

Public Health Students Can Use Geographic Information Systems to Make a Positive Impact on Communities

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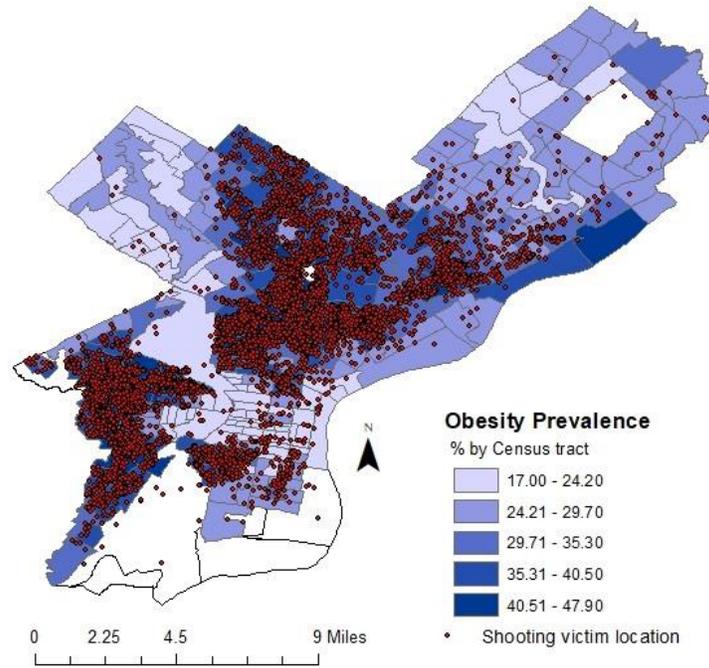
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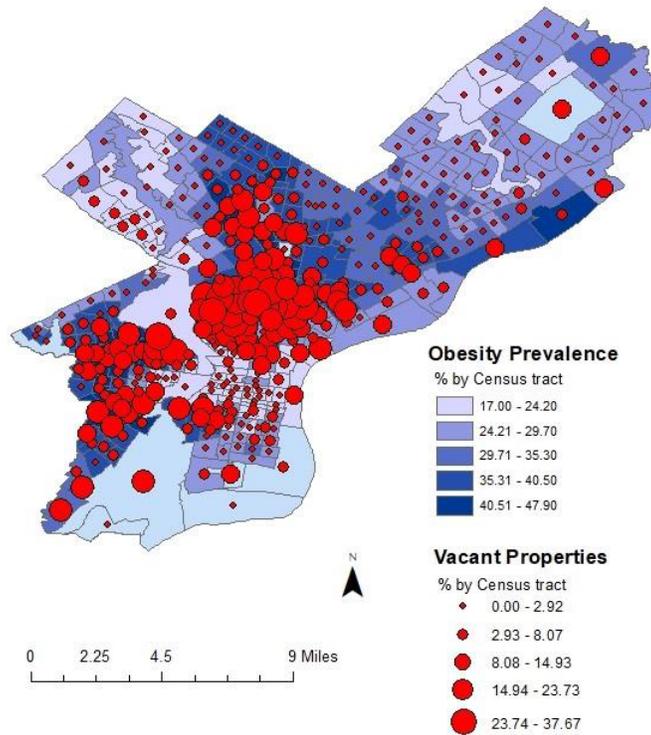
Geographic information systems (GIS) are a framework that can be used to create maps, analyze spatial data, and solve geographic problems.¹⁻³ Implementation of GIS can explore, identify, and illustrate spatial relationships and patterns between geographic variables, in order to inform policies that better the lives of individuals.¹⁻³ For example, GIS recently have been used to examine spatial data on COVID-19 cases, hospitalizations, deaths, and to share that data through maps.⁴⁻⁶ The maps have demonstrated that communities in the Global South continue to suffer higher COVID-19 prevalence because, in part, they do not have equitable access to vaccines compared to the Global North.⁷⁻⁸ Geographic information systems can be used to analyze and then communicate this type of information to the public, which can inform and spur organizing, policy change, and intervention to promote vaccine equity.⁷⁻⁸ For reasons like this, GIS are a valuable skill for public health students to learn and apply to their future careers whether in local, domestic, or global health.

Public health students who are passionate about helping communities should seek opportunities to learn about GIS. I recently had the opportunity to learn more about GIS by participating in the National Institutes of Health (NIH) Short-term Research Experience for Students from Under-represented Populations (STEP-UP) program. This program provides hands-on summer experience for high school and undergraduate students interested in exploring research careers.⁹ Students receive funding through the NIH and have the flexibility of seeking a research mentor whose work aligns with their interests, whether that is lab-based or community-based research. All students are expected to engage in 40 hours of research experience per week for a duration of 10 weeks, and then present their research at the NIH STEP-UP conference at the conclusion of the summer program. During my time in the NIH STEP-UP program, I worked with my research mentor, Krista Schroeder, PhD, RN, and learned about the application of GIS in public health research. Dr. Schroeder is currently conducting a study examining how neighborhood environments and childhood adversity impact obesity risk for adults in Philadelphia, PA. As part of my STEP-UP summer research project, I was able to build off her ongoing research by using GIS to examine the association between measures of neighborhood disorder (i.e., vacant properties and shooting victims) and obesity prevalence (Figures 1-2). As part of my training, I took classes in GIS, met with researchers who study health inequities, dove into the literature about place-based influences on obesity, and worked with Dr. Schroeder to apply what I learned in my independent project. This project offered me an opportunity to learn about GIS, and also provided evidence for inequities in neighborhood environments and obesity throughout the city.



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Figure 1. Obesity Prevalence by Census Tract and Locations of Shooting Victims, Philadelphia, PA, 2018



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Figure 2. Obesity Prevalence and Percentage of Vacant Properties by Census Tract, Philadelphia, PA 2018

As a Syrian immigrant who has seen the direct effects of the Syrian war and is passionate about global health, learning about GIS convinced me that it can be a powerful tool for public health students to affect positive change in the community. Public health students can use GIS to make an impact that better the material conditions of people in vulnerable situations across the globe. Geographic information systems provide a mechanism for analyzing spatial data, and can be used to inform intervention and policies that reduce place-based health inequities. By accessing and analyzing spatial data, students can contextualize public health issues from a lens of historical colonialism and imperialism. For instance, spatial data can be used to demonstrate how factors such as environmental racism, unjust immigration policies, war, and violence are associated with specific health outcomes; these data can then be used to shape associated policies and interventions. Students who are interested in public health can use GIS as a tool to stand in solidarity with oppressed people globally. For example, students can take classes in GIS and use class projects as an opportunity to learn more about public health equity topics of interest. Students can apply GIS to create maps of disparate conditions in local, regional, or global communities and disseminate that information to the public, policy makers, and community partners. Additionally, students can offer their knowledge of GIS when volunteering with community-based organizations whose missions are to improve health outcomes of populations who are marginalized.

Public health students can learn about GIS in multiple ways. For example, they can take a class through their university focused on GIS software, spatial analysis techniques, or theoretical and conceptual underpinnings of geographic research. In addition, students can self-study via free online courses (e.g., ¹⁰⁻¹⁶) or seek out a research program (e.g., NIH STEP-UP)⁹ that connects them with an experienced mentor who uses GIS in their public health research. Students can also take short courses, such as summer intensives, focused on building competence in GIS skills. Knowledge is power, and GIS provide public health students with the tools to identify and communicate geographic disparities in health outcomes.

Disclosures and Conflicts of Interest

The authors have no conflicts of interest to declare.

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Statement of Contributions

Zena Saifo and Krista Schroeder conceptualized this manuscript. Zena Saifo wrote the first draft and Zena Saifo and Krista Schroeder revised the final version of manuscript.