Socioeconomic Status and Stroke Outcome

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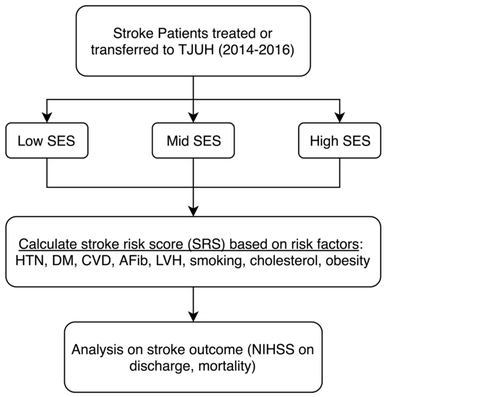
Introduction

- International studies find socioeconomic status (SES) to be predictive of functional impairment after stroke.[1,2]
- Lower socioeconomic status (LSE) is associated with increased severity of stroke onset, higher incidence of risk factors, and worse outcomes.[3]
- We sought to confirm the predictive significance of SES on acute ischemic stroke patient outcomes at a large urban, U.S. stroke center.

Background on Stroke

- 5th leading cause of death in the U.S (795,000 per year) with 16% mortality rate[4]
- Major risk factors (hypertension, smoking, high cholesterol, and obesity) are used to calculate an individual's 10-year probability of experiencing stroke.[5,6]
- International studies (London, Thailand, and Denmark) have determined SES to be predictive of stroke incidence and functional impairment severity.[2,7-9]
- Lower socioeconomic status (LSE) was associated with worse outcomes in other countries.

Study Design



Determining SES (U.S. Census Bureau 2014 - Median Household Income)

- Median household income based on zip code were used to represent socioeconomic status (SES).
- 111 unique zip codes were used.
- Patients were ranked by the median income for their zip code and divided into upper, middle, and lower thirds (Table 2).

NIH National Institute of Neurological Disorders and Stroke's 10-year Probability of Stroke

Points	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
Age	55-56	57-59	60-62	63-64	65-67	68-70	71-73	74-76	77-78	79-81	82-84
SBP-untrd		95-106	107-118	119-130	131-143	144-155	156-167	168-180	181-192	193-204	205-216
or SBP-trtd		95-106	107-113	114-119	120-125	126-131	132-139	140-148	149-160	161-204	205-216
Diabetes	No			Yes							
Cigarettes	No			Yes							
CVD	No		Yes								
AF	No					Yes					
LVH	No				Yes						

Table 1: Stroke Risk Score (SRS) point system for females

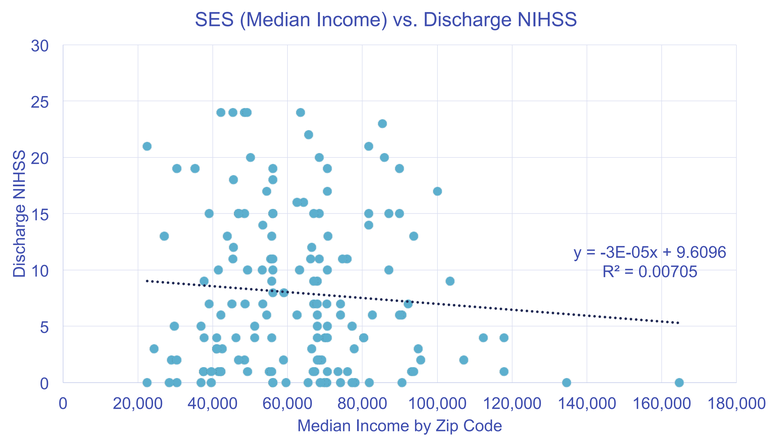
Statistical Analysis

- Demographic and stroke measures were compared across SES groups using ANOVA: Two Factor Without Replication run on XLMine Analysis Toolpak.
- Regression analysis: to ompare SES to SRS, SES to discharge NIHSS, and SRS to discharge NIHSS to determine if SES is predictive of stroke risk, stroke outcome and if stroke risk is predictive of stroke outcome among our cohort.

Outcomes

SES Group	N	Minimum Median Household Income ($)	Maximum Median Household Income ($)
Upper Third	65	70,032	164,773
Middle Third	65	51,211	69,863
Lower Third	64	22,487	50,450

	All patients N = 194		Upper Third N = 65		Middle Third N = 65		Lower Third N = 64		P value
	Mean	*Sd*	*Mean*	*Sd*	*Mean*	*Sd*	*Mean*	*Sd*	
Age	68.83	1.1	70.3	1.8	68.5	1.7	67.6	2.2	<0.0000001
Sex	***N***	***%***	***N***	***%***	***N***	***%***	***N***	***%***	
Male	101	52.0%	33	50.8%	43	66.2%	25	39.0%	-
Female	93	47.9%	32	49.2%	22	33.9%	39	60.9%	<0.01
Race									
Caucasian	138	71.1%	57	87.7%	49	75.3%	33	51.5%	<0.0001
African-American	33	17.0%	4	6.2%	10	15.3%	19	29.6%	<0.001
Asian	6	3.1%	1	1.5%	0	0.0%	4	6.2%	0.22
Unreported	17	8.8%	3	4.6%	6	9.2%	8	12.5%	-
Insurance									
Medicare	72	37.11%	26	40.0%	29	44.6%	17	26.5%	0.06
Medicaid	15	7.73%	4	6.2%	4	6.1%	6	9.3%	0.49
Medicare & Medicaid	27	13.92%	4	6.2%	12	18.4%	12	18.7%	0.11
Private	38	19.59%	16	24.6%	9	13.8%	13	20.3%	0.19
Private & Medicare	36	18.56%	12	18.5%	9	13.8%	15	23.4%	0.37
Uninsured	3	1.55%	2	3.1%	1	1.5%	0	0.0%	0.38
Other	3	1.55%	1	1.5%	1	1.5%	1	1.5%	0.99
Stroke Measures									
	Mean	***Sd***	***Mean***	***Sd***	***Mean***	***Sd***	***Mean***	***Sd***	
SRS	15.25	0.52	15.5	0.93	14.6	0.86	15.7	0.92	0.44
NIHSS Discharge	7.96	0.56	7.2	0.93	8.38	0.89	8.31	1.11	0.59
	N	***%***	***N***	***%***	***N***	***%***	***N***	***%***	
Expired	41	21.13	14	21.54	12	18.46	15	23.44	0.79



Discussion

Demographics:

- Older age of stroke onset observed in higher SES group.
- Younger age of stroke onset observed in lower SES group.
- Women had higher incidence of stroke compared to men in the lower SES group.
- Men had higher incidence of stroke in the middle SES group.
- Stroke incidence was similar for men and women in the upper SES group.
- Stroke incidence among non-Caucasian individuals increased as SES decreased.
  - This may be representative of the SES populations as a whole, where upper SES populations are composed predominantly of Caucasians.
- Increasing incidence of stroke observed among individuals of minority backgrounds (African-American, Asian) as SES decreased.

Was SES predictive of NIHSS upon discharge?

- No significant relationship observed between SES and NIHSS discharge.
  - Though these relationships have been reported among other studies, this conclusion cannot be made from the findings of this study.

Limitations

- Several limitations to this study relate to study size and patient inclusion criteria.
  - Compared to other large cohort studies conducted around the world, this study analyzes significantly less patients.
  - Many patients were excluded due to lack of hospital data necessary to calculate SRS, determine stroke outcome, or determine SES.

Conclusion

- No significant associations were found between SES and stroke outcome measures.
- However, obvious trends were observed which suggested that LSE correlates with worse stroke outcomes.
- Power analysis showed that at least 400 patients are required to show any significance and thus, further analyses and data collection are needed.
- Currently, SES represented by residential zip code is not associated with increased severity of stroke onset at a large urban U.S. stroke center. Additional data needs to be collected.

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