

# Community-Level Measures of Stroke Knowledge among Children: Findings from Hip Hop Stroke

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*Background:* Community-level determinants of stroke knowledge among children are unknown but could meaningfully impact public stroke education campaigns. We explored for associations between community- and school-level quality measures relative to baseline stroke knowledge among children participating in the Hip Hop Stroke program. *Methods:* Baseline stroke knowledge assessments were performed in 2839 fourth-, fifth-, and sixth-grade students (ages 9-11 years) from November 2005 to April 2014. Knowledge was assessed relative to school performance grade (SPG, graded A-F; a school-level measure determined by the New York City [NYC] Department of Education) and economic need index (ENI, range: 0-2; a community-level, within-school measure of subsidized housing and meals with higher scores indicating more socioeconomic distress). *Results:* Schools studied included those with SPG = B (n = 196), SPG = C (n = 1590), and SPG = D (n = 1053) and mean ENI = .85 (standard deviation: .23). A composite assessment of knowledge, including 4 stroke symptoms (blurred vision, facial droop, sudden headache, and slurred speech), was conducted consistently since 2006. Overall, students correctly identified a mean of 1.74 stroke symptoms (95% confidence interval: 1.70-1.79; possible range: 0-4, expected value of chance response alone or no knowledge = 2). For quartiles of ENI, mean knowledge scores are as follows: ENI<sub>Q1</sub> = 2.00, ENI<sub>Q2</sub> = 2.09, ENI<sub>Q3</sub> = 1.46, and ENI<sub>Q4</sub> = 1.56 (ENI<sub>Q3</sub> and ENI<sub>Q4</sub> versus ENI<sub>Q1</sub>,  $P < .001$ ). For SPG, SPG = B schools: 2.09, SPG = C: 1.83, and SPG = D: 1.56 (SPG = C and SPG = D versus SPG = B schools,  $P \leq .05$ ). *Conclusions:* Children's stroke knowledge was lowest in NYC communities with greater economic need and lower school performance. These findings could guide stroke education campaign implementation strategies. **Key Words:** Stroke—cerebrovascular disease—stroke prevention—health literacy—health education—knowledge translation—socioeconomic position.

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## Introduction

Racial-ethnic disparities in stroke are linked to differential disease burden and morbidity, disease awareness, healthcare access, and quality of care.<sup>1</sup> Each stroke literacy determinant is an important target for intervention. Moreover, poor stroke recognition and delayed emergency medical service activation are targets to impact acute stroke treatment disparities.<sup>2,3</sup>

In communities with low stroke knowledge, children may be an important link to improve stroke outcomes, critically serving as both witnesses of stroke<sup>4</sup> and conduits of stroke education into their homes and communities.<sup>5</sup> Since 2005, the Hip Hop Stroke (HHS) program has been a vehicle for delivering key stroke concepts, including stroke symptom recognition and development of urgent action plans, to at-risk communities.<sup>4,7</sup> HHS programs are delivered in a diverse array of neighborhoods, with locations differing by geographic, racial-ethnic, economic, and other social factors. An unmet need in improving the efficiency in delivering stroke literacy programs is identifying which areas may have lower stroke knowledge at a neighborhood level, and thus a greater need for stroke education programs. To this end, we explored data from HHS to identify community- and school-level factors that may predict stroke knowledge in children. We hypothesized that school-based metrics of academic performance and socioeconomic status could serve as predictors of baseline student stroke knowledge.

## Methods

### Data Sources

HHS delivers stroke education through culturally tailored, multimedia, interactive programs in local elementary schools over 3 consecutive days. Baseline stroke knowledge of fourth-, fifth-, and sixth-grade New York City (NYC) schoolchildren (ages 9-11 years old) enrolled in HHS programs between November 2005 and April 2014 was assessed; data for these analyses included only these baseline stroke knowledge assessments, collected prior to delivery of any health education content or materials. Seven questions were consistently asked over the entire study period, including stroke localization, the term "brain attack" as another name for stroke, and 5 possible stroke signs or symptoms (including facial droop, speech impairment, visual loss, sudden headache, and distractor symptom—chest pain). Urgent action plan (calling 911) was not included in the present study because the assessment was purposely changed midway through the study period to better reflect behavioral change.

Metrics of school quality and those related to the schools' neighborhood economics were obtained from the NYC Department of Education (DOE) school quality reports,

and were annually published publicly from 2006 to 2013. For the present study, we used data from the 2009-2010 academic calendar year (study midpoint) in our analysis, as these metrics do not substantially change year to year. We focused on 2 NYC DOE school quality indicators, the school performance grade (SPG) and the economic need index (ENI), which represent summative measures of school performance and neighborhood economics, respectively. SPG is provided as a letter grade (A-F) and reflects the proportion of students who reach or exceed proficiency on statewide English and Math exams, as well as the students' average score on these exams. The ENI (range: 0-2) is calculated as the proportion of students in temporary housing, plus the proportion of students eligible for public assistance or free lunch. A higher ENI indicates greater economic need and socioeconomic distress.

### Data Analysis

To assess stroke literacy, 2 stroke symptom composite scores were created: (1) a 4-symptom composite including only stroke symptoms such as blurred vision, facial droop, slurred speech, and headache; and (2) a 5-symptom composite additionally including the chest pain distractor. For analyses, schools were divided into quartiles of ENI; SPG was assessed based on letter grade. Students' scores on individual questions and symptom composites were compared by SPG and ENI using chi-square and regression analyses. Analyses were performed using SPSS v 22.0 (SPSS, Inc., Chicago, IL). This research was accomplished following approval from the Columbia University Medical Center Institutional Review Board (IRB); the NYC DOE Institutional Review Board approved the individual studies comprising the final dataset.

## Results

Students included in the analyses attended 18 distinct NYC public schools. Of those schools, eight were in Manhattan, six were in Queens, two were in the Bronx, and two were in Brooklyn. In 14 of the schools (78%), over 95% of enrolled students were black or Hispanic. Overall, 2839 student baseline stroke assessments were collected, including 196 students attending 2 SPG = B schools, 1590 students attending 8 SPG = C schools, and 1053 students attending 9 SPG = D schools (none were SPG = A schools). The mean ENI was .85 (range: .18-1.06, standard deviation: .23; see Table 1).

Students in schools with the greatest ENI (highest socioeconomic distress) were significantly less likely to correctly identify stroke symptoms (Fig 1; 4-symptom composite, mean number of symptoms correctly identified by quartile: ENI<sub>Q1</sub> = 2.00, ENI<sub>Q2</sub> = 2.09, ENI<sub>Q3</sub> = 1.46, ENI<sub>Q4</sub> = 1.56; ENI<sub>Q1</sub> versus ENI<sub>Q3</sub> or ENI<sub>Q4</sub>,  $P < .001$ ).

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