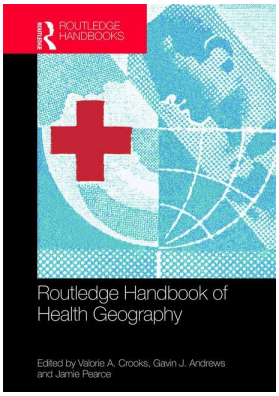

Routledge Handbook of Health Geography

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Practicing health geography in public health

Publication details
https://www.routledgehandbooks.com/doi/10.4324/9781315104584-50
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Published online on: 11 Jun 2018

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PRACTICING HEALTH GEOGRAPHY IN PUBLIC HEALTH

A focus on population-health-intervention research

Mylene Riva and Sarah M. Mah

The affinity between health geography and public health is clear (Curtis, Riva and Rosenberg, 2009; Dummer, 2008). Addressing questions of space, place and scale as shaping health and well-being is crucial to public-health practice and to population-health research and intervention (Dummer, 2008) and constitutes the crux of health geography. Public health is "the organized efforts of society to keep people healthy and prevent injury, illness and premature death. It is a combination of programs, services and policies that protect, promote, and restore the health of all people" (Last, 2001, p. 145). In this chapter, we refer to "population health" as it is defined in Canada: as the science underpinning the practice of public health and understandings about how health is generated and distributed in populations (Dunn and Hayes, 1999; Hawe and Potvin, 2009). While the overlap between public and population health is extensive, population health is in the unique position to broaden our understandings of health, because the approach is interdisciplinary, is intersectoral and embraces complexity. Population health recognizes health as emerging from the interactions between individuals and social and political processes operating over the life course in particular settings.

There are parallels in the historical and intellectual trajectories of public health, population health and health-geography research. These parallels have ranged from improving living conditions, to controlling the spread of infectious diseases, to examining the role of environments in influencing lifestyle and non-communicable diseases, to a wider shift toward the social determinants of health and a renewed focus on place and health (Curtis, Riva and Rosenberg, 2009). More recently, efforts have been made to find and implement solutions to improve health and reduce health inequalities through population-health interventions (PHI). PHI are policies or programs that shift the distributions of health risks by addressing the underlying social, economic and environmental issues (Hawe and Potvin, 2009). These interventions can be deliberate efforts to improve health through actions across a variety of sectors; policies or programs designed and/or implemented outside of the health sector but that may lead to health improvement as a *side effect*; or natural phenomena such as earthquakes, flood, and economic recession that can be investigated for their impacts on health (Hawe, Di Ruggiero and Cohen, 2012). Increasingly, health geography is making significant advances in assessing the health impacts of such interventions (Harrington, McLafferty and Elliott, 2017; Learmonth and Curtis, 2013).

This chapter explores health geography's contribution to population-health-intervention research (PHIR). PHIR refers to "the use of scientific methods to produce knowledge about interventions that operate within or outside of the health sector and have the potential to impact health at a population level" (Hawe and Potvin, 2009, p. I-8). Using selected examples, we highlight some of the ways in which health geography contributes to PHIR in defining the context of an intervention and identifying the mechanisms

through which an intervention can influence health. We also discuss the possibilities afforded by data linkage and geographic information systems (GIS) in conceptualizing and measuring the health effects of PHI targeting the built environment.

Defining "context" in PHIR

PHIs are complex. Upstream determinants of health almost always comprise multiple interacting actors and components. Simple linear relationships between exposures and outcomes are rare, and there can be long periods when no effects are observed and then, through micro-changes, effects emerge (Hawe, 2015). Context is key to understanding how and for whom an intervention creates change.

The context of an intervention is understood as encompassing several different features. The physical and social attributes of a setting are often accounted for, such as the school, the workplace, the neighborhood or the community. Context is also defined by the symbolic meaning ascribed to a setting, by the recursive interactions between actors and attributes of settings and by social networks and power relations between actors. Context also includes the political ecology of the setting, as well as its relational position within a broader system. A consideration of context enables us to examine the mechanisms through which a given intervention is hypothesized to influence health and to assess its effectiveness for improving population health and reducing health inequalities (Hawe, Shielland Riley, 2009).

Nonetheless, a recent review examining the representation of context in 21 empirical PHIR studies revealed that context was most often equated with the physical attributes of the intervention setting or as something that needed to be controlled for (Shoveller et al., 2016), as opposed to something that ought to be studied in its own right. Few of the studies reviewed provided a detailed description of the mechanisms through which the intervention was hypothesized to influence health or explored the interconnections between people, context and intervention. This is problematic because the success of an intervention at improving health and/or reducing health inequalities is closely connected to the context in which it is implemented (Hawe, 2009). Health geography, through its interest in perceptions and experiences of place, sense of place and everyday geographies, is well-positioned to contribute to our understanding and defining "context" in PHIR.

Housing and PHIR

Given that most people spend a significant time where they live, it makes sense to consider the home as the most proximal setting and a good candidate for health intervention. The Ottawa Charter for Health Promotion recognizes shelter as a fundamental condition and resource for health. In Western countries, most housing-intervention studies have assessed the effect of rehousing and housing improvement (e.g., improving energy efficiency) on physical and mental health outcomes (Thomson et al., 2013). Although the link between poor housing and poor health is known, the evidence of a *direct* effect of housing improvement on health outcomes ranges from strong to none or is conflicting (Thomson et al., 2013). This can be explained by numerous factors, including differences in the health outcomes selected for study, with more significant effects on physical health outcomes. Varying time to follow-up and the possibility of non-linear exposure effects on health outcomes are also challenges. Housing-intervention studies are often limited in defining the context of the intervention (i.e., the dwelling) by its physical attributes, whether these entail improvements such as warmth or structural integrity. Yet it is possible that housing interventions modify other contextual aspects that were unanticipated. For example, housing interventions may impact the interactions between the tenants and the house itself, or they may modify the meaning attached to the house. In turn, this may influence health outcomes, and especially mental-health outcomes, in ways that are different for men and women and different across age groups, family types and jurisdictions. The mechanisms through which housing interventions are thought to impact health are often not examined.

Importantly, there is an increased interest in the affective sense of home in PHIR – distinct from the functional necessity of being housed. Kearns and collaborators suggests that housing-related *psychosocial factors* might mediate the relationship between structural housing conditions and health (Kearns et al., 2011). These psychosocial factors refer to the ontological security the home conveys, the sense of being at home or of feeling in control of one's home (Padgett, 2007). In Scotland, a prospective controlled housing-intervention study showed improvements in mental health followed the relocation of low-income families to new housing units (Kearns et al., 2011). In the intervention group, rehousing and improved material conditions of the house did not have a direct effect on mental health. However, there were significant gains in psychosocial benefits, and these were associated with improved mental health. Psychosocial benefits included improved control of the domestic realm as well as perceived social status. In particular, significant positive effects were observed for families with dependent children, which suggests the intervention had a greater impact on certain subgroups. This serves to illustrate that failing to consider the potentially differential impacts of an intervention may obscure the scope of impacts observed in a group of heterogeneous individuals.

In a qualitative case study, Alaazi and collaborators used the therapeutic-landscapes framework to understand the sense of home among Indigenous homeless participants in the Canadian Housing First initiative, At Home/Chez Soi, in Winnipeg, Manitoba (Alaazi et al., 2015). The authors conceptualized sense of home as "a relational, social, and cultural construct that transcends the instrumental experience of being housed" (p. 30). This conceptualization extended beyond the physical attributes of the house to consider the symbolism and meaning of home. The authors observed that Indigenous participants reported that their home imparted a sense of place that reinforced connection to family, community and land. This representation of home was qualitatively different from non-Indigenous participants in the intervention, and it contrasted with the regimented approach of housing provision of At Home/Chez Soi, which precluded the support of culturally appropriate housing.

These studies illustrate how engaging with the sense, meaning and experience of place, as well as integrating cultural experiences of home, adds to our understanding of how the context of interventions may impact different groups of people. We need to integrate geographic inquiry into PHIR to understand how people relate to and interact with their environment, so that we might anticipate for whom and through which processes a given intervention may influence health outcomes.

Assessing the health impacts of large-scale interventions at the household level, but also at the neighborhood level, often requires hefty funding for studying their effects. Yet PHIs often occur in a time-sensitive period, which precludes large-scale primary data collection. The prominence of large-scale population surveys and ability to link these records to spatial datasets to characterize residential environment as well as to administrative data such as mortality, morbidity and hospitalizations offers unprecedented opportunities for conducting PHIR.

Embedding geography into population-health data: data linkage and GIS

Increasingly recognized by population-health researchers is the wealth of already existing data. However, the variables of interest are often located in different databases, collected by distinct agencies and sectors for purposes unrelated to research. Uniting individual-level records from disparate sources can be achieved using *data linkage*, which has been defined as "the bringing together of information from two records that are believed to relate to the same individual or family" (Black and Roos, 2005). Although statistics derived from administrative data (such as hospitalizations and cancer registries) are useful for understanding the broad patterning of diseases in populations and across geographies, they do not always tell us about the contributions of the social determinants of health or health-related behaviors (Sanmartin et al., 2016). In contrast, population-health surveys collect information about the health status and health behaviours of individuals but are typically cross-sectional and lack objective information on aspects such as health outcomes, utilization and medication. Combining health survey and administrative data through data linkage allows for robust

investigation of the relationships between social determinants and health outcomes without the need for costly cohort studies (Sanmartin et al., 2016).

These linkage initiatives, population-based by design, are an efficient means of creating *information-rich* research environments (Roos, Menec and Currie, 2004) from previously disparate data sources – regardless of whether data was originally intended for population health. Importantly, however, the success and quality of record-linkage approaches (Harron, Goldstein and Dibben, 2016), rely on the ability to identify matching records from the same individual. Major work has been undertaken to maximize the use of existing administrative and survey datasets to answer population-health questions.

The integration of GIS and data-linkage approaches in PHIR is a particularly fertile avenue to account for context in shaping health outcomes and behaviors. GIS is a computer-based tool for collecting, analyzing and visualizing spatial data. Most forms of GIS consist of storage of spatial information via different layers. GIS inherently involves aspects of linkage between variables in different information layers. It has the potential to further advance linkage processes and data management, as well as enhance the population-based health research made possible by linkage. In the case of PHIR, embedding geospatial measures into routine population-data collection practices would enable richer analyses of health outcomes of an intervention. The next section reviews examples of GIS applications in studying the health effects of interventions targeting the built environment.

The built environment and PHIR

The built environment is an ideal candidate for population-wide intervention to improve health. Walkable environments, for instance, are thought to promote physical activity and fitness (Smith et al., 2008). A 2007 report from the World Health Organization on implementing population-based approaches for physical activity cited urban design friendliness and active transport as being key to reducing obesity and chronic conditions (World Health Organization, 2007). Increased attention, in both research and policy, has thus turned to the role of the built environment in improving health outcomes. While this geographic information is not often collected in administrative and health-survey data, geocoded items such as postal codes (e.g., zip codes) that are often present on these health records can provide the coordinates necessarily to derive measures of the built environment using other data sources, such as business registries, land-use maps and street network files. This approach of merging health data with environmental measures from geocoded information can serve as a means to evaluate the built environment's impact on health behaviors and outcomes across the life course (Villanueva et al., 2013). Environmental contaminants, neighborhood walkability, zoning for housing development and food outlets, and transit systems are some of the aspects of the built environment that have been studied as potential candidates for PHIR.

In the early stages of an intervention, applying GIS to map patterns of environmental factors, risks and prevalence is valuable for making a plan or defining and assessing the context of a planned intervention. GIS has been used to assess exposure to environmental health hazards such as lead (Akkus and Ozdenerol, 2014), which motivated lead-poisoning screening and prevention activities. In North Carolina, in the United States, GIS has played a key role in implementing geographically targeted community-intervention strategies (such as the North Carolina Childhood Lead Poisoning Prevention Program). Using a subset of data from a larger Geographic Health Information System, high-risk exposure areas across a variety of socioeconomic factors were mapped, identified and flagged as priority intervention areas (Miranda, Dolinoy and Overstreet, 2002). The models from this work have had substantive impact on screening children, monitoring progress on eliminating lead poisoning, and increasing community cohesion and advocacy on lead as a health hazard (Miranda et al., 2013). As illustrated, GIS plays an important role in the early-stage research for PHIs.

Some of the innovative uses of GIS in PHIR have been at the planning and implementation stages of the intervention. Several studies have combined GIS with community-based participatory approaches, forming partnerships with stakeholders, universities, organizations and individuals. A recent study combined GIS and

neighborhood audits driven by youth for developing neighborhood-environment interventions related to health and physical activity (Topmiller et al., 2015). Engagement with youth in the project revealed safety concerns, and the study reported positive response from local government to improve their urban trails and sidewalks. Moreover, advances in communications technology and accessibility to this technology have given rise to Public Participatory GIS, in which members of the public or a certain community are able to directly contribute to the mapping of environmental health features. This application of GIS makes it possible for community members and stakeholders to participate in the design of interventions, and studies have begun to frame these initiatives as part of a holistic and democratic approach to designing PHIs.

PHIR can be a particularly effective approach for assessing both the implementation and impact of urban planning codes that mandate healthy environments. Western Australian State Government's Liveable Neighborhoods Guidelines is an operational policy consisting of urban design and assessment principles aimed at increasing safety and accessibility for walking, cycling and transit use (Western Australian Planning Commission, 2007). Introduced in 1998 as a voluntary alternative to the pre-existing design codes in Perth, these guidelines have been adopted and recognized as a unique natural experiment. The Residential Environments Project (RESIDE) monitored the implementation and effect of the policy on residential transport behaviors following new housing development (Giles-Corti et al., 2008). GIS-derived measures of design elements specified by the policy revealed that greater compliance with the urban design guidelines – particularly those related to community design (neighborhood structure, land use, access to amenities, public transit etc.), was associated with increased walking for transport (Hooper, Giles-Corti and Knuiman, 2014).

GIS also contributes to assessing the health impacts of large-scale PHIs, such as policies that promote active transport. For instance, the installation of major transit systems serve as natural experiments by which we can monitor population health changes. Public-transit use is associated with higher physical activity (Saelens et al., 2014) and might improve health outcomes by potentially preventing chronic conditions and reducing health inequalities (Turrell et al., 2013). An American study that utilized Global Positioning System tracking found that among study participants who lived close to a new light-rail system, new transit riders (which comprised about 10% of the sample) lost weight, while those who no longer took public transit gained weight (Brown et al., 2015). In assessing objectively measured accelerometer measures since the light-rail's installment, new transit riders were observed to have significantly higher physical activity than those who never used transit (Brown et al., 2015). Increasingly, the decision to evaluate substantive health changes before and after population-wide interventions is being made at the outset. One example is the Travel-Related Activity in Neighborhoods Study (TRAINS) (Durand et al., 2016), which will prospectively investigate the impact of a major expansion to the Houston light-rail system on physical activity and transit use, incorporating both macro-scale features (GIS-derived aspects such as street connectivity, land-use mix, and residential density) and micro-scale features (street-level characteristics such as transit access, pedestrian paths, and land use) of the built environment that are known to affect physical activity.

Conclusion

Interventions to improve population health aim to modify the characteristics of social and/or physical contexts, or the capacities of individuals in the population that influence the distribution of health risks. Trying to disentangle the intervention from its context is arbitrary, as they are mutually influencing one another (Potvin, 2017). The role that health geography can play in PHIR is unequivocal. The examples in this chapter were chosen to illustrate how health geography can be practiced in public health in the context of PHIR. Translating knowledge from geographical inquiry into place-based policy recommendations has the potential to contribute to the creation of settings that are supportive of health. To this end, both quantitative and qualitative methods used by geographers are necessary to understand the context of the intervention and the place-based mechanisms linking context, intervention and health outcomes.

References

Akkus, C. and Ozdenerol, E. (2014). Exploring childhood lead exposure through GIS: a review of the recent literature. *International Journal of Environmental Research and Public Health*, 11, pp. 6314–6334.

Alaazi, D., Masuda, J., Evans, J. and Distasio, J. (2015). Therapeutic landscapes of home: exploring Indigenous peoples' experiences of a Housing First intervention in Winnipeg. *Social Science & Medicine*, 147, pp. 30–37.

Black, C. and Roos, L. L. (2005). Linking and combining data to develop statistics for understanding the population's health. In: D. J. Friedman, E. L. Hunter and R. G. Parrish, eds., *Health statistics: shaping policy and practice to improve the population's health*. New York: Oxford University Press, pp. 214–240.

Brown, B. B., Werner, C. M., Tribby, C. P., Miller, H. J. and Smith, K. R. (2015). Transit use, physical activity, and body mass index changes: objective measures associated with complete street light-rail construction. *American Journal of Public Health*, 105, pp. 1468–1474.

Curtis, S., Riva, M. and Rosenberg, M. (2009). Health geography and public health. In: T. Brown, S. McLafferty and G. Moon, eds., *A companion to health and medical geography*. Chichester: Wiley-Blackwell, pp. 323–345.

Dummer, T. J. (2008). Health geography: supporting public health policy and planning. *Canadian Medical Association Journal*, 178, pp. 177–180.

Dunn, J. and Hayes, M. (1999). Toward a lexicon of population health. *Canadian Journal of Public Health*, 90(Supp 1), S7–S10.

Durand, C. P., Oluyomi, A. O., Gabriel, K. P., Salvo, D., Sener, I. N., Hoelscher, D. M., Knell, G., Tang, X., Porter, A. K., Robertson, M. C. and Kohl, H. W. (2016). The effect of light rail transit on physical activity: design and methods of the Travel-Related Activity in Neighborhoods Study. *Frontiers in Public Health*, 4(103).

Giles-Corti, B., Knuiman, M., Timperio, A., Van Niel, K., Pikora, T. J., Bull, F. C., Shilton, T. and Bulsara, M. (2008). Evaluation of the implementation of a state government community design policy aimed at increasing local walking: design issues and baseline results from RESIDE, Perth Western Australia. *Preventative Medicine*, 46, pp. 46–54.

Harrington, D., McLafferty, S. and Elliott, S. (2017). *Population health intervention research: geographical perspectives*, New York: Routledge.

Harron, K., Goldstein, H. and Dibben, C. (eds.) (2016). *Methodological developments in data linkage*. New York: Wiley.

Hawe, P. (2009). The social determinants of health: how can a radical agenda be mainstreamed? *Canadian Journal of Public Health*, 100(4), pp. 291–293.

Hawe, P. (2015). Lessons from complex interventions to improve health. *Annual Review of Public Health*, 36, pp. 307–323.

Hawe, P., Di Ruggiero, E. and Cohen, E. (2012). Frequently asked questions about population health intervention research. *Canadian Journal of Public Health*, 103, e468–471.

Hawe, P. and Potvin, L. (2009). What is population health intervention research? *Canadian Journal of Public Health*, 100(1), pp. I-8–I-14.

Hawe, P., Shiell, A. and Riley, T. (2009). Theorising interventions as events in systems. *American Journal of Community Psychology*, 43, pp. 267–276.

Hooper, P., Giles-Corti, B. and Knuiman, M. (2014). Evaluating the implementation and active living impacts of a state government planning policy designed to create walkable neighborhoods in Perth, Western Australia. *American Journal of Health Promotion*, 28, pp. S5–18.

Kearns, A., Whitley, E., Mason, P., Petticrew, M. and Hoy, C. (2011). Material and meaningful homes: mental health impacts and psychosocial benefits of rehousing to new dwellings. *International Journal of Public Health*, 56, pp. 597–607.

Last, J. M. (2001). *A dictionary of epidemiology*. Oxford: Oxford University Press.

Learmonth, A. and Curtis, S. (2013). Place shaping to create health and wellbeing using health impact assessment: health geography applied to develop evidence-based practice. *Health Place*, 24, pp. 20–22.

Miranda, M. L., Dolinoy, D. C. and Overstreet, M. A. (2002). Mapping for prevention: GIS models for directing childhood lead poisoning prevention programs. *Environmental Health Perspectives*, 110, pp. 947–953.

Miranda, M. L., Ferranti, J., Strauss, B., Neelon, B. and Califf, R. M. (2013). Geographic health information systems: a platform to support the "triple aim." *Health Affairs (Millwood)*, 32, pp. 1608–1615.

Padgett, D. (2007). There's no place like (a) home: ontological security among persons with serious mental illness in the United States. *Social Science & Medicine*, 64, pp. 1925–1936.

Potvin, L. (2017). Transforming local geographies to improve health. In: D. Harrington, S. McLafferty and S. Elliott, eds., *Population health intervention research: geographical perspectives*. New York: Routledge, pp. 163–169.

Roos, L. L., Menec, V. and Currie, R. J. (2004). Policy analysis in an information-rich environment. *Social Science & Medicine*, 58, pp. 2231–2241.

Saelens, B. E., Vernez Moudon, A., Kang, B., Hurvitz, P. M. and Zhou, C. (2014). Relation between higher physical activity and public transit use. *American Journal of Public Health*, 104, pp. 854–859.

Sanmartin, C., Decady, Y., Trudeau, R., Dasylva, A., Tjepkema, M., Finès, P., Burnett, R., Ross, N. and Manuel, D. (2016). Linking the Canadian Community Health Survey and the Canadian Mortality Database: an enhanced data source for the study of mortality. *Health Reports*, 27, pp. 10–18.

Shoveller, J., Viehbeck, S., Di Ruggiero, E., Greyson, D., Thomson, K. and Knight, R. (2016). A critical examination of representations of context within research on population health interventions. *Critical Public Health*, 26, pp. 487–500.

Smith, K. R., Brown, B. B., Yamada, I., Kowaleski-Jones, L., Zick, C. D. and Fan, J. X. (2008). Walkability and body mass index density, design, and new diversity measures. *American Journal of Preventative Medicine*, 35, pp. 237–244.

Thomson, H., Thomas, S., Sellstrom, E. and Petticrew, M. (2013). *Housing improvements for health and associated socioeconomic outcomes (Review)*. The Cochrane Collaboration, 2. Chichester: Wiley-Blackwell.

Topmiller, M., Jacquez, F., Vissman, A. T., Raleigh, K. and Miller-Francis, J. (2015). Partnering with youth to map their neighborhood environments: a multilayered GIS approach. *Family & Community Health*, 38, pp. 66–76.

Turrell, G., Haynes, M., Wilson, L. A. and Giles-Corti, B. (2013). Can the built environment reduce health inequalities? A study of neighbourhood socioeconomic disadvantage and walking for transport. *Health & Place*, 19, pp. 89–98.

Villanueva, K., Pereira, G., Knuiman, M., Bull, F., Wood, L., Christian, H., Foster, S., Boruff, B. J., Beesley, B., Hickey, S., Joyce, S., Nathan, A., Saarloos, D. and Giles-Corti, B. (2013). The impact of the built environment on health across the life course: design of a cross-sectional data linkage study. *BMJ Open*, 3(1).

Western Australian Planning Commission. (2007). *Liveable neighbourhoods: a Western Australian government sustainable cities initiative*. Perth: Western Australian Planning Commission.

World Health Organization. (2007). *A guide for population-based approaches to increasing levels of physical activity: implementation of the WHO global strategy on diet, physical activity and health*. Geneva: World Health Organization.