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Title: Socioeconomic disparities in stroke case fatality – Observations from Riks-Stroke, the Swedish stroke register

Authors:

Anita Lindmark, MSc; Eva-Lotta Glader, MD; Kjell Asplund, MD; Bo Norrving, MD; Marie Eriksson, PhD; for the Riks-Stroke Collaboration

Affiliations:

Department of Statistics, Umeå School of Business and Economics, Umeå University, Sweden (A.L., M.E.),

Department of Public Health and Clinical Medicine, Umeå University, Sweden (K.A., E-L.G.),

Department of Clinical Sciences, Section of Neurology, Lund University, Sweden (B.N),

Addresses:

Department of Statistics, USBE, Umeå University, SE-901 87 Umeå, Sweden (A.L., M.E.),

Department of Public Health and Clinical Medicine, Umeå University, SE-901 85 Umeå, Sweden (K.A., E-L.G.),

Department of Clinical Sciences, Section of Neurology, Lund University, SE-221 85 Lund, Sweden (B.N)

Address for correspondence:

Anita Lindmark

Department of Statistics, USBE

Umeå University

SE-901 87 Umeå

Sweden

E-mail: anita.lindmark@stat.umu.se

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CONFLICTS OF INTEREST

The authors have no conflicts of interest related to this article.

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ABSTRACT

Background and Purpose – Low socioeconomic status (low education and income level) has been found to be associated with increased stroke mortality. However, findings from previous studies on the association between socioeconomic status and case fatality (survival) after stroke have been inconsistent.

Aims - To explore the association between socioeconomic status and survival after stroke, using Riks-Stroke, the Swedish Stroke Register with emphasis on changes in survival (in)equality with time after stroke .

Methods – All 76 hospitals in Sweden admitting acute stroke patients participate in Riks-Stroke. Riks-Stroke data on 18-74 year old patients with onset of first stroke during the years 2001-2009 were combined with data from other official Swedish registers. Case fatality was analyzed by socioeconomic status (education, income, country of birth and cohabitation) and other patient characteristics.

Results – Of the 62 497 patients in the study, a total of 6 094 (9.8 %) died within the first year after stroke. Low income, primary school education and living alone were independently associated with higher case fatality after the acute phase. Differences related to income and cohabitation were present already early, at 8-28 days after stroke, with the gaps expanding thereafter. The association between education and case fatality was not present until 29 days-1 year after stroke. Dissimilarities in secondary preventative medications prescribed on discharge from hospital had only a minor impact on these differences.

Conclusions – Socioeconomic status had only a limited effect on acute phase case fatality, indicating minor disparities in acute stroke treatment. The survival inequality, present already in the subacute phase, increased markedly over time since the stroke event. The socioeconomic differences could not be explained by differences in secondary prevention at discharge from hospital. Large socioeconomic differences in long-term survival after stroke may exist also in a country with limited income inequity.

INTRODUCTION

There is a well-established association between low socioeconomic status (low level of education or low income) and increased total mortality (1). Similar socioeconomic patterns exist for stroke mortality (2, 3). However, the relationship between socioeconomic factors and case fatality (survival) after stroke is less well known. Findings have been inconsistent between studies (2), and this may be related to differences in study designs, region/country, socioeconomic measures used, and/or time interval.

Aims: We have used a large data set from the Swedish Stroke Register to analyze case fatality at different times after stroke in relation to socioeconomic factors. We studied 4 dimensions of socioeconomic status: level of education, income, country of birth and living alone or being cohabitant. We explored how survival differences associated with socioeconomic status changed over time since the stroke event.

METHODS

Patients

The Swedish Stroke Register (Riks-Stroke) was established in 1994 to monitor and support improvement of quality of stroke care in Sweden (4). It covers all hospitals in the country admitting acute stroke patients (76 hospitals in 2009). Details on what information is collected are available at the Riks-Stroke website http://www.riks-stroke.org.

Patients included in this article were a subset of those recorded in Riks-Stroke between January 1, 2001 and December 31, 2009. Out of the 219 587 recorded patients, only those who were 18-74 years old, had not previously suffered a stroke, and were independent in activities of daily living (ADL) prior to the stroke were included in the study, a total of 62 497

patients. Patients over the age of 74 were excluded from the main analysis because information on highest attained education was not recorded for this age group prior to the year 2008. A sensitivity analysis of the results included all patients aged 18 or older, a total number of 134 387 patients.

Information on survival up to 1 year after stroke and cause of death was retrieved from the Swedish Cause of Death Register managed by the National Board of Health and Welfare. Information on socioeconomic status was retrieved from the LISA database (Longitudinal integration database for health insurance and labor market studies) managed by Statistics Sweden. The LISA database contains information from 1990 and onward, is updated annually, and integrates existing data from registers in the labor market, educational and social sectors. All individuals aged 16 and older registered as residing in Sweden are included in the database. More information is available on Statistics Sweden's website http://www.scb.se. Data from the Swedish Cause of Death Register, LISA and Riks-Stroke were linked through the personal identity numbers (Swedish national identification numbers) of the patients.

This study has been approved by the Ethical Review Board in Umeå.

For analyses of the effect of medication prescribed on discharge from hospital, we included only patients with date of stroke onset after April 1, 2004, because this was the date the Riks-Stroke questionnaire was amended to facilitate grouping of different secondary preventive medications.

Variable Definitions

Case fatality was defined in three time periods after stroke: 0-7 days (acute phase), 8-28 days (subacute phase) and 29 days-1 year (late phase) after stroke.

The socioeconomic variables included in the study were highest attained education the year before the stroke (primary school, secondary school or university), the individual's part of the family disposable income the year before the stroke, country of birth and whether or not the patient lived alone at stroke onset. Information on highest attained education, income and country of birth was retrieved from LISA, while information on cohabitation is recorded in Riks-Stroke. The individual's part of the family disposable income is defined as the sum of the incomes of all family members, multiplied by the consumption weight of the individual, and divided by the total consumption weight of the family in order to take into account the size and composition of the household. This income was also adjusted for consumer price index (reference year 2009) and was divided into tertiles consisting of patients with low, middle and high incomes. Note that the definition of the consumption weights used in the calculation of the individual's part of the disposable income changed in 2004, leading to a measurement that, on average, tends to be slightly higher than the previous one. Country of birth was grouped into Sweden, Nordic countries (Norway, Finland, Denmark and Iceland), Europe (excluding the Nordic countries), and other countries.

Level of consciousness on admission to hospital is registered using three levels, based on the Reaction Level Scale (RLS).(5) Alert corresponds to RLS 1, drowsy to RLS 2-3 and unconscious to RLS 4-8.

Independence in ADL is defined as the patient being able to manage clothing, toileting and walking unassisted.

Cause of death was grouped into three categories: cerebrovascular diseases (ICD-10 codes I60-69), other circulatory diseases (I00-I99, except for I60-69), and other diseases.

Groups of medication prescribed on discharge from hospital included in the study were antihypertensive medication, statins, antiplatelets and anticoagulants.

Statistical Methods

Cox regression survival curves adjusted for age at stroke onset, sex, stroke severity and stroke subtype for different socioeconomic groups are presented.

Case fatality in the defined time periods after stroke is presented with corresponding 95 % confidence intervals (CI) within different socioeconomic groups and other important patient characteristics. Associations were univariately tested using the Pearson χ^2-test. To simultaneously test the effect of the socioeconomic variables on case fatality while adjusting for other important factors, multiple logistic regression was used. Dependence between patients treated in the same hospital was adjusted for by the use of a multi-level approach, considering patients as repeated observations within hospitals. Assuming an exchangeable correlation structure, the logistic regression parameters were estimated by generalized estimation equations (GEE) using SPSS procedure GENLIN. In order to test whether differences between socioeconomic groups varied with time (year of stroke onset), age or sex, two-way interaction terms were added to the model.

A sensitivity analysis of the findings was performed by repeating the multiple logistic regression analyses (excluding the variable highest attained education) including patients over 74 years old.

The effect of medication on the relationship between socioeconomic status and case fatality was investigated through multiple-adjusted logistic regression.

Statistical analyses were performed using IBM SPSS Statistics 20.0 and R 2.15.0 (The R Foundation for Statistical Computing).

RESULTS

Survival after stroke

Of the 62 497 patients in the study a total of 6 094 (9.8 %) died within the first year after stroke. A total of 2 392 (3.8 %) patients died within the first 7 days, 1 070 (1.7 %) within 8-28 days and 2 632 (4.2 %) within 29 days-1 year after stroke.

Survival probability curves, adjusted for age of stroke onset, sex, stroke severity and stroke subtype (Figure 1) show a positive association between a higher level of attained education and higher probability of survival. Survival curves for different income groups, including also patients older than 74 (Figure 2) show similar patterns -- patients in the highest income group had higher survival probability than patients in lower income groups.

For case fatality in the acute phase, 0-7 days after stroke, univariate analysis showed differences between patients with different socioeconomic status. A lower case fatality was observed for patients with secondary school (3.6 %, 95 % CI: 3.4-3.8 %) or university (3.1 %, 2.7-3.4 %) as their highest attained education than for patients with primary school as their highest attained education (4.3 %, 4.1-4.6 %). Patients with high income level (3.2 %, 3.0-3.5 %) had lower case fatality than patients with middle (3.9 %, 3.6-4.1 %) or low (4.4 %, 4.1-4.7 %) income levels. However, after adjusting for case-mix (sex, age, level of consciousness on admission, atrial fibrillation, diabetes, smoking, and stroke subtype) and year of stroke, neither the differences for education (P=0.053) nor the differences for income level (P=0.086) were significant. Cohabitation was significant (P=0.022) but had only a minor effect on the risk of death (OR: 0.894, 95 % CI: 0.812-0.984). Hence, the acute time interval was not further analyzed for the purpose of the study.

For both 8-28 days after stroke and 29 days-1 year after stroke, univariate analyses showed that the associations between socioeconomic status and case fatality were significant (P<0.001 for education, income and cohabitation, respectively, and P<0.05 for country of birth; Table

1). Case fatality was higher for patients with only primary school education compared to patients with higher levels of education. Patients with low or middle income levels had higher case fatality than patients with high income level, and patients living alone had higher case fatality than patients who were cohabitant. For country of birth, the differences were less clear-cut, although patients born in "other countries" had the lowest case fatality for both the subacute and the late phases.

Older patients, patients with atrial fibrillation or diabetes, and patients who were drowsy or unconscious on admission had higher case fatality (Table 1). The pattern of higher case fatality in patients with a low level of education, low income and living alone was observed in all 3 major groups of underlying causes of death (stroke, other circulatory diseases and other diseases) both in the subacute and late phases (data not shown).

The results of multiple-adjusted logistic regression models for case fatality in the subacute phase, 8-28 days after stroke, and in the late phase, 29 days-1 year after stroke, showed that highest attained education was not significantly related to case fatality 8-28 days after stroke ($P=0.163$; leftmost panel, Table 2). However, it was significantly related to case fatality at 29 days-1 year after stroke ($P=0.046$; rightmost panel, Table 2), where patients with university education had lower risk of death than patients with primary school education. Income group was also significant, ($P=0.001$ and $P<0.001$, respectively) in both phases, where patients from the lowest income group had higher risk of death than patients from the highest income group. Cohabitation also had a significant effect on case fatality in both phases after stroke ($P=0.040$ and $P<0.001$, respectively), where patients who lived alone had higher case fatality than patients who did not. Country of birth was not significant in either of the two phases.

There were no significant interactions between year of stroke onset and income group or education level, implying that the differences in case fatality between socioeconomic groups remained at a similar level during 2001-2009.

For case fatality 8-28 days after stroke, there was a significant interaction between cohabitation and age (P=0.010). The effect of living alone on case-fatality decreased with age. For 29 days- 1 year after stroke, there was a significant interaction between sex and cohabitation (P=0.001), the reduced survival in patients living alone being more pronounced in men. In women, the difference between being cohabitant and living alone was not statistically significant.

A subgroup analysis of patients with ischemic stroke who were alert on admission to hospital showed similar associations between socioeconomic status and late phase case fatality as those from the analysis of the full data (results not shown). The sensitivity analysis of the association between income (Figure 2), living alone, and case fatality, including patients older than 74 years, showed similar results. The odds ratios for high compared to low income patients was 0.824 (95 % CI: 0.760-0.894) for case fatality 8-28 days after stroke and 0.826 (95 % CI: 0.783-0.873) for case fatality 29 days to 1 year after stroke.

Medication prescribed on discharge from hospital

Out of the 62 497 patients included in the study, 41 411 had date of stroke onset after April 1, 2004; 39 177 were alive at the time of discharge from hospital permitting analyses of the effects of medications prescribed.

Since the majority of patients who died in the subacute phase, 8-28 days after stroke, did so before being discharged from hospital, only case fatality in the late phase, 29 days-1 year after stroke, was included in these analyses.

Patients in the highest income group received the largest proportion of statin prescriptions, while patients with only primary school education received the largest proportion of antihypertensive prescriptions (Table 3). The highest income group and university-educated patients received the highest proportions of anticoagulant prescriptions. The differences between groups were small for patients prescribed with antiplatelets (Table 3).

Adding medication at discharge from hospital to a logistic regression model for case fatality 29 days-1 year after stroke (Table 4) had only a minor effect on the relationships between the socioeconomic variables and case fatality.

DISCUSSION

High income, university education and being cohabitant were independently associated with improved survival after a first stroke. The differences related to income and cohabitation were present early, 8-28 days after stroke. The survival differences between income and education groups were consistent across men and women, different ages, and time periods whereas the differences due to living alone rather than being cohabitant decreased with age in the subacute phase and were much less pronounced for women than for men in the late phase.

The effect sizes of the socioeconomic variables were relatively large. For example, having low income had an effect on late phase case fatality that was comparable to that from having atrial fibrillation, being a smoker or from a 5-year increase in age.

Overall, previous studies report inconsistent findings concerning socioeconomic status and survival after stroke (2). In ecological studies, an association between median neighborhood income and survival has been observed in Ontario, Canada (6), and Malmö, Sweden (although only in men and not in women in the Malmö study) (7). A recent Swedish study using vital

statistics reported long-term survival in 40-59 year old patients with first-ever stroke (8). Patients with a low level of education or low income had reduced survival during the 4 years of follow-up (not adjusted for differences in interacting factors such as co-morbidity and ethnicity). In contrast, no relation between area-level socioeconomic status and 1-year case fatality was seen in Australia and New Zeeland (9) or in Italy (10). The discrepant findings between studies may reflect differences in the relationship between socioeconomic status and case fatality between different parts of the world, but may also be due to differences in types of populations studied or how socioeconomic status was measured.

The strengths of our study are that: (a) it included stroke patients from a nationwide register with high coverage, (b) in contrast to ecological studies, individual patient data were used, (c) the register data were detailed enough to permit comprehensive multivariable adjustments, and (d) four different measures of socioeconomic status were used.

A limitation of our study is that information on level of education could not be retrieved for the oldest patient group; hence the main analysis was limited to patients under 75 years of age. However, similar results were observed in a sensitivity analysis including older patients. A possible bias due to incomplete coverage may also be considered. When compared with hospital discharge diagnoses and taking a 6% overdiagnosis of acute stroke in routine clinical practice into account, approximately 91 % of stroke patients in Sweden were covered by Riks-Stroke in 2009 (for more information see http://www.riks-stroke.org). Patients dying very early after admission are overrepresented among patients not included in the registry (11). This may have impacted on absolute percentages of survival during the 0-7 day interval.

The explanation for the association between low socioeconomic status and reduced survival is probably multifactorial. Previous studies have shown that lower socioeconomic groups have a greater burden of vascular risk factors, comorbidity (12-14), and suffer more severe strokes

(13, 15). In this study, the observed inequality in survival remained after adjustment for comorbidities and level of consciousness at admission. However, unmeasured comorbidities (16), psychological factors and stroke severity may still have contributed to the lower survival in the low socioeconomic group.

Another explanation may be inequalities in stroke care (2). A Danish study showed inequalities in acute stroke management associated with socioeconomic status (17). We observed no significant relationship between education, income and 7-day case fatality after correction for confounders, indicating minor impact of acute treatment disparities. However, the reduced survival in the subacute phase (8-28 days) in patients with low income infers that inequity in the prevention and treatment of acute severe complications of stroke, such as pneumonia or venous thromboembolism, may have contributed to differences in survival in the subacute phase. Differences in secondary prevention at discharge from hospital could not explain the lower survival associated with low socioeconomic status in the late phase after stroke (29 days-1 year). Nevertheless, factors related to secondary prevention after discharge, e.g. patient adherence to medication (18) and its determinants (such as frequency of outpatient follow-up visits) may contribute to the worse prognosis in lower socioeconomic groups. Differences in access to rehabilitation and social support, and knowing who to contact may further explain the inequalities.

In the present study, survival was reduced in patients living alone. The unfavorable outcome remained in multivariable analyses that included other socioeconomic factors. People who are not married have worse survival after myocardial infarction, and this is not fully explained by differences in biological or lifestyle factors or occupation (19). Socially isolated patients also have worse survival in several other diseases, such as cancer (20). It has been suggested that this may be because of limited caregiving from family members and friends and reduced access to care (20). It should be noted that our results disagree with those of a recent study

from Denmark that concluded that marital status was not related to short-term or long-term survival after stroke (21).

In many socioeconomic respects, Sweden is not very different from other high-income countries. Its Human Development Index ranks number 9 in the world, next to Canada and Germany(22). According to Statistics Sweden, the proportion of citizens born in other countries is 15% 2011, higher than in many neighboring countries. Perhaps most noteworthy in the present context is that the income Gini coefficient, showing the degree of inequity, is low in comparisons with countries such as USA and UK but similar to other Scandinavian countries (22). It is evident that marked socioeconomic gaps in long-term survival after stroke may exist also in a country with limited income inequity.

Socioeconomic inequity contributes to the total societal burden of disease (23). Our results emphasize that stroke is no exception. The association between education and case fatality, even when adjustment is also made for income, demonstrates the strength of association in this setting. Differences in survival by socioeconomic status are present already in the subacute phase of stroke and increase over time since the stroke event. The socioeconomic gradients in survival cannot be fully explained by differences in comorbidity or differences in the prescription of secondary prevention medications. The socioeconomic survival gap has remained unchanged during the 2000s. People who are socially underprivileged constitute a target group for intensified stroke care and support during and after hospital stay.

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Table 1. Case fatality (with 95 % CIs) 8-28 days and 29 days-1 year after stroke for 18-74 year old patients in different patient subgroups.

	8-28 days			29 days-1 year		
		Case fatality			Case fatality	
Variable	Valid obs.	Freq.	Prop., % (95 % CI)	Valid obs.	Freq.	Prop., % (95 % CI)
Highest attained education						
Primary school	24 478	518	2.1 (1.9-2.3)	23 960	1 265	5.3 (5.0-5.6)
Secondary school	24 229	391	1.6 (1.5-1.8)	23 838	962	4.0 (3.8-4.3)
University	10 558	140	1.3 (1.1-1.5)	10 418	351	3.4 (3.0-3.7)
Income group						
Low	19 867	427	2.1 (1.9-2.4)	19 440	1 008	5.2 (4.9-5.5)
Middle	19 965	379	1.9 (1.7-2.1)	19 586	949	4.8 (4.5-5.1)
High	20 103	262	1.3 (1.1-1.5)	19 841	673	3.4 (3.1-3.6)
Country of birth						
Sweden	51 601	903	1.7 (1.6-1.9)	50 698	2 248	4.4 (4.3-4.6)
Nordic countries (excl. Sweden)	4 004	80	2.0 (1.6-2.4)	3 924	205	5.2 (4.5-5.9)
European countries (excl. Nordic countries and Sweden)	3 087	70	2.3 (1.7-2.8)	3 017	132	4.4 (3.6-5.1)
Other countries	1 413	17	1.2 (0.6-1.8)	1 396	47	3.4 (2.4-4.3)
Living alone						
No	40 315	656	1.6 (1.5-1.8)	39 659	1 566	3.9 (3.8-4.1)
Yes	19 487	413	2.1 (1.9-2.3)	19 074	1 059	5.6 (5.2-5.9)
Age group						
18-54	9 362	101	1.1 (0.9-1.3)	9 261	179	1.9 (1.7-2.2)
55-64	19 174	267	1.4 (1.2-1.6)	18 907	625	3.3 (3.1-3.6)

Variable	8-28 days			29 days-1 year		
		Case fatality			Case fatality	
	Valid obs.	Freq.	Prop., % (95 % CI)	Valid obs.	Freq.	Prop., % (95 % CI)
65-74	31 569	702	2.2 (2.1-2.4)	30 867	1 828	5.9 (5.7-6.2)
Sex						
Men	37 074	659	1.8 (1.6-1.9)	36 415	1 639	4.5 (4.3-4.7)
Women	23 031	411	1.8 (1.6-2.0)	22 620	993	4.4 (4.1-4.7)
Level of consciousness on admission						
Alert	53 643	556	1.0 (1.0-1.1)	53 087	2 046	3.9 (3.7-4.0)
Drowsy	4 761	317	6.7 (6.0-7.4)	4 444	414	9.3 (8.5-10.2)
Unconscious	1 203	180	15.0 (12.9-17.0)	1 023	138	13.5 (11.4-15.6)
Atrial fibrillation						
No	51 480	785	1.5 (1.4-1.6)	50 695	2 085	4.1 (3.9-4.3)
Yes	8 019	267	3.3 (2.9-3.7)	7 752	515	6.6 (6.1-7.2)
Diabetes						
No	48 039	752	1.6 (1.5-1.7)	47 287	1 895	4.0 (3.8-4.2)
Yes	11 831	310	2.6 (2.3-2.9)	11 521	729	6.3 (5.9-6.8)
Smoking						
No information	5 669	247	4.4 (3.8-4.9)	5 422	362	6.7 (6.0-7.3)
No	38 929	611	1.6 (1.4-1.7)	38 318	1 589	4.1 (3.9-4.3)
Yes	15 507	212	1.4 (1.2-1.5)	15 295	681	4.5 (4.1-4.8)
Type of stroke						
Hemorrhagic	8 066	301	3.7 (3.3-4.1)	7 765	421	5.4 (4.9-5.9)
Ischemic	50 218	738	1.5 (1.4-1.6)	49 480	2 129	4.3 (4.1-4.5)
Unspecified	1 821	31	1.7 (1.1-2.3)	1 790	82	4.6 (3.6-5.5)

Table 2. Multiple logistic regression modeling the risk of death in 18-74 year old patients 8-28 days and 29 days-1 year after stroke. Adjusted for other factors in the table and year of stroke onset. Odds ratios with corresponding 95 % CIs are given.

	Case fatality 8-28 days			Case fatality 29 days-1 year		
	Estimated OR	95 % CI of OR		Estimated OR	95 % CI of OR	
Highest attained education						
Primary school	Ref.			Ref.		
Secondary school	0.888	0.762	1.034	0.946	0.855	1.047
University	0.822	0.646	1.046	0.867	0.774	0.971
Income group						
Low	Ref.			Ref.		
Middle	0.960	0.790	1.166	0.957	0.870	1.053
High	0.714	0.586	0.870	0.766	0.693	0.847
Country of birth						
Sweden	Ref.			Ref.		
Nordic countries (excl. Sweden)	1.094	0.834	1.436	1.055	0.911	1.221
European countries (excl. Nordic countries and Sweden)	1.180	0.961	1.449	0.948	0.784	1.146

	Case fatality 8-28 days			Case fatality 29 days-1 year		
	Estimated OR	95 % CI of OR		Estimated OR	95 % CI of OR	
Other countries	0.583	0.270	1.259	0.839	0.579	1.215
Living alone						
No	Ref.					
Yes	1.141	1.006	1.294	1.274	1.156	1.404
Age	1.038	1.029	1.046	1.056	1.049	1.062
Sex						
Women	Ref.			Ref.		
Men	1.119	0.984	1.271	1.171	1.072	1.279
Level of consc. on admission						
Alert	Ref.			Ref.		
Drowsy	5.557	4.762	6.483	2.480	2.213	2.780
Unconscious	14.920	12.061	18.456	4.199	3.410	5.171
Atrial fibrillation						
No	Ref.			Ref.		
Yes	1.830	1.547	2.164	1.299	1.157	1.459
Diabetes						
No	Ref.			Ref.		

	Case fatality 8-28 days			Case fatality 29 days-1 year		
	Estimated OR	95 % CI of OR		Estimated OR	95 % CI of OR	
Yes	1.596	1.361	1.873	1.493	1.344	1.657
Smoking						
No	Ref.			Ref.		
Yes	1.030	0.840	1.264	1.271	1.144	1.412
No information	2.098	1.673	2.629	1.450	1.235	1.702
Type of stroke						
Hemorrhagic	Ref.			Ref.		
Ischemic	0.578	0.495	0.676	0.845	0.750	0.952
Unspecified	0.636	0.414	0.976	0.853	0.660	1.102

Table 3. Proportions of patients prescribed with different types of medication on discharge from hospital, within different income groups and education levels. Only patients who survived the first 29 days after stroke are included.

		Income group				Highest attained education level			
Type of medication	Patient selection	Low	Middle	High	P	Primary school	Secondary school	University	P
Antihypertensive	All patients	69.9	70.5	69.6	0.244	73.4	68.6	65.6	<0.001
Statins	Only ischemic stroke	60.3	62.8	67.3	<0.001	63.2	64.4	63.6	0.145
Antiplatelets	Only ischemic stroke	82.3	82.1	81.1	0.034	82.5	81.6	80.5	0.002
Anticoagulants	Only ischemic stroke and atrial fibrillation	54.8	57.7	64.6	<0.001	57.2	59.8	64.5	0.001

Table 4. Multiple logistic regression modeling the risk of death in 18-74 year old patients 29 days-1 year after stroke. Adjusted for other factors in the table and age, sex, level of consciousness on admission, atrial fibrillation, diabetes, smoking, type of stroke and year of stroke onset. Only patients with date of stroke onset after April 1, 2004 and who did not die before being discharged from hospital are included. Odds ratios with corresponding 95 % CIs are given.

	Case fatality 29 days-1 year		
	Estimated OR	95 % CI of OR	
Highest attained education			
Primary school	Ref.		
Secondary school	0.933	0.808	1.077
University	0.802	0.671	0.959
Income group			
Low	Ref.		
Middle	0.909	0.808	1.022
High	0.733	0.643	0.836
Country of birth			
Sweden	Ref.		
Nordic countries (excl. Sweden)	1.089	0.901	1.316
European countries (excl. Nordic countries and Sweden)	1.075	0.868	1.333
Other countries	0.926	0.583	1.470
Antihypertensive medication at discharge			
No	Ref.		
Yes	0.884	0.790	0.990
Statins at discharge, pat. with ischemic stroke			

	Case fatality 29 days-1 year		
	Estimated OR	95 % CI of OR	
No	Ref.		
Yes	0.459	0.395	0.533
Antiplatelets at discharge, pat. with ischemic stroke			
No	Ref.		
Yes	0.594	0.506	0.697
Anticoagulants at discharge, pat. with ischemic stroke and atrial fibrillation			
No	Ref.		
Yes	0.277	0.207	0.372

LEGENDS TO THE FIGURES

Fig. 1. Cox regression survival curves in 18-74 year old stroke patients. Adjusted for age, sex, stroke severity and stroke subtype. Separate lines for different education groups.

Fig. 2. Cox regression survival curves in stroke patients including all ages. Adjusted for age, sex, stroke severity and stroke subtype. Separate lines for different income groups.