Association Between Socioeconomic Deprivation and Functional Impairment After Stroke

The South London Stroke Register

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Background and Purpose—Previous findings of the association between socioeconomic deprivation and functional impairment after stroke are inconsistent. There is a lack of data on long-term association. We assessed the association and differences by age, sex, prestroke comorbidities, and stroke phenotypes.

Methods—We examined data from the South London Stroke Register cohort of 1995 to 2011, recording all first-ever strokes in patients of all ages in South London. A total of 2104 patients were alive at 3 months after stroke. Socioeconomic deprivation was measured using the index of multiple deprivation based on patient postcodes, and functional impairment after stroke was defined as a Barthel index of <15.

Results—At 3 months after stroke, 643 patients had functional impairment (30.6%; 95% confidence interval, 28.6%–32.5%). Compared with the first quartile of index of multiple deprivation (the least deprived), multivariate-adjusted odds ratios for functional impairment in patients with the second, third, and fourth quartiles were 1.29 (95% confidence interval, 0.94–1.76), 1.33 (0.97–1.82), and 1.78 (1.31–2.43), overall P=0.004. The association was significant in patients aged ≥65 years (corresponding odds ratios were 1.49 [1.02–2.17], 1.21 [0.83–1.75], and 1.94 [1.34–2.81]; P=0.003); in women, P=0.008, in patients who do not have prestroke comorbidities, P=0.009, and in patients with ischemic stroke, P<0.001, but not significant in their counterpart patients. There were similar patterns of the associations of socioeconomic deprivation with impairment at 3 years after stroke.

Conclusions—There are significant inequalities in short- and long-term functional recovery after stroke. General socioeconomic improvement, targeting groups at high risk of functional impairment is likely to reduce inequality in functional recovery after stroke. **(*Stroke*. 2015;46:800-805. DOI: 10.1161/STROKEAHA.114.007569.)**

Key Words: comorbidity ■ epidemiology ■ hemorrhage ■ ischemia ■ sex ■ socioeconomic status ■ stroke recovery

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Stroke is a major public health problem as the population is ageing in the world. During the past 2 decades, the burden of stroke has increased from the fifth rank to the third,[1] and stroke remains the second cause of death.[2] There is evidence that people with socioeconomic deprivation (SED) have an increased incidence of stroke and a higher mortality after stroke.[3,4] However, it is unclear whether SED is associated with functional impairment after stroke. Previous studies examining the association were of small sample size and had insufficient adjustment for potential confounders, showing conflicting findings.[5–8] There is a lack of data on the SED effect on long-term functional impairment after stroke. Although it is known that older or female patients are more likely to have SED and functional impairment after stroke in comparison with their counterparts,[8] it is unclear whether the effect of SED on functional recovery after stroke differs by age and sex. Recent data[9] showed that in patients with stroke, the prevalence of prestroke comorbidities, such as atrial fibrillation, has decreased during the past 2 decades. It is unknown whether the effect of SED on functional recovery after stroke is different among patients with and without these comorbidities. Although the number of patients with primary hemorrhagic stroke is increasing globally, no study has examined the association of SED with functional impairment after hemorrhagic stroke. In this study, we investigated the effect of SED on functional impairment after stroke in a long-term follow-up of population-based stroke register. We examined differences in the effect in terms of patients' age, sex, prestroke comorbidities, and stroke subtypes.

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Methods

Data Collection

The study population was derived from the South London Stroke Register (SLSR).[10] The SLSR methodology has been fully described before.[10,11] In brief, the SLSR is an ongoing prospective population-based stroke register set up in January 1995, recording all first-ever strokes in patients of all ages living in 22 electoral wards in Lambeth and Southwark (total population at the 2011 census were 357 308) in South London. Stroke case ascertainment and data collection have been described in detail elsewhere.[10,11] Data collected between January 1995 and December 2011 were used in this analysis.

Sociodemographic Characteristics

According to patients' postcode of residence at the time of stroke, we calculated the index of multiple deprivation (IMD) 2007[12] to measure the baseline SED for each patient. IMD is a composite measure of relative deprivation at a small-area level (called lower super output areas) covering an average population of 1500 people. The overall index aggregates 38 indicators covering 7 dimensions of deprivation weighted as follows: income (22.5%), employment (22.5%), health and disability (13.5%), education, skills, and training (13.5%), barriers to housing and services (9.3%), crime (9.3%), and living environment (9.3%). The IMD is better suited to measuring change over time because the lower super output area boundaries remain fixed over time (unlike electoral wards). The smaller mean population (typically 1500 as opposed to 6000 people in electoral wards) improves the population homogeneity and reduces grouping of residents with differing levels of deprivation.[13] The 32 482 lower super output areas in England were ranked in the ascending order of the deprivation score. The IMD scores range from 1 to 100 (categorized into quintiles in the analyses); higher scores indicate more deprived areas.

Risk Factors Before Stroke

Data of hypertension (general practice or hospital records of high blood pressure >140 mm Hg systolic or >90 mm Hg diastolic), myocardial infarction, atrial fibrillation, peripheral vascular disease, previous transient ischemic attack, diabetes mellitus, and current smoking status were collected. Barthel index (BI) before stroke was collected from the hospital records or from our interview team using a standard questionnaire. Living conditions were recorded to measure the social network and contact.

Case Mix

The diagnosis of stroke, using the World Health Organization clinical definition, was verified by a study clinician, and patients were examined within 48 hours of being notified to the SLSR where possible. We obtained the clinical details at the time of maximal impairment. Case severity variables included Glasgow Coma Scale, dichotomized to <13 (severe/moderate) and ≥13 (mild), and BI at 7 to 10 days after stroke, urinary incontinence, swallow impairment, speech deficit, and motor deficit.

Stroke Subtypes

Classification of the pathological subtypes (cerebral infarction, primary intracerebral hemorrhage, and subarachnoid hemorrhage) was based on results from ≥1 of the following: brain imaging, cerebrospinal fluid analysis, or necropsy examination. Cases without pathological confirmation of stroke subtypes were unclassified.

Acute Care After Stroke

Patients were classified as (1) not admitted to hospital, (2) admitted to stroke unit, (3) >50% of stay on stroke unit, (4) brain imaging, and (5) swallow test.[14]

Follow-Up of the Cohort

Follow-up data were collected by validated postal codes or face-to-face interviews with patients or their carers.[10] Patients were assessed at 3 months and annually after stroke. All follow-up assessments included in this study were completed by December 31, 2011. We estimated rehabilitation therapy provision for those with recorded deficits and appropriate management of clinical risk factors. Outcome measures included the activity of daily living using the BI, health-related quality of life measured with the SF-12, cognitive impairment using the mini-mental state examination or abbreviated mental test, and anxiety and depression using the hospital anxiety and depression scale. We assessed the functional impairment after stroke using the BI, which was grouped to <15 (severe/moderate disability), 15 to 19 (mild disability), and 20 (independent). All interviewers underwent regular standardized training in the use of the different scales. The vital status of the cohort members is monitored via Office for National Statistics.

Statistical Analysis

The median score of IMD was examined according to sociodemographics, risk factors, severity of stroke, and processes of care, using a nonparametric Kruskal–Wallis test. To examine the association of SED with functional impairment, we divided patients into 4 groups according to the quartiles of the IMD score. We refer to quartile 1 as most affluent and quartile 4 as most deprived. We used multivariate-adjusted logistic regression models to compute odds ratios and their 95% confidence intervals for functional impairment (defined as BI <15) after stroke in relation to SED. In the logistic models, we adjusted for age, sex, ethnicity, living conditions before stroke, years of stroke occurring, admitted to hospital, smoking habits, hypertension, prestroke BI <15, prestroke comorbidities (scored from myocardial infarction, atrial fibrillation, ischemic attack, and diabetes mellitus), prestroke primary prevention medications (scored from antihypertensives, lipids, and anticoagulants), stroke subtype, Glasgow coma scale, speech deficit, and acute care, including hospital admission, stroke unit admission, and >50% of stay on stroke unit. We further analyzed data stratified by age, sex, prestroke comorbidities, and stroke subtype. In each of the subgroups, we divided patients into 4 parts according to the quartiles of the IMD score and examined the association of SED with functional impairment. We analyzed the data of functional recovery 3 months and 3 years after stroke separately. All analyses were performed using Stata, version 13 (StataCorp, College Station, TX).

Ethics

Patients or their relatives gave written informed consent to participate in the study. Ethical approval was from the ethics committees of Guy's and St Thomas' Hospital Trust, King's College Hospital, Queens Square, and Westminster Hospital (London).

Results

From January 1, 1995, to December 31, 2011, 4414 people with first-ever stroke were registered, of whom 1171 (26.5%) died before 3 months, 2128 (48.2%) had a 3-month assessment, and 1115 (25.3%) were lost to follow up (declined, not traced in time, or moved away). In the 3-month assessment, 2109 had BI measured, of whom 2104 had IMD scores for analysis. High IMD scores were significantly associated with black ethnicity, admission to King's College hospital, and having no atrial fibrillation. The associations with later years of stroke occurring, diabetes mellitus, myocardial infarction, and admission to stroke unit were at borderline significant. Other factors in Table I in the online-only Data Supplement were not significantly related to the IMD score.

Table 1 shows the number and adjusted odds ratio of functional impairment in patients across 4 groups of the quartiles of the IMD score. Baseline SED was associated with functional impairment 3 months and 3 years after stroke. The effect magnitude in 3 months after stroke was similar to that in 3 years after stroke.

Table 1. Number and Adjusted OR* of Functional Impairment (BI) Among Patients With Stroke Across 4 Groups of the Index of Multiple Deprivation Score: South London Stroke Register of 1995 to 2011

	All Stroke Patients			
Patient With Different SED (Quartile)	Impairment Case/ Patients (%)	OR*	95% CI	*P* Value†
Three months after stroke, n=2104				
Q-1	138/532 (25.9)	1.00	…	0.004
Q-2	162/535 (30.3)	1.29	0.94–1.76	
Q-3	160/516 (31.0)	1.33	0.97–1.82	
Q-4	183/521 (35.1)	1.78	1.31–2.43	
Three years after stroke, n=1106				
Q-1	67/303 (22.1)	1.00	…	0.046
Q-2	65/280 (23.2)	1.09	0.70–1.69	
Q-3	76/269 (28.3)	1.34	0.87–2.07	
Q-4	81/254 (31.9)	1.77	1.15–2.72	

BI indicates Barthel index; CI, confidence interval; OR, odds ratio; and SED, socioeconomic deprivation.

*Adjusted for age, sex, ethnicity, living conditions before stroke, years of stroke occurring, admitted to hospital, smoking habits, hypertension, prestroke BI <15, comorbidities (scored from diabetes mellitus, myocardial infarction, atrial fibrillation, previous transient ischemic attack, and peripheral vascular disease), primary prevention medications (scored from antihypertensive, lipid, and anticoagulant use), stroke subtype, Glasgow coma, speech deficit, hospital admission, stroke unit admission, and >50% of stay on stroke unit.

†Overall *P* value for the variable.

In data analysis stratified by age, we found that there was more significant association of SED with poor functional recovery in older patients; compared with the first quartile of IMD, patients with the fourth quartile of IMD had an odds ratio of ≈2 having functional impairment at 3 months and 3 years after stroke. In patients aged <65 years, there was no association of SED with functional recovery (Table 2). In women but not men, functional recovery was significantly affected by SED (Table 3).

Table 4 shows the number and adjusted odds ratio of functional impairment across 4 groups of the quartiles of IMD scores in patients with and without prestroke comorbidities. In patients without prestroke comorbidities, functional recovery was inversely associated with SED, whereas in patients with prestroke comorbidities, there was not such association (Table 4). Analyzing the data of stroke subtypes separately, we observed a significant association in ischemic stroke but not in hemorrhagic stroke (Table 5).

Discussion

In this large population-based stroke register cohort, we found that SED was associated with short- and long-term functional impairment after stroke. The effect of SED on poor functional recovery was predominant among patients who are older, women, have ischemic stroke, or do not have prestroke comorbidities. The overall effect on functional impairment is stronger than that on mortality after stroke.[11]

Previous studies report inconsistent findings related to the association between SED and functional impairment after stroke. Analysis of the Berlin Stroke Register data,[8] including patients with ischemic stroke only, showed that patients with the lower education level had lower rated of functional recovery 3 months after stroke, which could not fully be explained by variations in the patients' clinical and demographic characteristics, including severity of stroke. In the Netherlands, following-up 465 patients with all types of stroke, van den Bos et al[5] suggested that the low education level was associated with an increased risk of disability 6 months after stroke but not significantly in disability 3 years after stroke. Putman et al[7] analyzed the data of 419 consecutive patients with stroke

Table 2. Number and Adjusted OR* of Functional Impairment (BI) at 3 Months and 3 Years After Stroke in Young and Older Patients Across 4 Groups of the Index of Multiple Deprivation Score: South London Stroke Register of 1995 to 2011

	Stroke Onset Aged ≥65				Stroke Onset Aged <65			
Patient With Different SED (Quartile)	Impairment Case/ Patients (%)	OR*	95% CI	*P* Value†	Impairment Case/ Patients (%)	OR*	95% CI	*P* Value†
Three months after stroke	n=1402				n=702			
Q-1	109/353 (30.9)	1.00	…	0.003	27/179 (15.1)	1.00	…	0.119
Q-2	132/349 (37.8)	1.49	1.02–2.17		29/173 (16.8)	1.32	0.68–2.59	
Q-3	123/352 (34.9)	1.21	0.83–1.75		40/177 (22.6)	2.13	1.12–4.05	
Q-4	145/348 (41.7)	1.94	1.34–2.81		38/173 (22.0)	1.62	0.83–3.13	
Three years after stroke	n=691				n=415			
Q-1	49/199 (24.6)	1.00	…	0.026	17/106 (16.0)	1.00	…	0.674
Q-2	49/168 (29.2)	1.35	0.78–2.32		16/102 (15.7)	1.10	0.45–2.71	
Q-3	56/170 (32.9)	1.44	0.84–2.47		21/107 (19.6)	1.49	0.61–3.62	
Q-4	62/154 (40.3)	2.27	1.33–3.87		19/100 (19.0)	1.64	0.64–4.20	

BI indicates Barthel index; CI, confidence interval; OR, odds ratio; and SED, socioeconomic deprivation.

*Adjusted for age, sex, ethnicity, living conditions before stroke, years of stroke occurring, admitted to hospital, smoking habits, hypertension, prestroke BI <15, comorbidities (scored from diabetes mellitus, myocardial infarction, atrial fibrillation, previous transient ischemic attack, and peripheral vascular disease), primary prevention medications (scored from antihypertensive, lipid, and anticoagulant use), stroke subtype, Glasgow coma, speech deficit, hospital admission, stroke unit admission, and >50% of stay on stroke unit.

†Overall *P* value for the variable.

Table 3. Number and Adjusted OR* of Functional Impairment (BI) at 3 Months and 3 Years After Stroke in Women and Men Across 4 Groups of the Index of Multiple Deprivation Score: South London Stroke Register of 1995 to 2011

	Women				Men			
Patient With Different SED (Quartile)	Impairment Case/ Patients (%)	OR*	95% CI	*P* Value†	Impairment Case/ Patients (%)	OR*	95% CI	*P* Value†
Three months after stroke	n=997				n=1107			
Q-1	76/252 (30.2)	1.00	…	0.008	62/280 (22.1)	1.00	…	0.466
Q-2	91/248 (36.7)	1.55	0.98–2.45		68/279 (24.4)	1.13	0.72–1.78	
Q-3	91/250 (36.4)	1.54	0.98–2.43		71/272 (26.1)	1.14	0.73–1.80	
Q-4	104/247 (42.1)	2.18	1.39–3.42		80/276 (29.0)	1.43	0.91–2.23	
Three years after stroke	n=501				n=605			
Q-1	33/134 (24.6)	1.00	…	0.115	34/169 (20.1)	1.00	…	0.208
Q-2	39/126 (31.0)	1.50	0.78–2.89		24/149 (16.1)	0.72	0.37–1.40	
Q-3	38/123 (30.9)	1.25	0.63–2.47		39/149 (26.2)	1.23	0.68–2.22	
Q-4	47/118 (39.8)	2.18	1.13–4.19		35/138 (25.4)	1.41	0.77–2.58	

BI indicates Barthel index; CI, confidence interval; OR, odds ratio; and SED, socioeconomic deprivation.

*Adjusted for age, sex, ethnicity, living conditions before stroke, years of stroke occurring, admitted to hospital, smoking habits, hypertension, prestroke BI <15, comorbidities (scored from diabetes mellitus, myocardial infarction, atrial fibrillation, transient ischemic attack, and peripheral vascular disease), primary prevention medications (scored from antihypertensive, lipid, and anticoagulant use), stroke subtype, Glasgow coma, speech deficit, hospital admission, stroke unit admission, and >50% of stay on stroke unit.

†Overall *P* value for the variable.

and found conflicting results: during inpatient stay, functional impairment 6 months after stroke was associated with a low educational level but not low income, and between discharge and 6 months post stroke, no significant association was found with the educational level and income. The inconsistencies may be because of the studied sample variations and SED methodology used. Our study, which used a composite socioeconomic status indicator, has shown that the associations of SED with short- and long-term functional recovery after stroke are significant.

As far as we know, this study has included the largest number of patients for determining the effect of SED on functional impairment. Compared with previous studies, we adjusted more variables for analysis, including prestroke disability,

Table 4. Number and Adjusted OR* of Functional Impairment (BI) at 3 Months and 3 Years After Stroke Among Patients With and Without Prestroke Comorbidities Across 4 Groups of the Index of Multiple Deprivation Score: South London Stroke Register of 1995 to 2011

	Comorbidities† Before Stroke							
	No				Yes			
Patient With Different SED (Quartile)	Impairment Case/ Patients (%)	OR*	95% CI	*P* Value‡	Impairment Case/ Patients (%)	OR*	95% CI	*P* Value‡
Three months after stroke	n=1165				n=939			
Q-1	64/296 (21.6)	1.00	…	0.009	73/235 (31.1)	1.00	…	0.140
Q-2	77/290 (26.6)	1.39	0.89–2.17		81/237 (34.2)	1.34	0.84–2.14	
Q-3	92/289 (31.8)	1.75	1.13–2.72		73/236 (30.9)	1.12	0.71–1.79	
Q-4	97/290 (33.5)	2.02	1.30–3.12		86/231 (37.2)	1.66	1.05–2.63	
Three years after stroke	n=631				n=463			
Q-1	32/180 (17.8)	1.00	…	0.032	35/124 (28.2)	1.00	…	0.873
Q-2	33/154 (21.4)	1.39	0.75–2.59		30/118 (25.4)	0.90	0.46–1.78	
Q-3	42/153 (27.5)	1.63	0.88–3.02		36/123 (29.7)	1.06	0.55–2.04	
Q-4	47/144 (32.6)	2.48	1.34–4.59		34/110 (30.9)	1.20	0.62–2.33	

BI indicates Barthel index; CI, confidence interval; OR, odds ratio; SED, socioeconomic deprivation. and TIA, transient ischemic attack.

*Adjusted for age, sex, ethnicity, living conditions before stroke, years of stroke occurring, admitted to hospital, smoking habits, hypertension, prestroke BI <15, comorbidities (scored from diabetes mellitus, myocardial infarction, atrial fibrillation, TIA, and peripheral vascular disease), primary prevention medications (scored from antihypertensive, lipid, and anticoagulant use), stroke subtype, Glasgow coma, speech deficit, hospital admission, stroke unit admission, and >50% of stay on stroke unit.

†Including myocardial infarction, atrial fibrillation, TIA, and diabetes mellitus.

‡Overall *P* value for the variable.

Table 5. Number and Adjusted OR* of Functional Impairment (BI) at 3 Months and 3 Years After Ischemic or Hemorrhagic Stroke Across 4 Groups of the Index of Multiple Deprivation Score: South London Stroke Register of 1995 to 2011

	Ischemic Stroke				Hemorrhagic Stroke			
Patient With Different SED (Quartile)	Impairment Case/ Patients (%)	OR*	95% CI	*P* Value†	Impairment Case/ Patients (%)	OR*	95% CI	*P* Value†
Three months after stroke	n=1739				n=277			
Q-1	114/435 (26.2)	1.00	…	0.0008	20/72 (27.8)	1.00	…	0.141
Q-2	134/437 (30.7)	1.38	0.97–1.95		19/67 (28.4)	1.03	0.34–3.18	
Q-3	138/440 (31.4)	1.32	0.93–1.86		24/69 (34.8)	2.06	0.69–6.21	
Q-4	160/427 (37.5)	2.01	1.43–2.84		17/69 (24.6)	0.56	0.16–1.90	
Three years after stroke	n=899				n=166			
Q-1	55/239 (23.0)	1.00	…	0.205	12/52 (23.1)	1.00	…	0.289
Q-2	52/222 (23.4)	1.13	0.70–1.85		8/39 (20.5)	0.60	0.09–4.11	
Q-3	64/230 (27.8)	1.18	0.73–1.90		11/39 (28.2)	3.38	0.47–24.2	
Q-4	68/208 (32.7)	1.65	1.02–2.67		10/36 (27.8)	1.67	0.19–14.5	

BI indicates Barthel index; CI, confidence interval; OR, odds ratio; and SED, socioeconomic deprivation.

*Adjusted for age, sex, ethnicity, living conditions before stroke, years of stroke occurring, admitted to hospital, smoking habits, hypertension, prestroke BI <15, comorbidities (scored from diabetes mellitus, myocardial infarction, atrial fibrillation, previous transient ischemic attack, and peripheral vascular disease), primary prevention medications (scored from antihypertensive, lipid, and anticoagulant use), stroke subtype, Glasgow coma, speech deficit, hospital admission, stroke unit admission, and >50% of stay on stroke unit.

†Overall *P* value for the variable.

comorbidities, preventive medications, and severity of stroke. The findings still showed that the effect of SED on poor function recovery was significant in short- and long-term follow-up. This article is the first to report the strong effect in older patients and women, which are of timely importance. Older age and female sex are associated with SED, and after stroke, they are more likely to have poor functional recovery.[8] Within these populations, SED further worsened functional recovery. Interestingly, it is unclear why there is a significant association in patients who do not have prestroke comorbidities but not in those who do have prestroke comorbidities. One of the possible reasons is that patients with prestroke comorbidities were already targeted for healthcare inequalities before stroke. Other reason could be that patients with prestroke comorbidities may die quickly during the acute stage of stroke and would not survive for increased disability in the follow-up.

To our knowledge, this article is the first study of examining the association of SED with functional impairment recovery after hemorrhagic stroke. Although the effects of SED on mortality in patients with both ischemic and hemorrhagic strokes are significant,[3,15,16] we did not find a significant association between SED and functional impairment after hemorrhagic stroke. One of the reasons for this could be that the functional recovery after hemorrhagic stroke was more dependent on the size and place of hemorrhage and progression of disease. More work is required to further examine the association of SED with functional impairment after hemorrhagic stroke in a larger cohort study.

Our previous SLSR studies showed that although black and minority ethnicity patients are more deprived than their white counterparts, they are more likely to have stroke care[14] and have longer survival.[17] This may result in more black and minority ethnicity patients living with the expense of increased disability. In this study, we adjusted for ethnicity and still found a significant effect of SED on short- and long-term functional recovery after stroke. In data analysis stratified by ethnicity, we found that the association of SED with functional impairment was similar between black and white patients.

There are some limitations in this study. First, the number of patients with hemorrhagic stroke is small, which may lead to a low statistical power to detect the association of SED with function recovery. Second, we did not have data of the National Institutes of Health (NIH) score for adjustment in the analysis. Although we adjusted for the subtype and severity of stroke, which may be associated with the NIH score, the confounding effect of the NIH score on the association between SED and functional impairment after stroke may be not entirely removed. However, based on the significant findings, it seems unlikely that additional adjustment for the NIH score would substantially change the association between SED and functional impairment. Further research on the association is needed, including NIH score adjustment. Third, like other studies,[18] we did not adjust for processes of care variables, recurrent stroke, and incident comorbidities which occurred during the follow-up. They may have some confounding effects on our findings. But we did adjust for prestroke comorbidities, severity of stroke, and stroke care at baseline, and thus, the residuals of the confounding effects from these factors would be minimized.

In conclusion, our study reported the significant associations of SED with both short- and long-term functional impairment after stroke. The associations were independent of stroke risk factors, severity, and acute care. There are stronger associations of SED with poor functional recovery after stroke in older people, women, and patients who do not have prestroke comorbidities. The findings have shown evidence that inequalities in functional recovery after stroke exist in England. Innovative acute and long-term stroke care strategies targeting people with SED are required, particularly in older and female patients. Reducing SED and tackling health

inequality will improve short- and long-term functional recovery after stroke.

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Disclosures

None.

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Association Between Socioeconomic Deprivation and Functional Impairment After Stroke: The South London Stroke Register

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Supplemental Table I. Characteristics of patients and median score of Index of Multiple Deprivation (IMD): SLSR of 1995-2011

	Patients		IMD score		
Variable	*n*	*%*	Median	Interquartile range (IQR)	P value†
Socio-demography					
Age (years)					
0-64	*702*	*33.4*	37.2	31.7-41.8	0.863
65-74	*597*	*28.4*	37.7	32.5-42.0	
75-84	*562*	*26.7*	37.7	32.6-41.8	
85+	*243*	*11.6*	37.3	32.9-41.2	
Sex					
Men	*1107*	*52.6*	37.5	32.5-41.9	0.770
Women	*997*	*47.4*	37.3	32.5-41.8	
Ethnicity					
White	*1466*	*69.7*	37.2	32.5-41.6	<0.001
Black‡	*490*	*23.3*	39.0	32.6-44.5	
Asian/other‡	*133*	*6.3*	37.9	31.2-41.4	
Unknown	*15*	*0.7*	37.3	32.9-41.2	
Living conditions before stroke					
Private accommodation, living alone	*656*	*31.2*	37.8	32.9-41.8	0.497
Private accommodation, living with others	*1058*	*50.3*	37.2	32.2-41.9	
Sheltered home	*101*	*4.8*	37.5	33.1-42.7	
Nursing home or Other Residential home 5= Nursing home 6=	*58*	*2.8*	38.9	32.9-45.7	

Community hospital 7= Private hospital 8= Other					
Unknown	*231*	*11.0*	36.7	31.5-41.4	
Barthel Index (BI) prior to stroke					
BI>=15, no disability	*1981*	*94.2*	37.5	32.5-41.8	0.492
BI<15, disability	*93*	*4.4*	36.9	30.2-41.5	
Unknown	*30*	*1.4*	39.2	30.5-46.2	
Year of stroke					
1995-1997	*574*	*27.3*	37.2	32.2-41.7	0.057
1998-2000	*374*	*17.8*	37.0	31.7-41.5	
2001-2003	*366*	*17.4*	37.2	32.9-41.5	
2004-2007	*439*	*20.9*	37.7	32.6-42.7	
2008-2011	*351*	*16.7*	39.0	33.1-43.4	
Admitted to hospital					
St Thomas' hospital	*1189*	*56.5*	37.7	32.5-41.8	0.042
King's College hospital	*474*	*22.5*	38.7	31.7-44.5	
St George's hospital	*201*	*9.6*	36.4	33.7-40.7	
Other hospitals in UK or abroad	*44*	*2.1*	34.9	32.5-41.5	
Unknown	*196*	*9.3*	36.6	31.6-41.6	
Risk factors prior to stroke					
Smoking status					
Never-	*749*	*35.6*	37.3	31.7-41.8	0.483
Former-	*616*	*29.3*	37.3	32.5-41.8	
Current-	*696*	*33.1*	37.2	33.1-41.8	
Unknown	*43*	*2.04*	39.6	33.5-44.5	
Hypertension					

No	*694*	*33.0*	37.3	32.2-41.8	0.831
Yes	*1350*	*64.2*	37.5	32.6-41.8	
Unknown	*60*	*2.9*	36.3	32.0-41.6	
Myocardial infarction					
No	*1822*	*86.6*	37.3	32.2-41.8	0.105
Yes	*213*	*10.1*	38.4	34.1-42.4	
Unknown	*69*	*3.3*	39.0	33.5-43.0	
Atrial fibrillation					
No	*1766*	*83.9*	37.7	32.6-42.0	0.003
Yes	*271*	*12.9*	35.7	31.7-40.9	
Unknown	*67*	*3.2*	39.0	32.9-43.4	
Peripheral vascular disease					
No	*1922*	*91.4*	37.5	32.4-41.9	0.242
Yes	*69*	*3.3*	35.6	31.3-41.1	
Unknown	*113*	*5.4*	37.2	33.5-41.5	
Transient ischemic attack (TIA)					
No	*1764*	*83.8*	37.3	32.2-41.8	0.888
Yes	*281*	*13.4*	37.7	32.9-41.7	
Unknown	*59*	*2.8*	37.5	33.6-41.9	
Diabetes					
No	*1652*	*78.5*	37.2	32.2-41.8	0.060
Yes	*396*	*18.8*	38.7	33.1-42.6	
Unknown	*56*	*2.7*	38.8	34.7-43.1	
Stroke subtype					

Infarction	*1739*	*82.7*	37.3	32.5-41.8	0.998
Haemorrhage	*277*	*13.2*	37.7	31.7-42.2	
Unclassified	*34*	*1.6*	38.2	30.8-40.6	
Unknown	*54*	*2.6*	36.4	33.1-41.7	
Prevention medications prior to stroke					
Anti-hypertenive					
No	*1140*	*54.2*	37.2	32.2-41.8	0.246
Yes	*839*	*39.9*	37.8	32.9-41.9	
Unknown	*125*	*5.9*	37.3	32.2-41.5	
Lowering-lipid					
No	*1453*	*69.1*	37.3	32.6-42.0	0.984
Yes	*333*	*15.8*	38.4	32.6-41.8	
Unknown	*318*	*15.1*	37.2	31.7-41.7	
Anticoagulants					
No	*1878*	*89.3*	37.3	32.5-41.9	0.889
Yes	*63*	*3.0*	38.7	30.3-43.2	
Unknown	*163*	*7.8*	37.8	32.9-41.6	
Stroke severity (Case mix)					
Glasgow coma scale score					
≥13	*1777*	*84.5*	37.3	32.4-41.8	0.688
<13 (impaired consciousness)	*275*	*13.1*	37.7	32.9-42.2	
Unknown	*52*	*2.5*	37.2	32.4-40.7	
Incontinence					
No	*1379*	*65.5*	37.5	32.5-41.8	0.985
Yes	*667*	*31.7*	37.5	32.5-42.0	

Unknown	*58*	*2.8*	36.3	31.5-43.4	
Speech deficit					
None	*732*	*34.8*	38.1	32.6-42.2	0.192
Yes	*1185*	*56.3*	37.3	32.6-41.8	
Unknown	*187*	*8.9*	36.4	31.3-41.4	
Motor deficit					
None	*410*	*19.5*	37.5	31.7-41.8	0.974
Present	*1666*	*79.2*	37.3	32.6-41.8	
Unknown	*28*	*1.3*	36.7	32.8-41.9	
Stroke acute care					
Hospital admission					
No	*242*	*11.5*	37.2	31.5-41.6	0.196
Yes	*1862*	*88.5*	37.5	32.4-41.9	
Stroke unit admission §					
No	*688*	*37.0*	37.2	32.4-41.5	0.060
Yes	*1134*	*60.9*	37.7	32.5-42.5	
Unknown	*40*	*2.2*	38.9	34.3-45.7	
>50% of stay on stroke unit §					
No	*819*	*44.0*	37.3	32.5-41.6	0.119
Yes	*853*	*45.8*	37.8	32.6-42.7	
Unknown	*190*	*10.2*	37.3	32.2-41.9	
Brain imaging					
No	*45*	*2.1*	37.5	31.3-40.6	0.614
Yes	*1980*	*94.1*	37.4	32.5-41.8	
Unknown	*79*	*3.8*	37.7	32.9-43.2	

Swallow test §					
No	*92*	*4.9*	37.5	32.5-41.9	0.985
Yes	*1766*	*94.8*	37.6	33.1-41.8	
Unknown	*4*	*0.2*	38.5	34.6-40.1	

† p value was for patients who had available data for characteristic variables.
§ Analysis limited to patients admitted to hospital.