RE-THINKING STUDENT SAFETY BY PREEMPTING PUBLIC HEALTH POLICIES TO PREVENT YOUTH VIOLENCE: HOW SAFE ARE 'SAFE ROUTES TO SCHOOL'?

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YOUTH EXPOSURE TO GUN VIOLENCE

A Public Health Approach to Gun Violence

- The odds of dying from assaultive violence are approximately 8.89 times higher, and the death rate 17.14 times higher, for Black males between 14 - 24 compared to their White male counterparts.[1]
- Despite the urgent need to address disparities in violence victimization, and develop effective interventions targeted to neighborhoods heavily affected by gun violence, public health efforts have been inadequate.

Gun Violence Near Schools

- Developing a better understanding about the public health impact of violence exposure in areas where youth frequent, such as schools, represents a first step in addressing its causes and consequences and reducing existing disparities.
- For youth in violence-prone areas, schools constitute a "neighborhood-based spatial exposure" that impacts students' ability to learn.[2]
- However, studies have focused on shootings that happen in schools rather than shootings that take place near schools.
- One study of gun violence near Boston Public Schools (BPS) found that the average and median distance from any school to the nearest shooting incident was 0.22 and 0.20 miles, respectively. 56% of BPS had at least one shooting within 400 meters (~ a 5-minute walk if traveling by foot).[3]

Safe Routes to School Program (SRTS)

- The SRTS[4] program has three main goals:
  1. to enable and encourage children, including those with disabilities, to walk and bicycle to school;
  2. to make bicycling and walking to school a safer alternative, thereby encouraging a healthy and active lifestyle; and
  3. to facilitate the planning, development, and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption, and air pollution in the vicinity (within 2 miles) of primary and middle schools
- A safe route to school should be ensuring that children who walk to school are safe, which includes reducing the potential to be exposed to violence, either as a victim or witness, but are they?

RESEARCH QUESTIONS

- (RQ1a) Which school district in the city of Chicago has the most gun violence? (RQ1b) How many schools in that district expose youth to high levels of gun violence? How close, on average, is gun violence from each school?
- (RQ2a) How much gun violence do students encounter w/in a 5- and 15- minute walk to or from school (accessibility)?
- (RQ2b) How long does a student have to walk before encountering gun violence (cumulative cutoff)?
- (RQ3) Are safe routes to schools exposing children to gun violence exposure?

METHODOLOGY

The R statistical computing environment[5] was used to conduct this analysis.

Data

- The following data was downloaded from the Chicago Open Data Portal:
  - *ShotSpotter*[6] data on gunfire incidents. ShotSpotter consists of audio sensors implemented throughout a targeted area (on top of buildings and in similar discrete locations), which detect the sound of gunfire and triangulate its location.
  - Census block, Safe Routes to School, and school boundary data was downloaded from the Chicago open data portal
- The analysis was conducted for the 2021-2022 school year (SY).

METHODOLOGY

Statistical Analysis

- Buffers were created around each school boundary for 100-meter intervals and the number of gun violence incidents within each buffer was computed
- The *sf* package in R[8] was used to calculate the centroid of each home census block
- A pedestrian street network was created using OpenStreet Map[9] data.
- A cumulative opportunity measure was used to count the number of gun violence incidents that can be reached on foot for 5- and 15- minute travel times. Travel times were computed using Rapid Realistic Routing on Real-world and Reimagined Network routing (*r5r*).[10]
- Travel time estimates between home locations and schools were computed. The travel time matrix was used to calculate "accessibility" to gun violence, or the ease with which students encounter gun violence on the 5-min walk to school (based on a walking speed of 3.6 km/hour).
- Only gun violence incidents taking place during school hours were selected (i.e., M-F; 6am – 6pm). The Chicago school calendar for the 2021-2022 school year was used to remove all days when students were not present at school (e.g., due to a holiday, teacher conferences, etc.).

RESULTS

Table 1. Gun violence w/in 100-meter interval walking distances to school

Distance	Mean	SD	CV	IQR	# schools	Min	Max
400m	11.97	7.01	0.586	8.0	100%	3	38
300m	7.17	5.32	0.742	6.0	96.9	1	30
200m	3.94	3.54	0.898	4.0	76.6	2	18
100m	1.40	1.54	1.097	2.0	48.4	1	6

Note. SD = standard deviation; CV = coefficient of variation; IQR = interquartile range; Min = minimum; Max = maximum

(RQ1a): Englewood School District had the most shooting incidents during the 2021-2022 school year

- According to the Chicago Dept. of Education[11], 70% of students are chronically absent, 69.4% identify as Black/African American, 23.6% have moved schools in the past year, and 96% are classified as low-income.

(RQ1b): On average, there were 12 shooting incidents within 400 meters from school (~5 min walking time) during school hours for the SY 2021-22; all schools in Englewood were w/in 400 meters of gun violence (Table 1).

Table 2. Average Number of gun-related events students encounter on their walk to school, and average travel time before encountering gun violence

	Mean	SD	CV	IQR	Min	Max
Gun Violence encounters	9.591	3.163	0.330	4.627	2.611	20.928
Min travel time to closest gun violence	3.812	3.193	0.838	3.0	0	23

Note. SD = standard deviation; CV = coefficient of variation; IQR = interquartile range; Min = minimum; Max = maximum

(RQ2a): Students attending Englewood schools were exposed to about 9 incidents of gun violence, on average during SY2021-2022. The minimum number of gun violence exposures was 2.61, and the maximum was 20.93 (Table 2).

(RQ2b): The minimum travel time to reach an incident of gun violence was 3.81 minutes when traveling by foot.

(RQ3) The maps to the right illustrates the severity of gun violence exposure for students in Englewood. The evidence strongly suggests that the 'Safe Routes' program may not shield students from violence; in fact, several of the 'safe routes' had multiple incidents of gun violence located directly on the route.

RESULTS

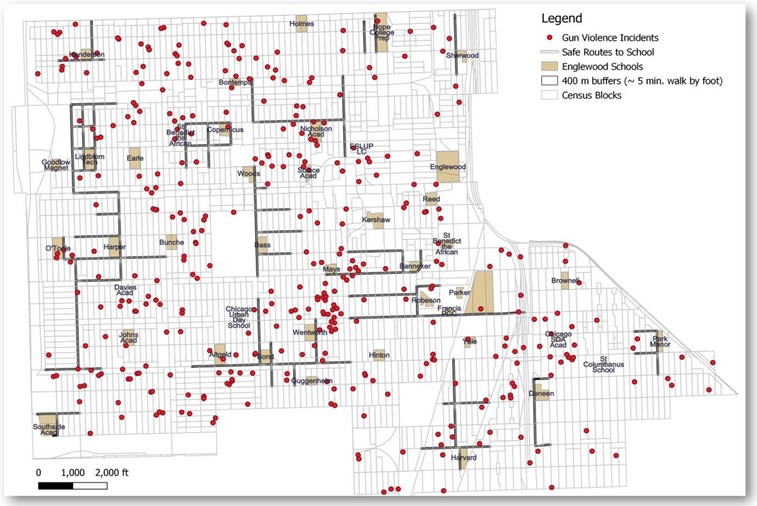

Fig 1. Map of gun violence incidents, school boundaries, and safe routes to school. Notice that guns were fired directly within the safe routes to school boundaries.

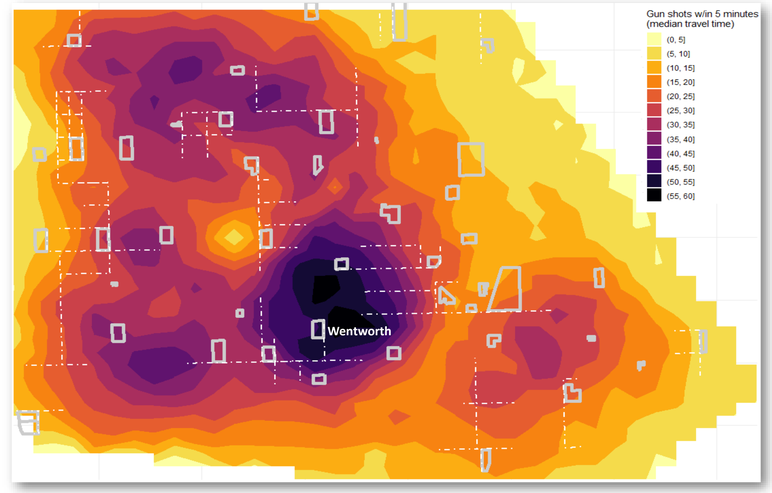

Fig 2. Map of gun violence accessibility w/in a 5-min walking time to school from home locations, school boundaries and safe routes to school. Boundaries are represented by polygons and routes represented by dashes. Darker colors represent more accessibility to gun violence within a 5-min. walk. Gun violence is most accessible to students attending Wentworth Elementary school.

POLICY IMPLICATIONS/FUTURE DIRECTIONS

- A public health framework aims to reduce and prevent firearm injury, including death, while promoting the well-being of populations.
- Public health policies do not explicitly incorporate violence as a possible outcome or unintended consequence. Public health interventions, such as "SRTS' may need to be preempted by programs that consider the potential impact of gun violence exposure in vulnerable neighborhoods.
- The SRTS program may achieve its goals better in neighborhoods where walking does not increase the risk of gun violence exposure.
- Innovative data and analyses are critical to illustrate how public health policies obscure spatial inequities in youth activity spaces. Future research should continue to explore how public health policies differentially impact the health and well-being of vulnerable populations particularly as regards violence exposure.