal in the local laboratory with either typical symptoms and abnormal electrocardiogram or an electrocardiogram progression labeled “probable” and less symptoms (19, 20).

Fatal cases that were classified as “definite” fulfilled the criteria for definite nonfatal event or had necropsy findings of myocardial infarction or coronary thrombosis. Fatal events defined as “possible” had a history of coronary heart disease but no necropsy, or necropsy findings of chronic occlusive coronary heart disease or old infarction, or suggestive terminal symptoms before death with no evidence of another cause of death. Unclassifiable events were mostly fatal cases with a death certificate diagnosis of AMI in which no information on previous history of AMI or of the clinical event was obtainable (19). In this paper, only cases classified as “definite infarction” have been included in nonfatal events. In fatal events, “possible infarction” and “unclassifiable infarction” have also been included.

In the MONICA Project, stroke was defined (according to the World Health Organization criteria) as rapidly developing clinical signs of focal (or global) disturbance of cerebral function lasting more than 24 hours (unless interrupted by surgery or death), with no apparent cause other than a vascular one (23). Transient ischemic attacks, silent brain infarction (events without clinical signs), and stroke caused by a trauma, blood disease, or malignancy were not included in the MONICA Project (23).

Each case was classified into one of the three categories: “definite stroke,” “unclassifiable,” or “not stroke.” Stroke events were classified as “definite” when the information available permitted a clinical stroke diagnosis. The category “unclassifiable” was mainly used in fatal cases where acute cerebrovascular disease was given as the cause of death on the death certificate but the clinical information was too limited to classify the event as a definite stroke. In the present study, only cases classified as definite stroke were included in the nonfatal events, whereas fatal events also included cases coded as unclassifiable. The three stroke subtypes, subarachnoid hemorrhage, intracerebral hemorrhage, and ischemic stroke, were analyzed together.

Socioeconomic classification

Information on patients’ social class was obtained by linking patients in the MONICA Project registry with the Swedish population census in 1980 (Folk- och Bostadsrättslagen 1980). The census includes a classification of the economically active population into 18 socioeconomic groups (24), which are constructed using information primarily on individuals’ occupational title. In this study, a more aggregate form of the classification with the following six groups was used: A, unskilled and semiskilled workers; B, skilled workers; C, assistant nonmanual employees; D, intermediate nonmanual employees; E, employed and self-employed professionals (also higher civil servants and executives); and F, self-employed (other than professionals) (24). Employed and self-employed professionals include people with occupations normally requiring at least 6 years of post-comprehensive school education. Self-employed (other than professionals) are farmers and small- and large-scale entrepreneurs without 6 years of post-comprehensive school education. Individuals who were part-time employed or were not employed at the time of the census (e.g., unemployed, early retired, housewives, students) and those who did not participate in the census (<1 per-
cent) constitute a seventh group in this study, G, not classified, and were analyzed separately. Of men who were grouped as “not classified,” 64 percent were early retired and 25 percent were unemployed. In women, 49 percent were retired, 30 percent housewives, and 9 percent unemployed. In subanalyses, the group “not classified” was further divided in three groups: “home workers (inclusive housewives), students, part-time workers,” “early retired,” and “unemployed or missing information.”

Patients included in this study were restricted to the age group 40–60 years at the time of the census in 1980. For calculation of AMI incidence rates, patients were restricted to the age group 40–50 years at the time of the census to ensure a full 10-year period of event registration (as the AMI register includes only ages up to 64 years).

Mortality follow-up

All subjects were followed up for information on vital status in 1997 with the help of the Cause of Death Register in Sweden (25), which at that time included all deaths up to and including the year 1995. Thus, every individual had a follow-up time of at least 1 year; in this study we analyzed 28-day and 1-year case fatality. Individuals not identified as deaths in the Cause of Death Register were assumed to be alive at the end of year 1995, as the register has a coverage of over 99 percent (25).

Statistical analyses

Age-adjusted incidence rates for AMI and stroke in different socioeconomic groups were calculated using the distribution of socioeconomic status in the study population in the census year 1980. Confidence intervals for incidence rates were calculated under the assumption that the number of events follows Poisson distribution. A logistic regression model was used to calculate age- and time period of onset-adjusted 28-day and 1-year case fatality rates and odds ratios with 95 percent confidence intervals for death, with the group “unskilled and semiskilled workers” as the reference group. The “time period of onset” refers to the year of disease onset for each individual. Further, the place of living at the time of onset was grouped into two categories, defined as communities with and without a local acute care hospital, and included in the logistic model. All analyses were made separately for AMI and stroke patients. Differences in clinical characteristics and severity of the disease among social groups were compared in a logistic model, adjusted for age, time period of onset, and place of living. Analyses were performed with the Stata statistics package (26).

RESULTS

Acute myocardial infarction

The total number of first-ever AMIs aged 25–64 years during the study period 1985–1994 was 3,397 men and 860 women. Of these, 2,734 men and 732 women were aged 40–60 years in the census year 1980 (table 1). Only 0.3 percent of the AMI patients were not identified in the population census. In women, the number of cases per socioeconomic group was small. Further, a large number of women were not classified in any of the six groups, reflecting the large proportion of women aged 40–60 years who were not employed at the time of the census.

Age-adjusted incidence rates of AMI showed a marked social patterning in men, in that the group “employed and self-employed professionals” had the
lowest rates (366 per 100,000), and the highest rates were in the group “not classified” (587 per 100,000 for AMI) (figure 1). In women, a similar pattern emerged, although not as clearly as in men, with the lowest rates in the group “employed and self-employed professionals” and the highest in the “not classified” group. The second highest incidence rates were among unskilled and skilled workers, and self-employed nonprofessionals, in both men and women.

In the “not classified” group, the incidence rates were highest among those who were early retired (711 and 496 per 100,000 in men and women, respectively) and in the group “unemployed or missing information” (578 and 326 per 100,000 in men and women), whereas the rates in the group “home workers, students, part-time workers” were low (386 and 164 per 100,000 in men and women, respectively).

To estimate the proportion of AMI incidence that would not have occurred if the incidence rate in all of the socioeconomic groups had been the same as in the group “employed and self-employed professionals,” we calculated attributable risk for the population (excluding the group “not classified”). These proportions were 25 and 45 percent in men and women, respectively.

Odds ratios and case fatality rates in AMI patients, adjusted for age at onset, time period of onset, and place of living, are shown in figure 2. In men, the highest case fatality rates were observed in the groups “self-employed (nonprofessionals)” and “not classified,” with a 28-day case fatality of 30 and 40 percent (95 percent confidence intervals (CIs): 24.9, 35.2 and 35.6, 45.1, respectively). The corresponding proportion in the group with the lowest case fatality, “employed and self-employed professionals,” was 16 percent (95 percent CI: 11.1, 22.5). As compared with the group “unskilled and semiskilled workers,” three of the six groups had statistically significant lower odds ratios for death within a 28-day period in men. The differences in long-term case fatality (1 year) were similar to the 28-day case fatality. In women, no statistically significant differences were observed, although the 28-day case fatality varied from 11 to 23 percent (the group “not classified” had a case fatality of 33 percent). The case fatality rates in the group “not classified” were clearly highest among those who were early retired (44 and 48 percent in men and women, respectively).

In men with AMI, the proportion of patients who died before reaching the hospital was lowest (8.6 percent) in the group “employed and self-employed professionals” and highest (20.1 percent) in the group “self-employed (nonprofessionals)” (table 2), which is in agreement with the case fatality rates in figure 2.

![Graph](https://example.com/graph.png)

**FIGURE 1.** Incidence rates and 95% confidence intervals (CIs) for first-ever acute myocardial infarction (AMI) and stroke by socioeconomic group, Northern Sweden MONICA Project, 1985–1994. AMI: men and women aged 40–50 years in 1980; stroke: men and women aged 40–60 years in 1980. Adjusted for age at onset. MONICA, Multinational Monitoring of Trends and Determinants in Cardiovascular Disease. Socioeconomic groups: A, unskilled and semiskilled workers; B, skilled workers; C, assistant nonmanual employees; D, intermediate nonmanual employees; E, employed and self-employed professionals; F, self-employed (nonprofessionals); G, not classified.
The differences in the clinical presentation of AMI (chest pain, electrocardiogram changes, and enzymes) did not reach statistical significance (table 2). When restricting the analyses of case fatality to AMI patients who reached the hospital alive, the observed differences in 28-day case fatality in men were reduced, and the only group that differed statistically significantly from the reference group “unskilled and semiskilled
workers" was that of "not classified" subjects (odds ratio = 2.2 in both men and women). In hospitalized patients, the odds ratios for the group "employed and self-employed professionals" as compared with the reference group were 0.7 and 0.8 (95 percent CIs: 0.38, 1.39 and 0.09, 6.52) in men and women, respectively.

**Stroke**

The number of first-ever strokes during the 10-year study period was 4,057 men and 2,762 women in the age group 25-74 years. Of these, 2,611 men and 1,604 women were aged 40-60 years in 1980 (table 3). Age-adjusted incidence rates of stroke in different socioeconomic groups showed a similar pattern as the rates for AMI, in both men and women (figure 1). The lowest rates were in the group "employed and self-employed professionals" (316 and 174 per 100,000 in men and women, respectively), and the highest rates were observed for the group "not classified" (635 and 328 per 100,000 in men and women, respectively). Corresponding attributable risks for the population (excluding the group "not classified") were 20 and 27 percent in men and women, respectively.

In the "not classified" group, the highest rates were observed for the group "early retired" (690 and 346 per 100,000 in men and women, respectively). In both men and women, the incidence rates in the group "home workers, students, part-time workers" were comparable to that of "unskilled and semiskilled workers."

The pattern of incidence rates was similar for all three subtypes of stroke, in that the group "employed and self-employed professionals" had the lowest rates in both men and women. However, the number of subarachnoid and intracerebral hemorrhages was low in several groups.

Differences in case fatality rates among socioeconomic groups in stroke patients did not reach statistical significance in men (figure 3). However, the group "employed and self-employed professionals," which had the lowest case fatality among AMI patients, also had the lowest 28-day case fatality of 8.4 percent (95 percent CI: 4.7, 14.5) in stroke patients (figure 3). In women, the group "skilled workers" had the highest 28-day case fatality of 28.6 percent (95 percent CI: 18.0, 42.2).

Table 4 shows the clinical characteristics of stroke patients by socioeconomic group. Among men, "employed and self-employed professionals," the group with the lowest case fatality rates, had, in general, the most favorable profile, with the lowest proportion of patients with atrial fibrillation and found dead or unconscious. In addition, the proportion of ischemic strokes was highest in this group. However, no statistically significant differences were observed among the socioeconomic groups, except in the proportion of ischemic strokes in men. In women, no clear pattern in clinical presentation by socioeconomic group was observed.

**DISCUSSION**

The majority of previous studies on socioeconomic status and cardiovascular disease have been based on mortality statistics. In the present study, socioeconomic status was related to the two main factors that affect mortality rates, namely, disease incidence and case fatality. As our study is population based, both incidence and case fatality can be studied more adequately from a public health point of view. The case ascertainment and registration procedures in the MONICA Project have been the same throughout the registration period. However, one should note that the study

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**TABLE 3. Number of first-ever strokes and median age at onset by socioeconomic group, Northern Sweden MONICA* Project, 1985–1994**

<table>
<thead>
<tr>
<th>Socioeconomic Group</th>
<th>Men†</th>
<th>Women†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count (no.)</td>
<td>Median age (years)</td>
<td>Count (no.)</td>
</tr>
<tr>
<td>Unskilled and semiskilled workers</td>
<td>572</td>
<td>64</td>
</tr>
<tr>
<td>Skilled workers</td>
<td>452</td>
<td>63.5</td>
</tr>
<tr>
<td>Assistant nonmanual employees</td>
<td>231</td>
<td>64</td>
</tr>
<tr>
<td>Intermediate nonmanual employees</td>
<td>287</td>
<td>63</td>
</tr>
<tr>
<td>Employed and self-employed professionals</td>
<td>135</td>
<td>63</td>
</tr>
<tr>
<td>Self-employed (nonprofessionals)</td>
<td>303</td>
<td>64</td>
</tr>
<tr>
<td>Not classified</td>
<td>625</td>
<td>66</td>
</tr>
<tr>
<td>Missing in the 1980 census</td>
<td>6</td>
<td>61</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,611</strong></td>
<td><strong>64</strong></td>
</tr>
</tbody>
</table>

* MONICA, Multinational Monitoring of Trends and Determinants in Cardiovascular Disease.
† Men and women aged 40–60 years in 1980.
FIGURE 3. Adjusted 28-day and 1-year case fatality (CF) with odds ratios and 95% confidence intervals for death among first-ever stroke patients by socioeconomic group in the Northern Sweden MONICA Project, 1985–1994. Men and women aged 40–60 years in 1980. Adjusted for age at onset, time period of onset, and place of living. MONICA, Multinational Monitoring of Trends and Determinants in Cardiovascular Disease. Socioeconomic groups: A, unskilled and semiskilled workers; B, skilled workers; C, assistant nonmanual employees; D, intermediate nonmanual employees; E, employed and self-employed professionals; F, self-employed (nonprofessionals); G, not classified.

TABLE 4. Clinical characteristics of first-ever stroke patients by socioeconomic group, Northern Sweden MONICA* Project, 1985–1994†

<table>
<thead>
<tr>
<th>Socioeconomic group</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diabetes</td>
<td>Atrial fibrillation</td>
</tr>
<tr>
<td>Unskilled and semiskilled workers</td>
<td>18.5</td>
<td>9.8</td>
</tr>
<tr>
<td>Skilled workers</td>
<td>18.8</td>
<td>10.3</td>
</tr>
<tr>
<td>Assistant nonmanual employees</td>
<td>22.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Intermediate nonmanual employees</td>
<td>16.0</td>
<td>8.5</td>
</tr>
<tr>
<td>Employed and self-employed professionals</td>
<td>19.6</td>
<td>6.2</td>
</tr>
<tr>
<td>Self-employed (nonprofessionals)</td>
<td>13.1</td>
<td>12.5</td>
</tr>
<tr>
<td>Not classified</td>
<td>24.4</td>
<td>12.1</td>
</tr>
</tbody>
</table>

p value§

0.099  0.333  0.131  0.045  0.212  0.635  0.123  0.398

* MONICA, Multinational Monitoring of Trends and Determinants in Cardiovascular Disease.
† Numbers are percentages (adjusted for age at onset, time period of onset, and place of living).
‡ Men and women aged 40–60 years in 1980.
§ Likelihood ratio test for equality among socioeconomic groups (excluding group "not classified").

population was not closed in the present study. This means that large differences in immigration or emigration among the socioeconomic groups in the study area could possibly affect the estimated incidence rates.

The incidence rates for both AMI and stroke in northern Sweden differed markedly among the socioeconomic groups. The pattern of these differences was consistent for both AMI and stroke and for men and
women. These observations are in agreement with those of several other studies on socioeconomic status and cardiovascular disease, in both Sweden (3, 6, 11) and other countries (2, 4, 5, 8). Despite the consistency of socioeconomic inequalities in cardiovascular disease, there is considerable variation in the size of differences among countries (27). In the present study, the marked differences in AMI and stroke incidence rates (with attributable risks ranging from 20 to 45 percent) among the socioeconomic groups imply that there is a potential for substantial reductions in the burden of cerebrovascular disease in the population, provided that the inequity in the community can be reduced. However, if this applies also to the older age groups, in which the majority of cardiovascular events occur, no such implication can be made from this study.

Several different indicators for socioeconomic status (or social class) have been proposed and used in epidemiology (1). The most common measures in cardiovascular disease epidemiology are based on occupation, education, or income, or some combination of these (1). Regardless of which classification has been used, the association between socioeconomic status and cardiovascular disease has been generally consistent, with higher risk in groups with low socioeconomic status. However, although these three measures correlate with each other, the strength of association with cardiovascular disease can differ. Education has sometimes been reported to be more closely related to cardiovascular disease than occupational status (28). The classification used in the present study is essentially based on occupational status, but it also takes education into account when grouping the various occupations into categories. Thus, professionals with both the lowest incidence and the lowest case fatality in both sexes usually have a university education. Further, the classification used here aims to describe individuals’ long-term position in working life, and it is not affected by short-term changes in employment (24).

In accordance with the MONICA Project protocol, the upper age limit for recording of AMI events was 64 years and for stroke, 74 years. By excluding older people, the study does not reflect the total burden of cardiovascular disease in the population. On the other hand, the impact of social stratification tends to decrease with increasing age (29). Thus, studies on how social patterning interacts with cardiovascular disease may be less meaningful if a large proportion of elderly people are included.

Population levels of conventional risk factors, common to both AMI and stroke, are more favorable among people with a high educational level in northern Sweden (30), which in part can explain the observed differences in AMI and stroke incidence rates. Still, in several studies, the differences in cardiovascular health in different socioeconomic groups cannot fully be explained by the differences in risk factor levels (6, 16, 17). Lynch et al. (15) reported that adjusting for biologic, behavioral, psychologic, and social risk factors eliminated differences in all-cause and cardiovascular mortality among income groups. Still, the association between income groups and AMI remained after adjusting for other risk factors (15).

Although the patterns of incidence rates for AMI and stroke were the same in men and women, the differences by socioeconomic status were more marked among men, something which also has been observed by others (1, 8). In the present study, the classification used for the socioeconomic status resulted in a large proportion of women with no classification, which could affect the comparisons. Further, the number of women in some of the socioeconomic groups was small. A better measure for the socioeconomic status for women in this age group and time period could perhaps be the socioeconomic status defined on the household level. However, this information was not available in the present study. In the group “not classified,” the highest incidence rates were among those who were early retired or were not employed at the time of the census, whereas those who worked at home had a risk similar to that of the other socioeconomic groups.

The variations in early case fatality rates after AMI in men among socioeconomic groups were largely attributed to marked differences in the proportion of sudden deaths, with the proportion of cases of sudden death being twice as high in unskilled and semiskilled workers as in professionals. Since differences in total AMI incidence rates were in the same direction, there was a threefold difference in the incidence of sudden death from a first-ever cardiac event between the two groups. This is in agreement with recent observations from both the Glasgow and the French MONICA studies, where both incidence rates of AMI and the proportion of AMI patients reaching the hospital alive were associated with socioeconomic group (7–9). In women, we observed no distinct social patterning in the risk for sudden cardiac death.

Neither in men nor in women were there any significant differences among socioeconomic groups in the clinical presentation of AMI among those patients who reached the hospital and, except for the group without classification of socioeconomic status, there were no major differences in case fatality in hospitalized patients. A large proportion of patients without socioeconomic classification had retired early, and it is rea-
sionable to assume that they had more comorbidity contributing to the worse outcome during the acute phase of AMI. In the French MONICA Project, the case fatality and medical management in hospitalized patients did not differ among occupational categories (7). In contrast, survival in hospitalized AMI patients has been shown to be worse in groups with low socioeconomic status in the United States (12–14). These differences could be attributed to differences in access to medical care and quality of care, differences in severity of the disease, or differences in patients’ potential to express symptoms and needs of care, and therefore receiving better treatment and follow-up.

The lack of social patterning in clinical characteristics could be affected by differences in the identification of such conditions among the socioeconomic groups. For example, the proportion of subjects with undetected diabetes in the population surveys in northern Sweden was somewhat higher among those with low education as compared with subjects with university education (Northern Sweden MONICA Project, unpublished data).

Studies on socioeconomic status and stroke are more sparse, and the relation does not appear as clear as for coronary heart disease. Socioeconomic status has been reported to be associated with stroke mortality and incidence (2, 5, 31), while others have failed to find a relation or the relation has not been clear (32, 33). In the present study, the social patterning was closely similar to that of AMI, but the differences among the socioeconomic groups were of a smaller magnitude.

The recording of stroke in the MONICA Project database covered ages up to 75 years, compared with 65 years for AMI. It is likely that the relative importance of socioeconomic class, like the impact of many biologic risk factors (34, 35), decreases with advancing age, especially after retirement. Similar to AMI, the lowest case fatality and the lowest proportion of patients found dead or unconscious were observed among professionals of both sexes, but the differences did not reach statistical significance because of the low number of professionals in the stroke-prone ages.

It is also worth noting that a larger proportion of the professionals live in areas with shorter distances to hospitals. Therefore, the lower case fatality rates among professionals to some extent could be due to a shorter time delay before diagnosis and treatment. Indeed, professionals had the lowest proportion of AMI patients who died before reaching the hospital. However, the estimates of case fatality and clinical characteristics were adjusted for place of living, defined as communities with and without an acute care hospital. Hence, the observed differences among socioeconomic groups cannot be explained by differences in the place of living. Nevertheless, it may be that family and working conditions make it more likely for informed bystanders to be present when a well-educated person is afflicted by an acute cardiovascular event. This would facilitate for the patient to be attended very early by medically trained staff (36).

In conclusion, whereas most previous studies have reported large differences in cardiovascular mortality among different socioeconomic groups, the present results help to explain the determinants of these differences. Incidence rates show a distinct social pattern with high rates in workers and self-employed nonprofessionals and low rates in professionals. The differences are similar in men and women. In men, early survival after an AMI follows the same socioeconomic pattern, whereas it is less clear if socioeconomic differences in early survival contribute to explain differences in mortality in AMI among women and mortality in stroke (both sexes). The high case fatality in male workers and self-employed professionals with AMI is, in turn, attributed to a very marked increase in the risk for sudden death. The reasons for this are currently not known. The incidence of stroke has the same social patterning as myocardial infarction, but the early outcome does not seem to be related to socioeconomic status.

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