Population Health, Place, and Space: Spatial Perspectives in Chronic Disease Research and Practice

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Journal Title: Preventing Chronic Disease
Volume: Volume 16, Number 9
Publisher: Centers for Disease Control and Prevention | 2019-09-01, Pages E123-E123
Type of Work: Article | Final Publisher PDF
Publisher DOI: 10.5888/pcd16.190237
Permanent URL: https://pid.emory.edu/ark:/25593/v3099

Final published version: http://dx.doi.org/10.5888/pcd16.190237

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Accessed April 24, 2020 10:44 PM EDT
Understanding the role of place and space in shaping the geographic distributions of chronic disease is critical to informing appropriate public health responses for chronic disease prevention and treatment. A geospatial perspective on chronic disease expands the focus of public health efforts beyond the individual, providing insights and guidance for action at the community, regional, and/or national levels. Accordingly, the articles in this special collection advance our understanding of population health dynamics and geospatial disparities for a wide range of chronic disease outcomes across 3 broad themes:

1. Examining connections between community-level characteristics and population health
2. Developing and applying spatial statistical methods and new geospatial tools
3. Using maps and geospatial results to guide program and policy decisions

Examining Connections Between Community-Level Characteristics and Population Health

Geospatial studies are uniquely designed to examine the contextual characteristics of communities that may affect opportunities for chronic disease prevention and treatment. The contextual characteristics addressed in this collection, Population Health, Place, and Space: Spatial Perspectives in Chronic Disease Research and Practice, range from underlying context (such as neighborhood deprivation [1], racial segregation [2], social capital [3], and resiliency [4]) to the built environment (walkability [5,6], park access [7], and healthy restaurants [8]) and environmental exposures (9).

The study comparing cardiovascular disease–resilient neighborhoods with cardiovascular disease–at-risk neighborhoods examines the important, but understudied, concept of neighborhood resiliency as it affects black populations (4). The study of neighborhood risk and pediatric asthma provides additional evidence of the need for interventions that move beyond primary care or clinical settings (1). Through their maps and spatial analyses, these studies reinforce that chronic diseases are not randomly distributed across communities, emphasize that drivers of disease occur at multiple geographic levels, and stress the importance of developing and implementing programs and policies that address the relevant contextual characteristics.

Developing and Applying Spatial Statistical Methods and New Geospatial Tools

This is a time of great advances in the development and application of spatial statistics, spatial tools, spatially referenced data sets, and spatial data visualization — all of which enable public health professionals to more precisely understand and address existing inequities in chronic diseases. Many studies in this collection use state-of-the-art spatial statistics, including Bayesian spatial smoothing (10,11) and the spatial Durbin econometric model (3), along with other advanced spatial analytic techniques, such as hot spot analysis (12) and spatial scan statistics for spatial clustering (13), and trajectory analysis (14). Furthermore, the development of 2 spatial analysis tools is included in this collection – The Peel Walkability Composite Index (6) and the Rate Stabilizing Tool (RST) (11). The Peel Walkability Composite Index uses a diverse range of measures to construct a repeatable measure of neighborhood walkability. The RST responds to the demand for high-quality, local-level estimates of chronic disease, and enables users with...
Using Maps and Geospatial Results to Guide Program and Policy Decisions

Another key theme in this special collection is the use of geospatial data to inform programs and policies for chronic disease prevention and treatment. For example, the authors of a study about walkability state that, “Understanding the capacity of the built environment to facilitate walking for utilitarian purposes allows public health departments to advocate for strategic land use and infrastructure developments that promote an increase in population physical activity levels” (6). Several studies in this collection document geographic disparities in access to care (eg, for chronic disease management [22], blood pressure medication adherence [17], diabetes prevention programs [18], and asthma prevention programs [1,12]), providing compelling guidance about where facilities and services are needed. A unique study demonstrates the use of real-time GIS to develop and update emergency response for chronically ill veterans during Hurricane Irma (23). From an applied perspective, staff members from 4 health departments (Maine Center for Disease Control and Prevention, New Jersey Department of Health, New York State Department of Health, and Cuyahoga County, Ohio, Board of Health) describe the ways in which GIS has become a critical tool (24). Their article provides specific examples of how health departments use maps and spatial analyses to 1) communicate the burden of disease; 2) inform decisions about resource allocation, policy, and priority communities for intervention efforts; 3) develop culturally competent programs; and 4) assist with program planning, monitoring, and evaluation.

By embracing the benefits of GIS, increasing the volume of spatially referenced public health data, and applying a broad range of spatial statistical tools, public health practitioners and investigators are continually pushing the envelope for using geospatial data to inform surveillance, epidemiologic research, program evaluation, resource allocation, and communication for chronic disease prevention and treatment. We invite readers to engage deeply with the geospatial approaches presented in this special collection, to contemplate further advances in understanding how place and space shape the distribution of chronic diseases, and to apply a geospatial perspective to promote health equity and inform public health action for chronic disease prevention and treatment.

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