Association of material deprivation with discharge location and length of stay after inpatient stroke rehabilitation: a retrospective, population-based cohort study.

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Abstract:	Background: Low socioeconomic status is associated with increased risk of stroke and worse post-stroke functional status. The aim of this study was to determine whether socioeconomic status, measured by material deprivation, is associated with direct discharge to long-term care or length of stay following inpatient stroke rehabilitation. Methods: A retrospective, population-based cohort study of 18,736 individuals admitted to inpatient rehabilitation in Ontario, Canada after stroke was performed. Community-dwelling adults discharged from acute care with a most responsible diagnosis of stroke between September 1, 2012 and August 31, 2017 and subsequently admitted to an inpatient rehabilitation bed were included. A multivariable logistic regression was used to examine the association between material deprivation quintile and discharge to long-term care and a multivariable negative binomial regression was used to examine the association between material deprivation quintile and rehabilitation length of stay. Results: There was no association between material deprivation and direct discharge to long-term care (P=0.20); however, individuals living in the most deprived areas had a mean length of stay 1.7 days longer than those living in the least deprived areas (P=0.004). This difference remained significant after adjusting for other baseline differences (RR 1.03 [95% CI, 1.01 – 1.06]).

	Interpretation: Individuals living in deprived areas are not at a disadvantage in terms of discharge destination, but have a longer mean inpatient rehabilitation length of stay.

STROBE Statement—Checklist of items that should be included in reports of ***cohort studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	0-1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2
Objectives	3	State specific objectives, including any prespecified hypotheses	2
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up (*b*) For matched studies, give matching criteria and number of exposed and unexposed	3-4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4-5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	3-5
Bias	9	Describe any efforts to address potential sources of bias	
Study size	10	Explain how the study size was arrived at	3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4-5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding (*b*) Describe any methods used to examine subgroups and interactions (*c*) Explain how missing data were addressed (*d*) If applicable, explain how loss to follow-up was addressed (*e*) Describe any sensitivity analyses	5
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	6
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) Summarise follow-up time (eg, average and total amount)	6
Outcome data	15*	Report numbers of outcome events or summary measures over time	

Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (*b*) Report category boundaries when continuous variables were categorized (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	6-7
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9-10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10
Generalisability	21	Discuss the generalisability (external validity) of the study results	10
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	10

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

Association of material deprivation with discharge location and length of stay after inpatient stroke rehabilitation: a retrospective, population-based cohort study.

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Key Words: Outcome, Poverty, Rehabilitation, Social Class, Stroke

Abstract

Background: Low socioeconomic status is associated with increased risk of stroke and worse post-stroke functional status. The aim of this study was to determine whether socioeconomic status, measured by material deprivation, is associated with direct discharge to long-term care or length of stay following inpatient stroke rehabilitation.

Methods: A retrospective, population-based cohort study of 18,736 individuals admitted to inpatient rehabilitation in Ontario, Canada after stroke was performed. Community-dwelling adults discharged from acute care with a most responsible diagnosis of stroke between September 1, 2012 and August 31, 2017 and subsequently admitted to an inpatient rehabilitation bed were included. A multivariable logistic regression was used to examine the association between material deprivation quintile and discharge to long-term care and a multivariable negative binomial regression was used to examine the association between material deprivation quintile and rehabilitation length of stay.

Results: There was no association between material deprivation and direct discharge to long-term care (P=0.20); however, individuals living in the most deprived areas had a mean length of stay 1.7 days longer than those living in the least deprived areas (P=0.004). This difference remained significant after adjusting for other baseline differences (RR 1.03 [95% CI, 1.01 – 1.06]).

Interpretation: Individuals living in deprived areas are not at a disadvantage in terms of discharge destination, but have a longer mean inpatient rehabilitation length of stay.

Introduction

Stroke is a significant cause of disability in Canada and around the world.[1] Although inpatient rehabilitation is essential to an individual's recovery and functional improvement after stroke,[2, 3] some patients will continue to have significant impairments at the time of discharge. In our region, approximately 3.5% of individuals undergoing inpatient rehabilitation for stroke are directly discharged to long-term care.[4] Given that long-term care facilities have high occupancy rates[5] with waitlists ranging from months to years,[6] this may result in a prolonged length of stay and a decreased capacity to admit new patients to inpatient rehabilitation. Furthermore, returning home is a common patient-identified goal.[7]

A 2015 review of the literature, which included several international studies, reported an association between low socioeconomic status and increased risk of stroke, having more severe strokes, and worse post-stroke functional status.[8] However, the role of socioeconomic status on discharge destination, particularly to long-term care, after inpatient stroke rehabilitation is unclear.[9] In order to facilitate a safe discharge home, some patients may require home modifications, the purchase of equipment, or private supports to supplement the often limited government-funded home care services.[10] As a result, one might postulate that socioeconomic status impacts choice of discharge destination following inpatient rehabilitation.

The aim of this study was to determine whether neighborhood material deprivation is associated with (i) direct discharge to long-term care following inpatient rehabilitation for stroke and (ii) increased rehabilitation length of stay.

Methods

Study Design

This was a retrospective, population-based cohort study of community-dwelling adults in Ontario, Canada, who were admitted to inpatient rehabilitation after stroke.

Data Sources and Cohort Selection

Study data were obtained from the multiple datasets at ICES. ICES is an independent, non-profit research institute whose legal status under Ontario's health information privacy law allows it to collect and analyze health care and demographic data, without consent, for health system evaluation and improvement.

The Registered Persons Database and Ontario Marginalization Index database were used for sociodemographic information, the Discharge Abstract Database for comorbidity and acute care data, and the National Rehabilitation Reporting System for rehabilitation information, including pre- and post-stroke living setting and arrangement. These datasets were linked using unique encoded identifiers and analyzed at ICES.

We included Ontario residents who were discharged from an acute care hospital with a most responsible diagnosis of ischemic or hemorrhagic stroke (International Classification of Diseases-10 I63, I64, I60 and I61) between September 1, 2012 and August 31, 2017 who were subsequently admitted to an inpatient rehabilitation bed within +/- 3 days with the rehabilitation client group code 1 (stroke). We restricted the cohort to individuals previously living at home (with or without supports), age 19-100 years inclusive, who had an inpatient rehabilitation length

of stay greater than three days and less than the 99th percentile. Individuals with missing material deprivation data were excluded.

Exposure and Outcomes

Our primary exposure was material deprivation.[11] Material deprivation is one of four dimensions of the Ontario Marginalization Index, a derived ecological-based index that captures differences in marginalization across the province of Ontario.[11, 12] For our observation period, the Ontario Marginalization Index was primarily created using dissemination area data, representing a population of 400-700 persons, from the 2011 and 2016 censuses.[11] The material deprivation dimension indicators include education level, ratio of income from government payments, as well as the proportion of the population who are lone parent families, unemployed, low-income, and living in homes in need of major repair.[11] Geographic units are divided into quintiles with quintile 1 representing the least marginalized 20% of areas in Ontario and quintile 5 representing the most marginalized areas.[11]

The primary outcome was the proportion of individuals discharged from rehabilitation to long-term care. Discharge destination was recorded and categorized as home with health services, home without health services, assisted living, long-term care, acute care, and other / unknown (boarding house, shelter, public place, or unknown). The primary outcome, discharge destination, was then reduced to a binary variable – discharge to long-term care (yes/no). The secondary outcome was inpatient rehabilitation length of stay, defined as inpatient rehabilitation discharge date minus admission date.

Covariates

Potential covariates included age, rurality (rural community = population ≤10 000), Charlson Comorbidity Index ≥2,[13, 14] history of atrial fibrillation,[15] whether the patient received tissue plasminogen activator or was treated on an acute stroke unit, acute care length of stay, pre-stroke living arrangement (alone or not alone), admission Functional Independence Measure score, whether the rehabilitation program was suspended due to a change in medical status (service interruption) or whether the patient was re-admitted to acute care (discharge from and re-admitted to an inpatient rehabilitation bed within 30 days).

Statistical Analysis

Means and standard deviations were calculated for continuous variables and frequencies and proportions for categorical variables. We analyzed between group differences using a one-way ANOVA for continuous variables and a Pearson's chi square test for categorical data. Variables were screened for collinearity defined as a tolerance <0.25. Co-variates for each model were selected using bivariate screening. Variables with a p-value <0.05 were included in the multivariable models. A multivariable logistic regression was used to examine the association between material deprivation and discharge to long-term care and a multivariable negative binomial regression was used to examine the association between material deprivation and rehabilitation length of stay.

Statistical tests were 2-tailed. A p-value of <0.05 was considered statistically significant. Statistical analyses were performed using SAS Enterprise Guide statistical software, version 7.1 (SAS Institute) in a UNIX environment.

Ethics Approval

The use of data in this project was authorized under section 45 of Ontario's Personal Health Information Protection Act, which does not require additional review by a Research Ethics Board.

Results

A total of 18,736 individuals met our inclusion criteria and were included in the analysis. The number of individuals in each quintile increased as material deprivation increased (least deprived n = 3,068, most deprived n=4,582; Table 1). Individuals living in the most deprived areas were younger (age 19-49, least deprived 5.9%, most deprived 7.3%; age 90+, least deprived 6.6%, most deprived 5.0%; P<0.001); had more co-morbidities (Charlson Comorbidity Index ≥2; least deprived 53.8%, most deprived 60.5%; P<0.001), but less atrial fibrillation (least deprived 15.6%, most deprived 12.0%; P<0.001); were more often living alone prior to their stroke (least deprived 24.0%, most deprived 34.9%; P<0.001); and were less frequently treated with tissue plasminogen activator (least deprived 15.8%, most deprived 13.8%; P=0.011) or on a stroke unit (least deprived 49.2%, most deprived 46.9%; P=0.026). Admission Functional Independence Measure scores were similar across deprivation quintiles.

Outcomes

As shown in Tables 2 and 4, there was no association between material deprivation and direct discharge to long-term care. However, when we examined all possible discharge destinations,

individuals living in the most deprived areas were less frequently discharged to assisted living (4.9% vs 6.8%; P=0.001) compared to the least deprived group (Table 3).

Although the median length of stay was the same across deprivation quintiles, mean length of stay increased as material deprivation increased (P=0.004). Individuals living in the most deprived areas had a mean length of stay 1.7 days longer than those living in the least deprived areas. In the adjusted model, being in the most deprived group was associated with a statistically significant longer length of stay compared to the least deprived group (RR 1.03 [95% CI, 1.01 – 1.06]; Table 5).

Interpretation

The objectives of this study were to determine whether (i) material deprivation is associated with direct discharge to long-term care following inpatient rehabilitation for stroke and (ii) whether there is an association between material deprivation and inpatient rehabilitation length of stay. Our study demonstrated that there is no association between material deprivation and direct discharge to long-term care following inpatient stroke rehabilitation. However, individuals living in the most deprived areas had a mean length of stay 1.7 days longer than persons in the least deprived areas. To the best of our knowledge, this is the first population-based study to examine the association between material deprivation as a measure of socioeconomic status and direct discharge to long-term care and length of stay after inpatient rehabilitation for stroke.

In the acute care setting, studies examining the association between socioeconomic status and discharge destination after stroke have provided mixed results.[16-21] Notably, studies in the United

States have demonstrated that individuals of lower socioeconomic status are less frequently discharged to inpatient rehabilitation and more frequently transferred to skilled nursing facilities.[19, 22, 23] Compared to inpatient rehabilitation facilities, skilled nursing facilities typically provide fewer hours of therapy per week and have less specialized staff, a longer length of stay (average length of stay 32 vs 15 days), and fewer regulations, which results in lower-cost care.[24, 25] Admission to skilled nursing facilities does not result in the same degree of patient functional improvements as inpatient rehabilitation hospitals.[26] In comparison, a 2013 Canadian study examined 11,050 individuals admitted to acute care with ischemic stroke or transient ischemic attack and found no association between neighborhood income quintile and rate of discharge to inpatient rehabilitation. [21]

In a universal health care system where inpatient rehabilitation is well resourced, it is possible that socioeconomic status has minimal impact on final discharge destination. Similar to our study, an Australian study found no association between the Index of Economic Resources, a measure of income and economic wealth, and discharge destination following inpatient rehabilitation.[27] In contrast, Nguyen et al.,[28] in the United States, demonstrated that individuals with Medicare, compared to private health insurance, were more likely to be discharged to a skilled nursing facility as opposed to home following inpatient acute care rehabilitation. The need for further institutionalization following their inpatient rehabilitation stay was considered a negative outcome.

Although material deprivation was not associated with direct discharge to long-term care in our study, there were subtle differences in final discharge destination across deprivation quintiles.

The frequency of discharge to assisted living increased as deprivation quintile decreased (least deprived 6.8%, most deprived 4.9%). In Canada, assisted living facilities typically provide services such as meals, housekeeping, laundry, and some degree of personal assistance; however, unlike long-term care, the cost of assisted living is typically paid for by the resident.[5] There was no difference in the frequency of discharge home with or without health services across quintiles.

The association of socioeconomic status on length of stay may be influenced by health care funding and insurance for hospital care. A study from Singapore, where rehabilitation is not fully publicly funded, demonstrated that patients in partially-subsidized beds (versus beds fully paid for by the patient) had a shorter length of stay, which the authors felt was at least partially a reflection of the ability of patients and families to pay for the balance.[29] In our study, length of stay increased as deprivation quintile increased. However, this increase was partially accounted for by other baseline factors (e.g. living alone pre-stroke and greater comorbidity). Nevertheless, given that the cost of an inpatient rehabilitation bed after stroke is over $600 CDN / day,[30] it is important to understand the key drivers of increased length of stay for individuals living in the most deprived areas. Future studies could consider exploring whether English language proficiency;[31] barriers to caregiver training, such as transportation and time;[32] and health literacy[33] are potential drivers of increased length of stay in this population.

Limitations

Although we used a well-described explanatory variable shown to be associated with worse health outcomes,[12] the index has limitations. The Ontario Marginalization Index is an ecological, not individual, measure of socioeconomic status and is prone to possible ecological fallacy; a

person's deprivation quintile based on their location of residence may not reflect their individual socioeconomic status.[34, 35] Although relationships described using ecological measures and individual-level indicators are often consistent, it is important to note that our results reflect associations with living in a deprived area, not individual socioeconomic status.[35] Furthermore, our study examined persons who were admitted to inpatient rehabilitation and was not designed to examine potential associations between material deprivation and acceptance to inpatient rehabilitation from acute care. Finally, given differences in health care system funding, the applicability of our findings to other settings, particularly those without universal publicly funded hospital care is unclear.

Conclusion

Individuals undergoing inpatient rehabilitation after stroke with low socioeconomic status, as measured by material deprivation, are not at a disadvantage in terms of discharge destination, but have longer mean inpatient rehabilitation lengths of stay.

Funding

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Conflicts-of-Interest / Disclosures

This study was supported by ICES, which is funded by an annual grant from the Ontario Ministry of Health and Long-Term Care (MOHLTC). The opinions, results and conclusions

reported in this paper are those of the authors and are independent from the funding and data sources. No endorsement by ICES or the Ontario MOHLTC is intended or should be inferred. Parts of this material are based on data and/or information compiled and provided by CIHI. However, the analyses, conclusions, opinions and statements expressed in the material are those of the author(s), and not necessarily those of CIHI.

Data Availability

The dataset from this study is held securely in coded form at ICES. While data sharing agreements prohibit ICES from making the dataset publicly available, access may be granted to those who meet pre-specified criteria for confidential access.

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Tables

Table 1. Baseline Characteristics by Material Deprivation Quintile

	Deprivation Quintile						
Factor	1 (least) N=3068	2 N=3411	3 N=3723	4 N=3952	5 (most) N=4582	Total N=18,736	P-value
Age in years at admission, n (%)							
19-49	182 (5.9)	193 (5.7)	209 (5.6)	227 (5.7)	333 (7.3)	1144 (6.1)	
50-59	332 (10.8)	405 (11.9)	440 (11.8)	482 (12.2)	767 (16.7)	2426 (12.9)	
60-69	612 (19.9)	692 (20.3)	829 (22.3)	906 (22.9)	1060 (23.1)	4099 (21.9)	<0.001
70-79	830 (27.1)	944 (27.7)	1002 (26.9)	1044 (26.4)	1153 (25.2)	4973 (26.5)	
80-89	909 (29.6)	987 (28.9)	1017 (27.3)	1081 (27.4)	1040 (22.7)	5034 (26.9)	
90+	203 (6.6)	190 (5.6)	226 (6.1)	212 (5.4)	229 (5.0)	1060 (5.7)	
Female, n (%)	1352 (44.1)	1574 (46.1)	1730 (46.5)	1858 (47.0)	2100 (45.8)	8614 (46.0)	0.155
Stroke type, n (%)							
Ischemic	2637 (86.0)	2912 (85.4)	3230 (86.8)	3449 (87.3)	4005 (87.4)	16233 (86.6)	0.045
Hemorrhagic	431 (14.0)	499 (14.6)	493 (13.2)	503 (12.7)	577 (12.6)	2503 (13.4)	

Proportion of ischemic stroke patients who received tissue plasminogen activator, n (%)	417 (15.8)	447 (15.4)	502 (15.5)	461 (13.4)	551 (13.8)	2378 (14.6)	0.011
Proportion treated on an acute stroke unit, n (%)	1509 (49.2)	1627 (47.7)	1738 (46.7)	1792 (45.3)	2148 (46.9)	8814 (47.0)	0.026
Acute care length of stay, mean (SD)	12.2 (13.4)	12.2 (12.3)	11.8 (12.8)	12.4 (14.3)	12.4 (13.7)	12.2 (13.4)	0.235
Charlson comorbidity index, n (%)							
0 or 1	1416 (46.2)	1512 (44.3)	1652 (44.4)	1660 (42.0)	1810 (39.5)	8050 (43.0)	<0.001
≥ 2	1652 (53.8)	1899 (55.7)	2071 (55.6)	2292 (58.0)	2772 (60.5)	10686 (57.0)	
Atrial fibrillation, n (%)	478 (15.6)	499 (14.6)	549 (14.7)	611 (15.5)	550 (12.0)	2687 (14.3)	<0.001
Rural, n (%)	244 (8.0)	427 (12.5)	585 (15.7)	611 (15.5)	380 (8.3)	2247 (12.0)	<0.001
Admit living arrangement, n (%)							
Alone	735 (24.0)	847 (24.8)	939 (25.2)	1119 (28.3)	1601 (34.9)	5241 (28.0)	<0.001
Not alone	2333 (76.0)	2564 (75.2)	2784 (74.8)	2833 (71.7)	2981 (65.1)	13495 (72.0)	
Rehab admit Functional Independence Measure, mean (SD)							

Motor	47.4 (19.9)	46.1 (19.6)	46.1 (19.8)	46.8 (19.6)	47.1 (19.5)	46.7 (19.7)	0.021
Cognitive	24.2 (7.0)	24.3 (7.0)	24.4 (7.0)	24.5 (7.0)	24.2 (7.0)	24.3 (7.0)	0.42
Total	71.6 (23.2)	70.5 (23.0)	70.5 (23.2)	71.2 (23.1)	71.3 (22.8)	71.0 (23.1)	0.151
Total admission Functional Independence Measure, n (%)							
>80	1127 (36.8)	1176 (34.6)	1327 (35.8)	1419 (36.0)	1668 (36.5)	6717 (36.0)	
40 – 80	1640 (53.6)	1850 (54.5)	1982 (53.5)	2133 (54.1)	2431 (53.3)	10036 (53.8)	0.512
<40	293 (9.6)	368 (10.8)	396 (10.7)	389 (9.9)	465 (10.2)	1911 (10.2)	
≥1 Service interruptions, n (%)	184 (6.0)	202 (5.9)	208 (5.6)	215 (5.4)	264 (5.8)	1073 (5.7)	0.844
≥1 Readmissions to acute, n (%)	107 (3.5)	128 (3.8)	142 (3.8)	101 (2.6)	156 (3.4)	634 (3.4)	0.018

Table 2. Proportion Discharged to Long-term Care and Length of Stay by Deprivation Quintile (N=18,736)

Factor	Deprivation Quintile					P-value
	1 (least)	2	3	4	5 (most)	
Discharge to long-term care, n (%)	242 (7.9)	243 (7.1)	303 (8.1)	315 (8.0)	394 (8.6)	0.20
Length of stay						
mean (SD)	31.0 (19.4)	31.4 (20.1)	31.6 (20.4)	32.1 (21.3)	32.7 (21.3)	0.004*
median (IQR)	28.0 (16.0-41.0)	28.0 (16.0-42.0)	28.0 (16.0-42.0)	28.0 (16.0-42.0)	28.0 (17.0-42.0)	0.09†

* ANOVA

† Kruskal-Wallis

Table 3. Association of Material Deprivation and Discharge Destination Following Inpatient Rehabilitation (N=18,736)

Discharge destination, n (%)	Deprivation Quintile					P-value
	1 (least)	2	3	4	5 (most)	
Long-term care	242 (7.9)	243 (7.1)	303 (8.1)	315 (8.0)	394 (8.6)	0.001
Home with paid health services	1454 (47.4)	1684 (49.4)	1810 (48.6)	1933 (48.9)	2173 (47.4)	
Home without health services	917 (29.9)	945 (27.7)	1011 (27.2)	1126 (28.5)	1380 (30.1)	
Assisted living	210 (6.8)	212 (6.2)	236 (6.3)	200 (5.1)	222 (4.9)	
Acute care	144 (4.7)	190 (5.6)	214 (5.8)	234 (5.9)	249 (5.4)	
Other / unknown	101 (3.3)	137 (4.0)	149 (4.0)	144 (3.6)	164 (3.6)	

Table 4. Adjusted Odds Ratio of Direct Discharge to Long-term Care from Inpatient Rehabilitation (N=18,664)*

Characteristic	OR (95% CI)
Material deprivation quintile	
Quintile 1 (least)	Ref
Quintile 2	0.86 (0.70 – 1.04)
Quintile 3	1.02 (0.84 – 1.23)
Quintile 4	1.00 (0.83 – 1.21)
Quintile 5 (most)	1.07 (0.89 – 1.28)
Female	0.92 (0.82 – 1.04)
Age in years at admission	
19-49	Ref
50-59	1.46 (0.99 – 2.15)
60-69	**1.79 (1.25 – 2.58)**
70-79	**1.94 (1.35 – 2.77)**
80-89	**2.09 (1.46 – 2.99)**
90+	**2.46 (1.66 – 3.65)**
Proportion admitted to an acute stroke unit	**1.24 (1.11 – 1.39)**
Acute care length of stay	**1.00 (1.00 – 1.01)**
Charlson comorbidity index ≥ 2	**1.17 (1.04 – 1.32)**
History of atrial fibrillation	1.05 (0.90 – 1.22)
Rural	**0.54 (0.44 – 0.66)**

Living alone pre-admission	**2.03 (1.79 – 2.29)**
Total admission Functional Independence Measure	**0.95 (0.94 – 0.95)**
≥1 service interruptions	0.85 (0.69 – 1.05)

*72 observations deleted due to missing variables

† c = 0.826

Table 5. Adjusted Relative Risk for Increasing Length of Stay (N=18,664)*

Characteristic	Adjusted RR (95% CI)
Material deprivation quintile	
Quintile 1 (least)	Ref
Quintile 2	0.99 (0.96 – 1.01)
Quintile 3	1.00 (0.97 – 1.02)
Quintile 4	1.02 (0.99 – 1.04)
Quintile 5 (most)	**1.03 (1.01 – 1.06)**
Acute care length of stay	**1.00 (1.00 – 1.00)**
Ischemic stroke	**0.97 (0.95 – 1.00)**
Proportion admitted to an acute stroke unit	**0.92 (0.91 – 0.94)**
Total admission Functional Independence Measure	**0.98 (0.98 – 0.98)**
Charlson comorbidity index ≥ 2	**1.02 (1.00 – 1.03)**
Pre-admission living arrangement	
Not alone	Ref
Alone	**1.12 (1.10 – 1.14)**
≥1 service interruptions	**1.34 (1.29 – 1.38)**

* 72 observations deleted due to missing values

† Deviance = 1.04