

An Assessment of Need for Automatic External Defibrillators by Race, Socioeconomic Status, and Region in Pennsylvania Public Schools

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Background

- Sudden cardiac arrest (SCA) occurs when the heart unexpectedly stops with cessation of blood flow to the body and brain.
- If not immediately treated with cardiopulmonary resuscitation (CPR) and/or an automated external defibrillator (AED), sudden cardiac death (SCD) occurs.
- More than 356,000 people** have an out-of-hospital sudden cardiac arrest in the US annually with **~23,000 SCAs occurring in youth**.
- Death occurs in 60-80% before reaching the hospital and **only 10-12% survive overall**.
- Sudden Cardiac Death (SCD) is responsible for 75% of deaths in young athletes.
- 20% of the US population is in a school each school day**.
- One in 70 high schools will have a SCA annually**.
- Schools with AEDs and a cardiac emergency response plan have a **survival rate of 80-89%**.
- It is recommended that a school have at least one AED for every 500 students and at least one in every building**.
- Pennsylvania (PA) Senate Bill 375 will require all PA schools to have at least one AED, CPR and AED staff training, and to practice SCA drills**. This bill was passed by the Education Committee and will be voted on the Senate floor in the fall of 2023.
- Socioeconomic status (SES)** often impacts access to health care, education, and other governmental support programs.
- In schools, free or reduced lunch (FRL) is given to students with family income at or below 130%-185% of poverty level.
- Minority status may reflect SES and disparities in health and education.

Study Aims

- To determine the number of AEDs/school in PA.**
- To determine if there is a correlation between SES and race in PA public schools and the number of AEDs in the school.**

Methods

- We obtained AED data from the Pennsylvania (PA) Department of Education (DOE) Pennsylvania Information Management System (PIMS) 2020-2021 AED Listing for Schools Database which included date of AED placement in the school.
- We obtained school demographic data from the National Center for Education Statistics Public School Characteristics 2021-22 database.
- A study database was created for all PA public schools to include #AEDs/school and school demographics and SES.
- We defined functional AEDs as <8 years old.
- PA schools are divided into 6 geographic regions by PA DOE.
- Data are presented as Mean(SD) and %. STATA 17 used for statistical analysis for descriptive statistics and correlations.

Results

Fig. 1: PA School District Distribution by Region

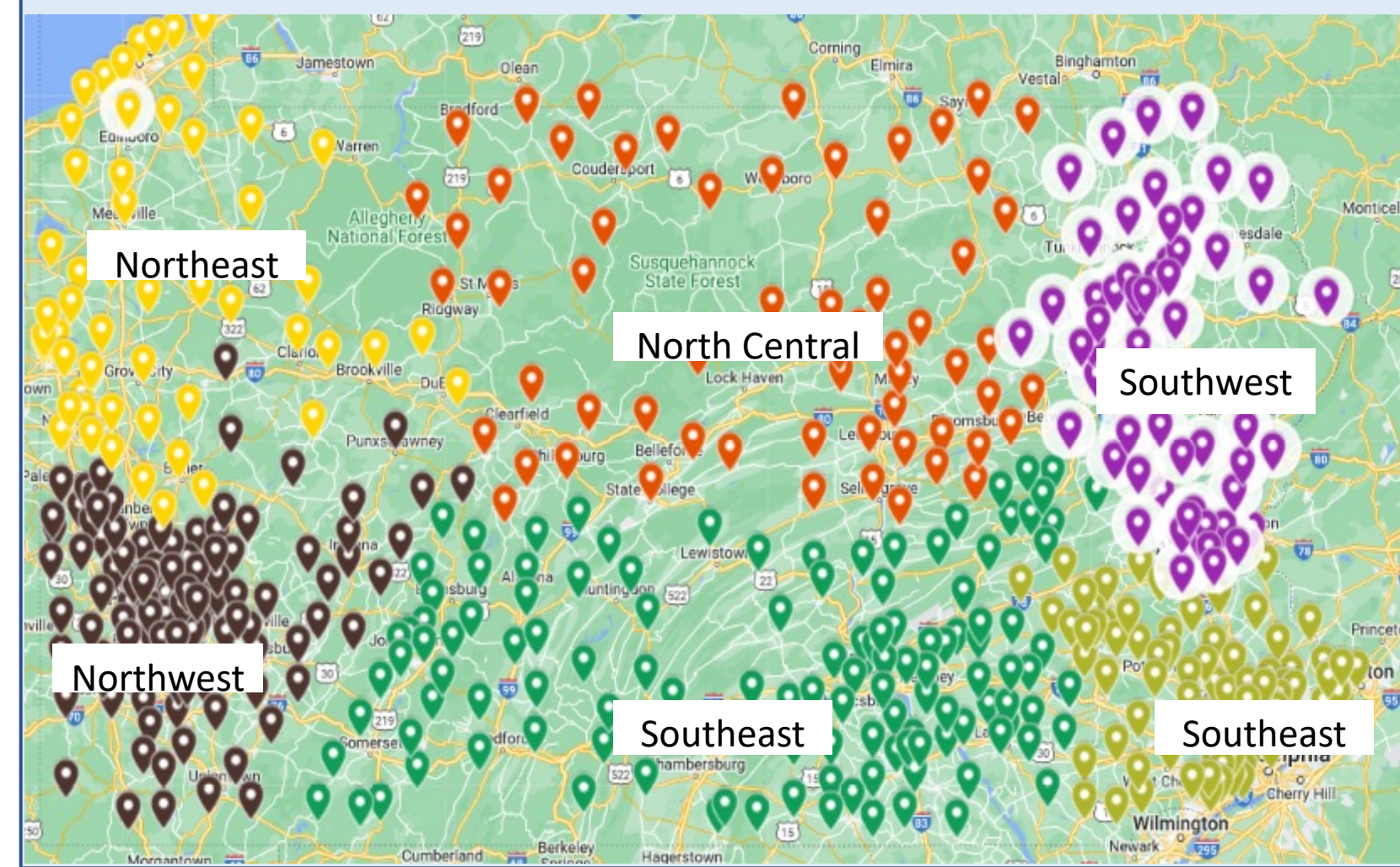


Fig. 2: Number and Percentage of PA Schools with at least one functional AED by Region

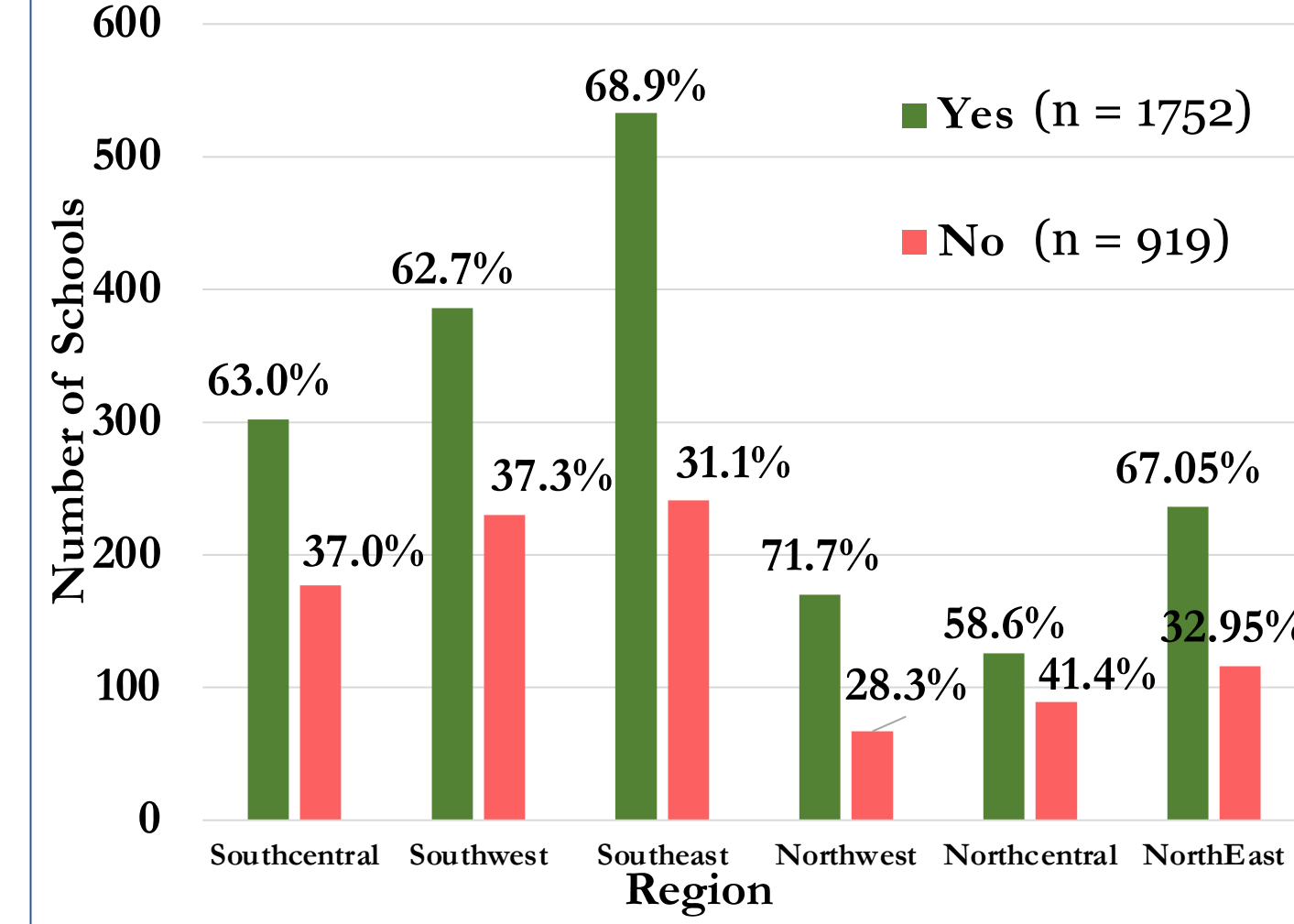


Table 1. School Study Population and Demographic Data by Region

Region		Southeast	South Central	Southwest	Northeast	North Central	Northwest	Total
Race (mean %)	White (%)	47.6	69.4	78.0	64.3	90.2	86.3	67.6
	Black (%)	23.8	7.32	11.1	6.69	1.95	5.09	12.2
	Hispanic (%)	16.3	15.0	2.51	22.2	3.13	2.89	11.4
	Asian (%)	7.02	3.05	2.40	2.27	2.32	2.05	3.61
	Native Hawaiian/Pacific Islander(%)	0.08	0.08	0.08	0.12	0.18	0.13	0.08
	American Indian/Alaskan Native (%)	0.16	0.16	0.13	0.24	0.15	0.26	0.002
	Multiracial (%)	5.03	5.04	5.74	4.12	3.44	4.98	4.92

Table 2 : Number of Schools with AEDs and Free/Reduced Lunch Eligibility (%) by Region

Region	Schools n	Free/Reduced lunch eligibility mean % (SD)	Has at least 1 functional AED Purchased in 2016 or more recently %	Correlation of #AED with FRL
South Central	476	47.0(24.2)	63.0	0.12 (NS)
Southwest	614	52.9(31.9)	62.7	
Southeast	774	54.7 (37.6)	68.9	
Northwest	233	57.2(28.7)	71.7	
North Central	215	52.2 (25.6)	58.6	
Northeast	342	56.0 (28.0)	67.1	
Total	2654	53.8(31.6)	65.6	
Of n=1740 with AED present				

- Of 2654 schools reporting free/reduced lunch, FRL eligibility percentage in the 1740 schools with at least one functional AED is 53.8%.
- The mean of free/reduced lunch eligibility percentage in the 914 schools with no functional AED is 51.8%.
- Schools with higher FRL showed a trend towards more AEDs/School than those without FRL (p=0.12).
- The mean % Black students in the 1751 schools with at least one functional AED is 14.0%, and in the 919 schools with no functional AED is 9.3%
- Schools with higher % Black had more AEDs/school. (p<0.001).
- The mean % White students in the 1751 schools with at least one functional AED is 65.8%, and in the 919 schools with no functional AED is 70.5%
- Schools with higher % White had fewer AEDs/school (p=0.001).

Conclusion

- Overall, 1,752 (65.6%) schools have at least one functioning AED that was purchased on or after Jan 1st, 2016.
- The Southeast region has the highest number of schools with no functioning AEDs, reported at 241 schools, and the highest percentage of school with black population at 23.8%.
- The Northwest region has the highest percentage of schools with at least one functioning AED at 71.7% and the highest mean percentage (57.2%) of free/reduced lunch eligibility.
- SES (by FRL) and minority status did not decrease the number of AEDs/school (p<0.001).

Discussion and Future Research

- Possibly related to funding of schools by both property taxes and state budget, SES, and minority status did not affect or decrease the number of AEDs/school.
- Based on the reported AED age, there are 919 schools that will need to purchase one AED.
- AEDs are distributed unequally across all regions of PA.
- Further studies should be conducted to analyze AED access in rural areas such as the North Central region of PA.
- To prevent disparities by SES, minority status, and urbanicity, our hope is that Senate Bill 375 will ensure each school can acquire an AED through state funding.

Limitations

- AED data is from the 2020-2021 school year. It's possible that some schools have installed AEDs in the past two school years.
- The PIMS database is school-reported and does not have a standardized way to define or collect all necessary information, particularly expiration date of the AEDs, batteries and electrode pads.
- Demographic information should be analyzed by census tract of enrolled students rather than zip code to represent more granular data by student population.

Acknowledgement

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