

Western University
Scholarship@Western

Human Environments Analysis Lab (HEAL)

11-2018

Promotion of physical activity in rural, remote and northern settings: a Canadian call to action

Candace I. J. Nykiforuk

Kayla Atkey

Sara Brown

Wayne Caldwell

Tracey Galloway

See next page for additional authors

Follow this and additional works at: <https://ir.lib.uwo.ca/healpub>

Authors

Candace I. J. Nykiforuk, Kayla Atkey, Sara Brown, Wayne Caldwell, Tracey Galloway, Jason Gilliland, Krystyna Kongats, Jonathan McGavock, and Kim D. Raine

Evidence synthesis

Promotion of physical activity in rural, remote and northern settings: a Canadian call to action

Candace I. J. Nykiforuk, PhD (1); Kayla Atkey, MSc (2); Sara Brown, PEng (3); Wayne Caldwell, PhD (4); Tracey Galloway, PhD (5); Jason Gilliland, PhD (6); Krystyna Kongats, MPH (1); Jonathan McGavock, PhD (7); Kim D. Raine, PhD, RD (1)

This article has been peer reviewed.

 [Tweet this article](#)

Abstract

Introduction: The lack of policy, practice and research action on physical activity and features of the physical (built and natural) environments in rural, remote and northern settings is a significant threat to population health equity in Canada. This paper presents a synthesis of current evidence on the promotion of physical activity in non-urban settings, outcomes from a national priority-setting meeting, and a preliminary call to action to support the implementation and success of population-level initiatives targeting physical activity in non-urban settings.

Methods: We conducted a “synopses of syntheses” scoping review to explore current evidence on physical activity promotion in rural, remote, northern and natural settings. Next, we facilitated a collaborative priority-setting conference with 28 Canadian experts from policy, research and practice arenas to develop a set of priorities on physical activity in rural, remote and northern communities. These priorities informed the development of a preliminary Canadian call to action.

Results: We identified a limited number of reviews that focused on physical activity and the built environment in rural, remote and northern communities. At the priority-setting conference, participants representing rural, remote and northern settings identified top priorities for policy, practice and research action to begin to address the gaps and issues noted in the literature. These priorities include self-identifying priorities at the community level; compiling experiences; establishing consistency in research definitions and methods; and developing mentorship opportunities.

Conclusion: Coordinated action across policy, practice and research domains will be essential to the success of the recommendations presented in this call to action.

Keywords: rural health, remote health, health policy, environment design, physical activity, health equity

Introduction

Regular physical activity is an important determinant of health. Increased physical activity decreases the risk of several chronic diseases and improves overall well-being.¹ Yet, nearly 80% of Canadian

adults do not complete the recommended 150 minutes of moderate-to-vigorous physical activity each week.² It is widely accepted that an individual’s physical activity is influenced by various determinants, including the physical, built and natural environments (see Box 1 for

Highlights

- Physical activity promotion must reflect the realities and context of rural and remote communities.
- Research literature on physical activity promotion in rural and remote communities does not yet provide adequate direction to communities or public health agencies.
- In November 2015, experts gathered to review existing evidence and to develop priorities to enhance physical activity promotion in rural, remote and northern settings in Canada.
- Priorities were summarized in a Canadian call to action that provides preliminary direction to support equitable action on rural and remote physical activity promotion across Canada, including the need for more culturally relevant, Indigenous-led research.

definitions). Policies and changes in environmental infrastructure can play a meaningful role in creating supportive settings to increase population-level physical activity.³

There appears to be significant support among decision makers, politicians, bureaucrats, members of the media and policy advocates in Canada as well as the general public for population-level interventions that promote physical activity by

Author references:

1. School of Public Health, University of Alberta, Edmonton, Alberta, Canada
2. Alberta Policy Coalition for Chronic Disease Prevention, Edmonton, Alberta, Canada
3. NWT Association of Communities, Yellowknife, Northwest Territories, Canada
4. School of Environmental Design and Rural Development, University of Guelph, Guelph, Ontario, Canada
5. Department of Anthropology, University of Toronto, Toronto, Ontario, Canada
6. Department of Geography, Western University, London, Ontario, Canada
7. Department of Pediatrics and Child Health, University of Manitoba, Winnipeg, Manitoba, Canada

Correspondence: Candace I.J. Nykiforuk, 3-291 ECHA, 11405-87 Avenue, Edmonton, AB T6G 1C9; Tel: 780-492-4109; Email: candace.nykiforuk@ualberta.ca

BOX 1 Key definitions

The terms “physical environment,” “built environment” and “natural environment” are variously defined in the literature and are often component parts of a single definition. For clarity in conducting this review, we used the following definitions:

Physical environment:	the perceived characteristics of the physical setting in which individuals spend their time. This may include aspects of urban design, traffic density and speed, distance to and design of venues for physical activity, e.g. recreation facilities, weather and air quality, and crime and safety. ⁴
Built environment:	features of the environment that are influenced by human design. This definition generally includes three main components: transportation systems; land development patterns; and the design and arrangement of buildings and other structures. ⁵
Natural environment:	the aspects of the natural world largely untouched by humans. Natural environments can be viewed as a continuum between wild nature and areas under some human influence, such as public parks or cultivated fields. ⁶

targeting the built and physical environment. For example, a 2016 survey conducted by members of our team found that 95.3% of policy influencers support improving opportunities for physical activity through neighbourhood revitalization programs.⁷ Furthermore, 87.7% of policy influencers and 92.8% of the general public support implementing transportation policies designed to promote bicycling.

Despite general support for policies and built environment interventions to promote physical activity, significant evidence, policy and practice gaps exist in non-urban settings. Evidence on the promotion of physical activity at the environmental level has focused on urban settings, with little attention paid to settings outside of cities and metropolitan areas.⁸ This is problematic as populations outside of urban areas have fewer resources or poorer accessibility to existing resources than their urban counterparts, which contributes to increased prevalence of adverse health outcomes in rural populations.⁸⁻¹⁰

Non-urban settings also experience inequities in the promotion of physical activity from both a practice and policy perspective. Communities with a population of less than 10 000 experience more barriers to accessing physical activity than larger communities with populations of 250 000 or greater.¹¹ Not surprising, a higher proportion of parents in rural, remote and northern regions report poor accessibility as a barrier to their children’s physical activity compared to the Canadian average.¹¹ Local governments in rural, remote and northern regions may also have other challenges to do with infrastructure, such as limited revenue and financial capacity, short construction seasons and high cost

of living.¹² This makes it difficult to provide community programming and create environments that support physical activity. In short, the *State of Rural Canada 2015* reports, “We have been neglecting rural Canada ... Fundamentally, we have forgotten how to re-invest in rural and small town places....”^{13, p. 1}

Having a better understanding of the nuanced contexts of non-urban settings has the potential to improve health equity and contribute to more effective policies and environmental interventions that promote physical activity across settings. With this in mind, we conducted a synthesis of the review-level literature on the promotion of physical activity in non-urban settings from the perspective of the built environment. We then held a conference with invited experts to develop a set of priorities for practice, policy implementation and research to support physical activity in rural, remote and northern communities. Taken together, this process resulted in the collaborative development of a Canadian call to action, which is presented in this paper.

Methods

Part 1: Evidence synthesis

To understand what is currently known about the promotion of physical activity in non-urban settings from the perspective of physical, built and natural environments, we conducted a scoping review and synthesis of the literature at the review level. This “synopses of syntheses” is an approach recommended by the National Collaborating Centre on Methods and Tools (NCCMT) for assessing the state of evidence on public health interventions,¹⁴ with searches of the highest quality sources conducted. Our intent was to scope and summarize

the evidence on a specific topic area, using the findings of systematic reviews—reviews of reviews—as our starting point.

Data collection

The synthesis involved retrieving review articles from four major databases (Ovid MEDLINE, CINAHL, Academic Search Complete and SPORTDiscus) and four grey literature sources (Active Living Research, Bridging the Gap/Robert Wood Johnson Foundation, Children and Nature Network and Ohio Leave No Child Inside Collaboratives). We also reviewed references cited in key articles and retrieved via Google Scholar and additional reviews identified by the research team. To facilitate inclusivity, a broad range of terms related to physical activity and the physical, built and natural environments in non-urban settings was used in different combinations, as outlined in Table 1.

Inclusion criteria were reviews, including narrative reviews and summary papers, published after 2000, in English or French; articles on research, strategies and/or interventions related to physical activity in the context of the physical, built and natural environments; and findings and/or implications relevant to non-urban settings, including rural, remote, northern and natural settings.

The articles were initially screened by title and abstract review to eliminate irrelevant articles. We then conducted a full review and relevance assessment, followed by data extraction. Figure 1 presents a modified (i.e. for scoping reviews) PRISMA flow diagram of records collected during the screening process.

The search resulted in a total of 36 review articles that explored the promotion of physical activity in non-urban settings

TABLE 1
Literature search strategy

Topic	Search terms
Physical activity	active* commut* or active* transport* or bicycling* or biking* or exercis* or hike or hiked or hikes or hiking* or motor activity or physical activ* or physical fit* or physical inactiv* or recreation* or walk or walks or walked or walking
Rural settings	aboriginal communit* or aboriginal reserv* or arctic region* or biodivers* area* or biodivers* environment* or biodiverse landscape* or biodiverse location* or biodiverse setting* or biodiverse space* or built environment* or built landscape* or built setting* or countryside* or first nation* communit* or first nation* reserv* or forest* or great outdoors or Inuit* communit* or Inuit reserv* or land conserv* or land protect* or national park* or natur* area or natur* environment or natur* landscape* or natur* setting* or natur* space* or northern communit* or open area* or open country* or open environment* or open landscape* or open space* or outdoor area* or outdoor environment* or outdoor landscape* or outdoor space* or park* act or park acts* or provincial park* or remote area* or remote communit* or remote environment* or remote landscape* or remote setting* or remote space* or rural area* or rural communit* or rural location* or rural setting* or rural space* or territorial park* or trail presence or trail use* or unbuilt environment* or unbuilt landscape* or unbuilt setting* or wild area* or wild environment* or wild landscape* or wild location* or wild setting* or wild space* or wilderness*

* Indicates a truncation command, allowing multiple forms of a given word (e.g. exercis* identifies exercise, exercised, exercises, exercising)

from the perspective of physical, built and natural environments. Of these, 13 focused explicitly on rural ($n = 4$), remote, northern or on reserve ($n = 5$) and natural ($n = 4$) settings. The remaining 24 review articles discussed findings and/or implications applicable to rural settings, even though this setting was not the primary

focus of our review. Because of the limited number of directly relevant review articles retrieved in the literature search, we did not use data quality as an inclusion criterion.

Data analysis

The data extraction and analysis process involved first charting the data and then

collating, summarizing and reporting results, based on Arksey and O'Malley's scoping review framework.¹⁵ A summary of included review articles is presented in Table 2. Information from the review articles was themed according to setting type (rural; remote, northern or on reserve; and natural). Sub-themes within each setting type were identified in an emergent and iterative manner to comprehensively summarize results from the literature. To minimize any potential bias, two reviewers separately extracted and analyzed the data. Team meetings with the two principal investigators and the reviewers were held to discuss the analyses and to resolve any inconsistencies between reviewers.

Of the 36 review articles included in the synthesis, only four specifically focused on rural settings (see Table 2). So, as a secondary focus of our review, we assessed the 24 broader review articles that discussed findings and/or implications applicable to rural settings. We also identified five review articles that focused on Indigenous health and included findings pertinent to remote, northern and/or reserve settings. (Reserves are commonly situated in non-urban settings and experience obstacles related to lack of access to health resources and community infrastructure.¹⁶) Lastly, we identified four review articles that contained findings related to natural settings outside of urban areas (i.e. wilderness areas and natural parks). Those natural settings described as being situated within rural areas were included in the rural settings category.

Part 2: Priority-setting conference

To build on the findings of the review and develop a set of priorities for practice and

FIGURE 1
Modified PRISMA Flow Diagram (for scoping review)

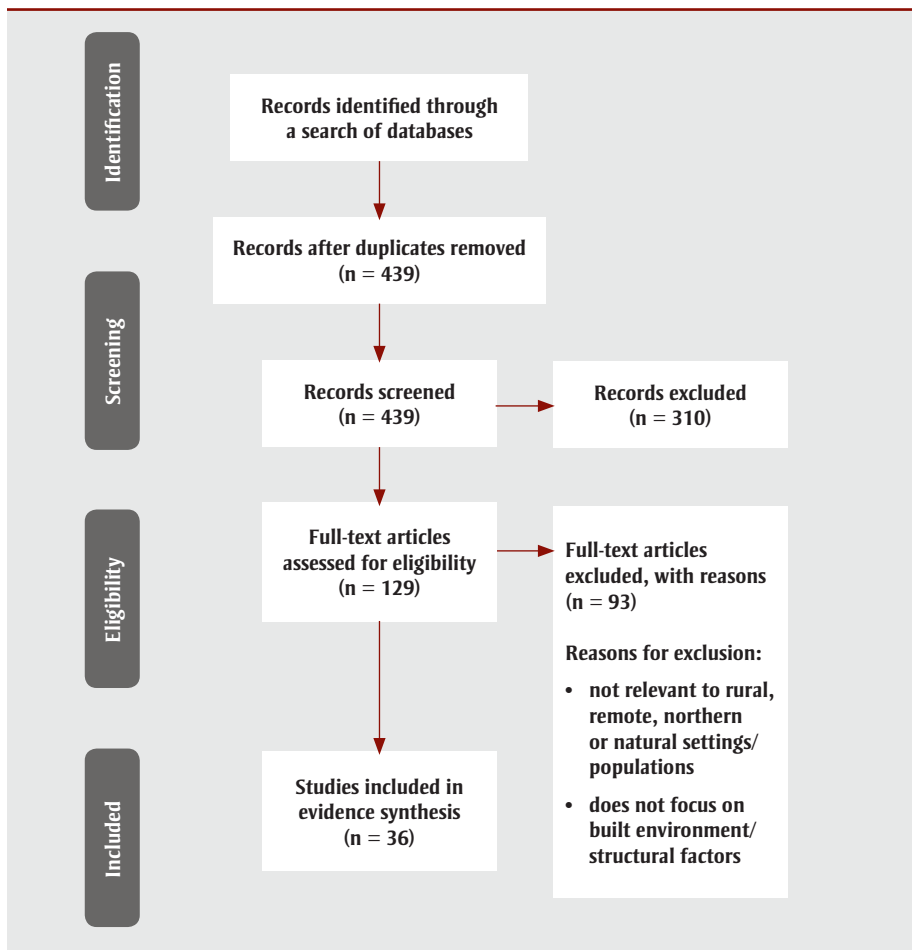


TABLE 2
Summary of included review articles

Author / Article title Journal / Year	Type of review / Objectives	Relevant findings and implications
Review articles with a stated rural focus		
Boehm et al. ¹⁷ “Barriers and motivators to exercise for older adults: a focus on those living in rural and remote areas of Australia” <i>Australian Journal of Rural Health</i> 2013	Literature review To explore barriers and facilitators to exercise for community-dwelling older people living in rural and remote Australia. The review also explores how these barriers and facilitators relate to population-based exercise programs on falls prevention.	Older adults (50 years+) <ul style="list-style-type: none"> The review includes 25 articles that explore barriers and facilitators to exercise for older adults. Five of the articles discuss rural or remote locations worldwide. None of the included articles focus on rural or remote locations in Australia. Relevant environmental barriers identified in the rural and remote literature include poor built environment (i.e. no or poor footpaths, uneven road surfaces, poor lighting), lack of access to facilities, safety concerns, dogs, traffic, weather and lack of transportation. Relevant environmental facilitators identified include accessible facilities and a built environment conducive to physical activity (i.e. presence of paved roads, good walking conditions). The review states that the environment, which needs to be carefully considered in program design, is a significant issue in literature on rural and remote settings. The review notes that the lack of literature about barriers and facilitators to exercise for older people in rural and remote Australia highlights a need for further research.
Frost et al. ⁸ “Effects of the built environment on physical activity of adults living in rural settings” <i>American Journal of Health Promotion</i> 2010	Systematic review To conduct a systematic review of the literature to examine the influence of the built environment on the physical activity of adults in rural settings.	Adults (18+ years) <p><i>Qualitative study findings</i> – used to identify barriers and motivators to physical activity in rural populations in 7 out of the 20 studies.</p> <ul style="list-style-type: none"> Barriers to physical activity include traffic, safety and uneven roads as well as lack of sidewalks, indoor facilities, parks and transportation. Motivators to increased physical activity include increasing the number and quality of recreational facilities, creating facilities for women only, improving outdoor lighting, providing better walking conditions, providing more public transportation and building sidewalks, tracks, parks or trails. <p><i>Quantitative study findings</i> – outlined in 16 studies</p> <ul style="list-style-type: none"> Of the 11 built environment elements identified in the reviewed studies, those that demonstrated significant positive associations with physical activity included aesthetics (4 out of 4 studies), safety/crime (6 out of 9), recreational facilities (5 out of 10), trails (4 out of 6) and parks (3 out of 6). Positive relationships were found related to walkable destinations in 2 out of 5 studies. Findings about sidewalks, shoulders on the road, traffic and street lighting were inconsistent and mixed. No significant association was found around the use of shopping malls for physical activity. <p>Conclusions</p> <p>The review found preliminary support for the understanding that features of the built environment associated with physical activity in rural and urban settings differ, but highlighted a need for more research. The reviews also called for the term “rural” to be more clearly defined in the literature.</p>
Olsen ¹⁸ “An integrative review of literature on the determinants of physical activity among rural women” <i>Public Health Nursing</i> 2013	Integrative review To examine the determinants of physical activity levels among rural women in the USA.	Rural women <p>The review</p> <ul style="list-style-type: none"> Included 21 studies; Reported on three themes of physical environment determinants that acted as barriers to physical activity: access, safety and structures; Noted that the definition of “rural” varied in the studies, and highlighted a need for additional research to more clearly and consistently define the term.

Continued on the following page

TABLE 2 (continued)
Summary of included review articles

Author / Article title Journal / Year	Type of review / Objectives	Relevant findings and implications
Sandercock et al. ¹⁹ “Physical activity levels of children living in different built environments” <i>Preventive Medicine</i> 2010	Systematic review To review the available literature assessing differences in physical activity levels of children living in different built environments (rural, urban and suburban, where available) classified according to land use within developed countries.	Children and adolescents (5–18 years) <ul style="list-style-type: none"> The literature does not show major differences in the physical activity levels of children from rural and urban environments, though there is some evidence for higher physical activity in children aged under 13 in rural settings. Where discrete samples of suburban or small-town children were analyzed, they tended to have higher physical activity levels than their urban or rural peers. There are differences in the types of physical activity that children from different environments engage in. Simple examination of “urban” versus “rural” has the potential to lead to errors in some studies. The review also draws attention to the heterogeneous nature of “rural” and “urban” definitions. Further research aimed at assessing differences in physical activity among children from different built environments should use detailed and logical geographical classification systems; be adequately powered; and take into account socioeconomic status, seasonal effects and racial factors.
Review articles from the wider literature with findings and/or implications relevant to rural settings		
Abraham et al. ⁶ “Landscape and well-being: a scoping study on the health-promoting impact of outdoor environments” <i>International Journal of Public Health</i> 2010	Scoping review / qualitative literature review To provide a scoping study of publications on the health-promoting influence of landscape.	Population not reported <ul style="list-style-type: none"> To be perceived as an option for physical activity, rural green landscapes should be aesthetically appealing to their users.
Bauman et al. ²⁰ “Correlates of physical activity: why are some people physically active and others not?” <i>The Lancet</i> 2012	Review of reviews To present knowledge about correlates and determinants of physical activity in adults and children.	Adults (≥18 years) and children (5–13 years, depending on the study) or adolescents (12–18 years, depending on the study) <ul style="list-style-type: none"> Density of exercise facilities and urbanization (i.e. urban versus rural residences) are positively associated with physical activity.
Calogjiuri and Chroni ²¹ “The impact of the natural environment on the promotion of active living” <i>BMC Public Health</i> 2014	Integrative systematic review To review the existing literature on the relationship between the natural environment and physical activity.	Healthy, non-athletic adult population >16 years <ul style="list-style-type: none"> The perceived ability to walk to local natural environments is a predictor of physical activity among older adults living in rural areas. Differences between rural and urban environments have been identified, with the natural environment–physical activity relationship stronger for people living in urban rather than rural areas, likely due to differences in land-use mix and connectivity.
Casagrande et al. ²² “Built environment and health behaviors among African Americans” <i>American Journal of Preventive Medicine</i> 2009	Systematic review To quantify the existing literature, acknowledge gaps that could affect future research and surmise any salient environmental characteristics that are associated with diet, physical activity and obesity in African Americans that may be important targets for environmental interventions.	Population not reported <ul style="list-style-type: none"> Features of the built environment may vary considerably between rural, urban and suburban locations. These geographical differences are important to understand when conceptualizing and assessing the ways in which the built environment affects health behaviours (i.e. physical activity, diet, obesity). The review calls for more investigation of the rural environment.
Cunningham and Michael ⁵ “Concepts guiding the study of the impact of the built environment on physical activity for older adults” <i>American Journal of Health Promotion</i> 2004	Comprehensive review To identify theoretical models and key concepts used to predict the association between built environments and seniors’ physical activity on the basis of a comprehensive review of the published literature.	Seniors <ul style="list-style-type: none"> Reports on findings from one study relevant to the rural setting. States that this study is notable because it is the only study within the review that focused on a rural community.

Continued on the following page

TABLE 2 (continued)
Summary of included review articles

Author / Article title Journal / Year	Type of review / Objectives	Relevant findings and implications
Ding and Gebel ²³ “Built environment, physical activity and obesity: what have we learned from reviewing the literature?” <i>Health and Place</i> 2012	Literature review To evaluate the quality and key characteristics of the reviews, and to set the agenda for future research through identifying research gaps and areas of improvement.	Population not reported <ul style="list-style-type: none"> • More rigorous studies in specific population subgroups, such as seniors, ethnic minorities and rural residents, are needed.
Feng et al. ²⁴ “The built environment and obesity” <i>Health and Place</i> 2010	Systematic review of the epidemiologic evidence To evaluate the extant literature for evidence of association between the built environment and obesity.	Population not reported <ul style="list-style-type: none"> • Includes 7 rural studies (related to physical activity, land use, transportation and/or the food environment overall). • Indicates that current literature has focused narrowly on metropolitan areas, while smaller towns, exurban areas and rural communities have been neglected.
Foster and Giles-Corti ²⁵ “The built environment, neighborhood crime and constrained physical activity: an exploration of inconsistent findings” <i>Preventive Medicine</i> 2008	Review To summarize the individual, social and built environment characteristics that influence whether people feel safe; examines the association between real and perceived crime-related safety and their association with physical activity.	Population not specified <ul style="list-style-type: none"> • Findings relevant to the rural setting. • Higher levels of physical disorder tend to cluster in denser urban areas, which have more non-residential land uses, suggesting that the study context (i.e. urban, suburban, rural) and neighbourhood walkability may confound the relationship between disorder and physical activity. • The review indicates that the degree of urbanization (i.e. urban, suburban and rural) may affect exposure to factors that influence safety perceptions.
Galvez et al. ²⁶ “Childhood obesity and the built environment” <i>Current Opinion in Pediatrics</i> 2010	Literature review, 2008–2009 To review the strength of the most current evidence with respect to the built environment and childhood obesity.	Children (<18 years) <ul style="list-style-type: none"> • The review reports on findings relevant to the rural setting. • Future research is needed on diverse populations that vary by key sociodemographics, including gender, race/ethnicity and income, and that consider subjective and objective measures of neighbourhood-level factors across urban, suburban and rural areas.
Hanson and Berkowitz ²⁷ “Does the built environment influence physical activity?” Institute of Medicine of the National Academies, 2005	Report on an examination of the evidence To review and summarize the broad trends affecting the relationships between physical activity, health, transportation and land use.	Population not reported <ul style="list-style-type: none"> • Findings relevant to the rural setting. • Effective policies are likely to differ for different population groups (e.g. children, youth, the elderly, the disadvantaged), for different purposes of physical activity (e.g. transportation, exercise) and in different contexts (e.g. inner city, inner suburb, outer suburb, rural).
Humpel et al. ²⁸ “Environmental factors associated with adults’ participation in physical activity” <i>American Journal of Preventive Medicine</i> 2002	Review To explore quantitative studies examining the associations of particular environmental attributes with physical activity behaviours.	Adults <ul style="list-style-type: none"> • Findings from one study relevant to the rural setting.
Kaczynski and Henderson ²⁹ “Environmental correlates of physical activity: a review of evidence about parks and recreation” <i>Leisure Sciences: An Interdisciplinary Journal</i> 2007	Review To review and critically examine evidence related to parks and recreation settings as features of the built environment and the relationship they have to physical activity.	Population not reported <ul style="list-style-type: none"> • Findings relevant to the rural setting. • Most of the active living research related to parks and recreation has involved middle class, mainly White adults living in urban and suburban settings.

Continued on the following page

TABLE 2 (continued)
Summary of included review articles

Author / Article title Journal / Year	Type of review / Objectives	Relevant findings and implications
Lovasi et al. ³⁰ “Built environments and obesity in disadvantaged populations” <i>Epidemiologic Reviews</i> 2009	Review To evaluate whether built environments might explain racial, ethnic and socioeconomic disparities in obesity and to derive implications from this evidence as to whether changes to the built environment might reduce obesity-related health disparities.	Disadvantaged populations (low socioeconomic status, Black or Hispanic ethnicity) <ul style="list-style-type: none"> • This review reports on findings relevant to physical activity in the context of the built environment and rural settings. • This review states that rural communities and cities do not provide the same opportunities or barriers and, based on this, health promotion interventions should be adapted to fit the local environment.
Matson-Koffman et al. ³¹ “A site-specific literature review of policy and environmental interventions that promote physical activity and nutrition for cardiovascular health: what works?” <i>American Journal of Health Promotion</i> 2004	Literature review To review selected and recent environmental and policy interventions designed to increase physical activity and improve nutrition as a way to reduce the risk for heart disease and stroke, promote cardiovascular health and summarize recommendations.	Population not reported <ul style="list-style-type: none"> • Findings relevant to physical activity in the context of the built environment and the rural setting.
Moran et al. ³² “Understanding the relationships between the physical environment and physical activity in older adults” <i>International Journal of Behavioral Nutrition and Physical Activity</i> 2014	Systematic review of qualitative studies To describe the characteristics and methodologies of qualitative studies conducted in this field, identify recurring physical environmental themes and factors possibly related to older adults’ behaviours in relation to physical activity, and compare the emerging themes and factors according to the qualitative method used.	Average age 65+ years <ul style="list-style-type: none"> • Findings relevant to the rural setting.
McCrorie et al. ³³ “Combining GPS, GIS and accelerometry to explore the physical activity and environment relationship in children and young people” <i>International Journal of Behavioral Nutrition and Physical Activity</i> 2014	Review To synthesize and summarize research where a combination of GPS, GIS and accelerometry has been used to investigate the physical environment/ physical activity relationship among young people and identify gaps in knowledge that future research should address.	Young people (5–18 years old) <ul style="list-style-type: none"> • Findings relevant to the rural setting.
Ferdinand et al. ³⁴ “The relationship between built environments and physical activity” <i>American Journal of Public Health</i> 2012	Systematic review To review the literature examining the relationship between built environments and physical activity or obesity rates.	Population not specified <ul style="list-style-type: none"> • Includes 8 studies relevant to the rural setting. • Indicates that studies of rural populations are lacking, especially on park or trail use, school playgrounds usage and inactivity.
Papas et al. ³⁵ “The built environment and obesity” <i>Epidemiologic Reviews</i> 2007	Review To examine the published empirical evidence for the influence of the built environment on the risk of obesity.	Children and adult populations <ul style="list-style-type: none"> • Reports on one study relevant to physical activity in the context of the built environment and rural settings. • When carrying out studies across large areas, creating metrics equally appropriate to different settings (rural, urban and suburban) is challenging.
Renalds et al. ³⁶ A systematic review of built environment and health <i>Family and Community Health</i> 2010	Systematic review To review and summarize the literature on the built environment as it pertains to health.	Population not reported <ul style="list-style-type: none"> • Examines the relationship between the built environment and physical activity, obesity, social capital and mental health. Overall, most studies were conducted in an urban setting, and it is not known what findings would result in a rural setting. • Longitudinal studies and studies conducted in a rural setting are needed.

Continued on the following page

TABLE 2 (continued)
Summary of included review articles

Author / Article title Journal / Year	Type of review / Objectives	Relevant findings and implications
Saelens and Handy ³⁷ Built environment correlates of walking <i>Medicine and Science in Sports and Exercise</i> 2008	Review To review the research on the characteristics of the built environment that correlates with walking and discuss outstanding questions and policy implications.	Population not reported <ul style="list-style-type: none"> Findings relevant to the rural setting.
Sallis et al. ³ “Role of built environments in physical activity, obesity, and cardiovascular disease” <i>Circulation</i> 2012	Review To describe multilevel ecological models of behaviour as they apply to physical activity; describe key concepts; summarize evidence on the relationship of built environment attributes to physical activity and obesity; and provide recommendations for built environment changes that could increase physical activity.	Population not reported <ul style="list-style-type: none"> For rural residents, traffic safety and availability of recreation facilities and trails were most consistently associated with physical activity. There are fewer studies focusing on rural populations, even though rural residents are at high risk of poor health outcomes.
Starnes et al. ³⁸ “Trails and physical activity” <i>Journal of Physical Activity and Health</i> 2011	Literature review To examine whether trails (e.g. existing trails, new trail construction or trail promotion campaigns) have positive effects on physical activity.	Population not specified <ul style="list-style-type: none"> Findings relevant to the rural setting. A general limitation of the studies was that many did not report on the study setting (i.e. urban, suburban or rural) or sample characteristics (i.e. age, gender, race, education). Future studies should include this information so that findings could be generalized.
Van Cauwenberg et al. ³⁹ “Relationship between the physical environment and physical activity in older adults” <i>Health & Place</i> 2011	Systematic review To provide a comprehensive overview of studies investigating the relationship between the physical environment and overall physical activity and the following domains: recreational physical activity, total walking and cycling, recreational walking and transportation walking in older adults.	Older adults <ul style="list-style-type: none"> Findings relevant to the rural setting. Most of the included studies focused on urban older adults, despite that urban/rural dwelling has a moderating effect on the physical environment/physical activity relationship.
Van Holle et al. ⁴⁰ “Relationship between the physical environment and different domains of physical activity in European adults” <i>BMC Public Health</i> 2012	Systematic review To provide an overview of the available European evidence from over the last decade.	European adults (18–65 years) <ul style="list-style-type: none"> There was convincing evidence of a negative relationship, which means that people living in less urbanized areas tended to be more physically active. That said, the review found a positive relationship between urbanization and cycling and total walking. The counterintuitive evidence regarding the degree of urbanization may be because occupational or domestic-oriented activities like gardening made the largest contribution to the total physical activity measures in the involved studies, and suburban or rural places lend themselves more to such pursuits than do urban ones.
Remote, northern and reserve settings		
Johnston et al. ⁴¹ “A review of programs that targeted environmental determinants of Aboriginal and Torres Strait Islander Health” <i>International Journal of Environmental Research and Public Health</i> 2013	Literature review To identify Indigenous health interventions that targeted environmental determinants of health.	Aboriginal People and Torres Strait Islanders <ul style="list-style-type: none"> Several programs reported developing infrastructure for physical activity as a strategy. Some discussion of interventions aimed to increase physical activity by targeting community infrastructure. For example, the review discusses the installation of swimming pools and the development of a “No School No Pool” policy in remote communities in Western Australia.

Continued on the following page

TABLE 2 (continued)
Summary of included review articles

Author / Article title Journal / Year	Type of review / Objectives	Relevant findings and implications
Shilton and Brown ⁴² “Physical activity among Indigenous and Torres Strait Islander people and communities” <i>Journal of Science and Sport in Medicine</i> 2004	Review To present recently published evidence on effective interventions promoting physical activity in this population.	Aboriginal People and Torres Strait Islanders <ul style="list-style-type: none"> • A limited number of physical activity interventions are described in the peer-reviewed literature. • One of the interventions included in the review did not focus specifically on physical activity but was relevant to the promotion of physical activity. According to the review, this study assessed the impact of opening swimming pools in two remote Indigenous communities. While participation in physical activity was not assessed in the study, the review notes that the swimming pool study has the potential to promote more widespread participation in swimming. • The review calls for further well-designed research into the effectiveness of innovative strategies to increase physical activity among Indigenous people.
Towns et al. ⁴³ “Healthy weight interventions in Aboriginal children and youth” <i>Canadian Journal of Dietetic Practice and Research</i> 2014	Literature review To identify and describe interventions aimed at reducing overweight or obesity risk among Indigenous children and youth and to present evidence of their effectiveness.	Indigenous children and youth (0–18 years) or family health <ul style="list-style-type: none"> • Of the 7 interventions explored, the Kahnawake Schools Diabetes Prevention Project (KSDPP) was the only one with a significant environmental component relevant to physical activity. • The goal of the KSDPP was to reduce rates of obesity and type 2 diabetes by improving children’s knowledge, attitudes and behaviours regarding healthy diets and physical activity and to change school environments and the nutritional content of school meals. The intervention included classroom activities and teacher training as well as community activities. • The KSDPP strengthened an existing school nutrition policy and implemented new cycling and walking paths in the community. • Physical activity was increased in some years, but these had returned to baseline by year 8.
Teufel-Shone et al. ⁴⁴ “Systematic review of physical activity interventions implemented with American Indian and Alaska Native populations in the United States and Canada” <i>American Journal of Health Promotion</i> 2009	Systematic review To describe physical activity interventions implemented in American Indian/Alaska Native populations in the USA and Canada.	American Indians, Alaska Natives, Indigenous peoples of Canada, Native Hawaiians and/or Native United States Samoans <ul style="list-style-type: none"> • Of the 64 interventions, 48 (75%) described an environmental resource or policy component aimed at modifying aspects of the social or physical environment. • Of these 48 programs, 6 involved developing fitness centres that offered access to exercise equipment and 2 involved the construction of walking paths.
Young and Katzmarzyk ⁴⁵ “L’activité physique chez les Autochtones au Canada” <i>Applied Physiology, Nutrition, and Metabolism</i> 2007	Review To summarize available information on patterns of physical activity, their determinants and consequences, and the results of various interventions designed to increase the physical activity of Indigenous peoples in Canada and the USA.	First Nations, Inuit and Métis in Canada <ul style="list-style-type: none"> • Describes the Kahnawake Schools Diabetes Prevention Project (KSDPP), an intervention in a Mohawk community outside of Montréal, that includes a school nutrition and healthy lifestyle education program, community-wide events and environmental changes, such as the building of a recreational path, to promote walking and running. • Characterizes the intervention as a complex package with multi-setting strategies implemented through dynamic exchanges between a range of community partners. • Calls for more research in a number of areas related to physical activity, for example, to identify determinants of and barriers to physical activity in a variety of environmental and cultural contexts.

Continued on the following page

TABLE 2 (continued)
Summary of included review articles

Author / Article title Journal / Year	Type of review / Objectives	Relevant findings and implications
Natural settings		
Abraham et al. ⁶ (see above)	Scoping review / qualitative literature review To provide a scoping study of publications on the health-promoting influence of landscape.	Population not reported <ul style="list-style-type: none"> The landscape can be imagined as a continuum between “wild” nature and “designed” environment, for example, urban and rural forests, green spaces, parks, gardens, waters and neighbourhood areas. Many of the studies show that forests play an important role when it comes to outdoor physical activity outside of cities, with people using forests mainly for recreation and exercise, including walking, hiking, kayaking and fishing. More research is required to better understand the health-promoting impacts of different landscape characteristics.
Gladwell et al. ⁴⁶ “The great outdoors: how a green exercise environment can benefit all” <i>Extreme Physiology & Medicine</i> 2013	Literature review To consider the declining levels of physical activity, particularly in the West, and how the environment may help motivate and facilitate physical activity.	Population not reported <ul style="list-style-type: none"> Management of countryside, forests and more extreme environments needs careful consideration to ensure access for all without having too many people visiting these areas as this would potentially destroy the natural environment that elicits these health benefits. The challenge for researchers in this field is not only to determine whether knowledge of nature’s health benefits can act as a motivator for behavioural change, but also to ensure that the increased use of “nature as a therapy” is accompanied by a conservationist approach to ensuring preservation of the environment.
Maller et al. ⁴⁷ “Healthy parks, healthy people: the health benefits of contact with nature in a park context” School of Health and Social Development, Faculty of Health, Medicine, Nursing and Behavioural Sciences, Deakin University Burwood, Melbourne 2009	Narrative review To review the potential and actual health benefits of contact with nature.	Population not reported <ul style="list-style-type: none"> In terms of physical benefits, parks provide a variety of settings and infrastructure for formal and informal sport and recreation, such as picnicking, walking, dog training/walking, running, cycling, ball games, sailing, surfing, photography, birdwatching, bushwalking, rock climbing and camping. There is a lack of awareness about opportunities for enhancing health provided by larger wilderness parks, such as national parks. Some of the most important wilderness areas around the world are located in parks. National parks in Australia (such as Big Desert and Wabba Wilderness Park) are designed for conservation but are also ideal for self-reliant recreation.
Thompson et al. ⁴⁸ “Does participating in physical activity in outdoor natural environments have a greater effect on physical and mental wellbeing than physical activity indoors?” <i>Environmental Science and Technology</i> 2011	Systematic review To provide an objective means of clarifying the value of outdoor green spaces in motivating physical activity and in conferring mental and physical well-being.	Adults or children; no eligible studies involving children were retrieved <ul style="list-style-type: none"> The natural environment includes many different types of green space such as wilderness areas, allotments, urban parks, open countryside, country parks, woodlands and wildlife reserves. While the impact of these different types of green space on well-being has begun to be investigated, the interaction of this impact with physical activity has yet to be clarified.

policy action in Canada, and to set a course for applied research on physical activity in rural, remote and northern communities to support that practice and policy action, we held a one-day priority-setting conference on physical activity in rural and remote/northern settings with 28 invited experts. These experts represented the spectrum of rural and/or remote/northern physical activity promotion-related research, policy and practice from across Canada. (Note: based on strong recommendations from the relevant

experts, the remote and northern categories from the literature were combined for the conference.) Participants included an Indigenous elder as well as practitioners and senior decision-makers from the North and from across Canada; representatives from municipal and provincial public health agencies and municipal planning agencies; university or institute-based researchers; and experts from sport and recreation, community and medicine. The experts were identified through a search of the scientific and grey literature

(e.g. policy documents and guidelines) on the topic and based on the recommendations of the Policy Advisory Group of the Policy Opportunity Windows – Engaging Research Uptake in Practice (POWER UP!) CLASP initiative, a panel of international experts on policy related to obesity and chronic disease prevention.

The scoping review results were provided to the participants in advance of the meeting so that they could review the evidence synthesis analysis and findings; critically

reflect on how that body of literature could inform enhanced action on physical activity in rural, remote and northern Canadian communities; and identify what was missing from the evidence synthesis. An overview of the findings was presented to the participants on the day of the conference.

While the evidence synthesis broadly explored rural, remote, northern and natural settings, the priority-setting conference narrowed that focus to specifically address rural and remote/northern settings based on recommendations from invited participants, recognizing that natural settings would be addressed as part of both.

This study was approved by the Health Panel of the Research Ethics Board at the University of Alberta.

Data collection

The priority-setting conference used a collaborative three-phased process that encouraged participants to generate priorities for action based on the available evidence and their own policy or practice-based experiences. Detailed notes were taken throughout the process. In the morning, presentations delivered by five experts focused on current research evidence and practice or policy-based experiences in rural and northern/remote settings, including one presentation that summarized findings from the evidence synthesis, and to unravel the nuanced, contextual nature of the issue of physical activity in rural and remote/northern settings. Two small group discussions organized by setting (rural and remote/northern) then took place simultaneously. In these discussions, the experts identified key priorities for the setting based on their own experiential knowledge and understanding of the research evidence, while also considering the information shared in the presentations and in the dynamic group discussions.

Data analysis

The analysis of priority-setting findings was collaborative. The participants reconvened as a large group to share their small-group priorities and to identify remaining issues. Then, working in new small groups, the experts selected their top three to five priorities for research, policy and practice. This provided them with another opportunity to share their perspective and expertise. To close the

conference, the small groups came together to rank and finalize a set of priorities.

We then used this list of priorities alongside the evidence synthesis and consideration of relevant policy and practice documents to compile an initial Canadian call to action on the promotion of physical activity in rural, remote, and northern settings.

Results

Literature review

Rural settings

Review articles with a stated rural focus

We identified four review articles that focused explicitly on rural (or remote) settings^{8,17-19} and that investigated the effects of the built environment on physical activity,⁸ determinants of physical activity,¹⁸ barriers and motivators to physical activity^{8,17} and differences in physical activity in rural, urban and suburban built environments.¹⁹ Demographic groups reported included children and adolescents,¹⁹ women,¹⁸ adults⁸ and older adults.¹⁷ Studies took place primarily in the United States of America (USA), as well as in Canada and Australia. One review incorporated studies from Cyprus, Iceland, Italy, Norway and Sweden.¹⁹

Defining rural

None of the four review articles provided explicit criteria on how they defined “rural.” For example, Frost et al.⁸ reviewed studies that identified the population as “rural,” whereas Olsen et al.¹⁸ used a varied definition, noting that one study limited the sample to communities of fewer than 1000 persons with no towns within a certain radius, while another included towns with up to 49 999 residents.

Barriers and motivators

Three out of the four rural-focused review articles discussed findings related to environmental motivators and/or barriers in rural settings. Examples of identified barriers included lack of sidewalks,^{8,18} poor lighting/lack of streetlights,^{17,18} safety concerns (i.e. crime, presence of hunters),^{8,17,18} the weather,^{17,18} dogs or wild animals^{17,18} and lack of physical access to facilities, transportation^{8,17,18} and parks.⁸ For example, Boehm et al.¹⁷ found that social and environmental barriers to exercise for older people—such as a poor built

environment, presence of dogs and bad weather—were more common in rural and remote community settings. While additional research is necessary, the review articles suggest there is a need for (1) policy to address barriers to physical activity in terms of the built environment (i.e. transportation, safety), particularly in specific populations (e.g. rural women); (2) for environmental design to consider environmental motivators and barriers; and (3) for practitioners to explore strategies to overcome these barriers.^{8,17}

Associations between physical activity and the built environment

In their review of 20 studies, Frost et al.⁸ identified 11 elements of rural built environments associated with physical activity levels in adults: sidewalks, street lighting, private and public recreational facilities, parks, malls, aesthetics, crime/safety, traffic, walking destinations, trails and access to the environment. To varying degrees, these studies explored the following elements: aesthetics (4/4 studies); perceptions of safety/crime levels (6/9); and presence of recreational facilities (5/10), trails (4/6) and parks (3/6). All these elements were found to be associated with physical activity levels.⁸ Frost et al. then compared findings from rural settings with those from 18 urban studies, and found that physical activity was positively associated with aesthetics in both settings, but that safety/crime levels, traffic and trails were better predictors of physical activity in rural settings.⁸ This evidence suggests that built environment features associated with adult physical activity may differ between rural and urban settings.

Differences in physical activity between rural, urban and suburban built environments

Of the four rural-focused review articles we included in our synthesis, Sandercock et al.¹⁹ had an explicit objective to compare differences in the physical activity levels of children living in urban and non-urban settings. Only 6 of the 18 studies Sandercock et al. reviewed explored physical activity beyond the rural/urban dichotomy and included suburban and/or small-town settings and/or populations. They found that physical activity levels of children in urban and, in some cases, rural settings were lower than those of children in suburban/small-town settings, a result (the authors suggest) of suburban and small towns sharing a mix of rural and urban characteristics. Suburban settings were also found to have fewer low

socioeconomic households and ethnic minority residents, two characteristics negatively associated with physical activity in adults.¹⁹ Sandercock et al. recommended that future studies consider socioeconomic status, racial factors and seasonal effects relative to physical activity within different built environments.

Review articles from the wider physical activity literature, with relevant findings and/or implications for rural settings

It was a challenge to draw definitive conclusions from the diverse evidence base. Taken together, these 24 review articles reiterated the importance of understanding how geographical differences can influence relationships between the built environment and health-related behaviours, and recommended setting sensitive environmental interventions.

Remote, northern and reserve settings

We identified five review articles on Indigenous health that included findings relevant to remote, northern and/or reserve settings (we did not find any review articles relevant to remote or northern settings that did emphasize Indigenous health). Four of these review articles discussed interventions to promote physical activity, either alone, or as an aspect of obesity or set of health outcomes. The fifth review article discussed physical activity correlates and patterns among Indigenous peoples in Canada and the USA, and provided an overview of intervention studies.⁴⁵ Studies included in the review articles took place in Australia,^{41,42} the USA⁴³⁻⁴⁵ and Canada.⁴³⁻⁴⁵

Environmental interventions to promote physical activity in Indigenous communities

The five review articles on Indigenous health discussed different interventions aimed at promoting physical activity that included an environmental component. For example, of the seven interventions aimed at promoting healthy weights among Indigenous children and youth that Towns et al.⁴³ identified, only two were multi-component interventions involving an environmental or policy change. In contrast, Johnston et al.⁴¹ and Shilton and Brown⁴² reported on the building of swimming pools in two remote Indigenous communities in Western Australia, where the goal was to increase school attendance and improve primary health outcomes. The review articles suggested that interventions like these demonstrate the value of implementing comprehensive strategies

to meet a range of community needs in resource-limited remote communities.

Teufel-Shone et al.⁴⁴ found that the majority of physical activity interventions in remote regions in Canada and the USA (72%) took place on reservations, reserves or pueblo. About 75% of the 64 interventions described an environmental resource or policy component aimed at modifying aspects of the social or physical environment. Effective interventions had an impact at various levels, including on risk behaviours and on health and fitness. Key factors for success included support from local leadership and the incorporation of cultural traditions into public health practice.

The review articles highlighted the need for more culturally relevant research that focuses on the histories of rural and remote Indigenous communities across a greater variety of geographical and cultural contexts.⁴³⁻⁴⁵ For example, the review articles revealed that barriers and opportunities for physical activity in Indigenous communities are not homogenous and that findings from one geographical region (e.g. country, province or community) or population (e.g. elders or children) may not readily apply to other regions or populations.

Natural settings

Four review articles that explore physical activity in natural settings (e.g. natural parks and wilderness areas) were identified. These review articles focused on a range of topics, including health benefits of contact with nature;⁴⁷ landscape as a resource for well-being;⁶ physiological benefits of exercise in a green environment;⁴⁶ and effects of participation in physical activity in natural environments versus indoor settings.⁴⁸ These review articles suggest there is a lack of awareness of the role that natural environments play in promoting physical activity and enhancing health,⁴⁷ particularly when these settings are considered as a feature of rural, remote or northern communities. Yet, there is also growing evidence for the importance of connecting with nature for people's health. For example, natural landscapes were found to have a greater restorative effect on mental fatigue and be better able to improve the ability to concentrate than urban areas.⁶ At the same time, there is concern about the sustainability of natural settings and the

environmental impact of increased human presence,⁴⁶ which suggests there is a need for intervention design for communities in natural areas.

Overall, across all non-urban settings, continued and enhanced efforts are required to synthesize and translate available evidence to inform the work of Canadian practitioners and policy makers. Furthermore, there is a need for additional primary research that uses scientifically robust methods to address current research gaps and limitations on this topic.

Priority-setting conference outcomes

The conference resulted in the identification of key priority areas for action and applied research to promote physical activity in rural and remote/northern communities. The key priorities represent the immediate and longer-term evidence needs and priorities of practitioners and academics working in these distinct settings.

Rural settings

Community self-identification of priorities and needs through collaborative processes with researchers.

- Involve rural communities in identifying research and policy priorities that promote physical activity in these settings to ensure that outcomes are meaningful and actionable for researchers, practitioners and policy makers.
- Increase funding opportunities that create spaces for collaboration between community members, practitioners, researchers and policy makers.
- Take inventory (of what is already happening) and develop a database of best practices to support moving knowledge to action.
- Develop a national virtual infrastructure to house best practices from across Canada.
- Work with communities, researchers, practitioners and policy makers to identify gaps and promising practices.
- Simultaneously understand, act and continually move forward on what is already known about promoting physical activity in rural settings despite the limited, if emerging, evidence base.
- Capture context in rural settings through qualitative and descriptive research.

- Promote the use of focused qualitative and descriptively rich research to develop policies and programs that are relevant to the specific contexts of communities, given the heterogeneous nature of rural communities.
- Use qualitative and descriptive research to unravel the specific nuances of different rural contexts. These findings can subsequently be compared and contrasted across different settings to help address some of the extant challenges in defining “rural” in Canada.

Remote/northern settings

- Look at physical activity in rural, remote and northern communities through a holistic lens (e.g. as an integral part of daily life).
- Assist practitioners and policy makers in identifying a broader range of opportunities to showcase the value of physical activity.
- Integrate physical activity with other community initiatives (e.g. when promoting mental wellness).
- Develop culturally appropriate programs, for example, focusing on the connection between land and food; the role of physical activity in healing, resilience and well-being; and the pre-eminent focus on wellness as a starting place would be a way of promoting Indigenous leadership for culturally-relevant physical activity opportunities.
- Create more opportunities for leadership, mentorship and resource development.
- Support community members, including youth, who are promoting physical activity in their communities to enhance long-term sustainability.
- Identify a broader pool of community members—youth, community ambassadors and recreation leaders, among others—to support physical activity initiatives.
- Identify existing training opportunities that support physical activity (e.g. the Certificate in Aboriginal Sport and Recreation* at the University of Alberta trains people within their own communities to develop expertise).
- Carefully consider how capacity building is defined; who decides what capacity is needed; who the trainers are; and who needs support.

Compile experiences in a database

- Develop and share an inventory of the different programs, activities and policies across Canada that promote physical activity in remote/northern settings.
- Incorporate local knowledge and community voice to ensure that culturally relevant activities are captured as part of documentation and sharing processes.
- Ensure resources are readily available and shared in a variety of ways (different languages, formats, e.g. video as well as text) to enhance reach to multiple cultural and geographical contexts.

Discussion

Expert participants at the priority-setting conference saw the need to move beyond the limited guidance currently available through extant research on physical activity in rural and remote settings to make meaningful, equitable and timely progress on physical activity promotion in those settings. In addition to careful consideration and discussion of the evidence, the experts drew on their rich and deep experience of working in these settings as practitioners, decision makers and researchers. Thus, while building from the evidence synthesis, the call to action described above reports on expert recommendations that recognize the nuance, variation, process and contextual issues that transcend the evidence currently available in the literature.

While the evidence synthesis and priority-setting process revealed similar issues and priorities in rural, remote and northern settings, the experts drew on their knowledge of the issues to clarify and expound on the implications for physical activity research and practice in these settings. Future research must address the problematic lack of clarity, transparency and consistency in how the term “rural” is defined and conceptualized.^{8,18,19} The lack of definition and conceptualization may limit the usefulness of the evidence and thus have a detrimental impact on the applicability of the findings for other rural settings.^{8,17} This lack of transparency and consistency compromised the utility of the findings from the review articles and led conference participants to deliberate on why it is complicated to define “rural.” For example, noting that rural areas can

vary greatly, Statistics Canada defines rural areas as “small towns, villages and other populated places with less than 1000 population according to the current census” and can include “agricultural lands” and “remote and wilderness areas.”⁴⁹ Currently, Statistics Canada’s definition has not been uniformly adopted by provincial/territorial health authorities or other governmental or organizational bodies concerned with rural or remote settings as other definitions may better align with particular service mandates or jurisdictional authority. While “rural” is a heterogeneous construct, further complications to the notion of a single definition are the similarities in the experience of rurality, despite wide differences in population-based or geographic characteristics often assigned to definitions of rural. A clear, consistent and transparent definition of “rural” would facilitate effective knowledge sharing across settings. The experts participating recommended the use of rigorous qualitative and mixed-method approaches as a starting point to unravelling this complexity.

The review articles noted the lack of peer-reviewed articles focusing on interventions targeting broader environmental levels for remote and northern settings.^{41,43} While setting priorities, experts echoed this concern and called for more resources dedicated to systematically promoting physical activity in these settings. Participants acknowledged the wealth of existing practice and policy under way (that is not adequately represented in current academic literature) and emphasized the need to increase investment in long-term sustainable funding and develop innovative funding models to reinvest in promoting physical activity in rural, remote and northern communities (i.e. which is also emphasized in the ParticipACTION Report Card on Physical Activity for Children and Youth^{50,51}); and document and share success stories and best practices in a more systematic way, including a focus on grey literature.

Experts described how this investment is particularly important in Indigenous rural or remote/northern communities to address the inequity of resources that promote physical activity⁵² and to systematically measure and reveal how those resource inequities are related to poor

* <https://www.ualberta.ca/kinesiology-sport-recreation/programs/undergraduate-programs/certificates/certificate-in-aboriginal-sport-and-recreation>.

health and social outcomes. Further, efforts to document the wide range of sources of evidence related to physical activity in rural and remote settings should be governed by rigorous, transparent and culturally appropriate criteria, including Indigenous research methods that are led by the communities themselves.

Expert participants from both rural and remote/northern settings groups identified similar best processes when bridging research, practice and policy gaps, suggesting that local community members, practitioners and decision-makers be actively involved in identifying issues and developing and implementing solutions. While this was not a theme identified in the evidence synthesis, it is reflected in both the *State of Rural Canada 2015* report¹³ and the 2016 *Pathways to Policy* report,⁵³ confirming the experts' rich process recommendations. Participants also raised the notion of community capacity to support physical activity in rural and remote/northern settings—an idea that echoes ParticipACTION's 2016 report card.⁵⁰ For example, they cited leadership development with youth and other community leaders in remote/northern communities as a key process to support long-term sustainability.

Expert participants carefully acknowledged the unique differences between rural and remote/northern settings. For example, experts from remote/northern settings emphasized the holistic nature of promoting physical activity, noting that action should reflect community culture and be integrated with core community priorities and Indigenous leadership. Experts stressed the importance of taking a strengths-based perspective and focusing on moving-to-the-land and on-the-land programs that involve traditional activities (e.g. hunting, snowshoeing) which embody physical activity and built environment concepts in ways that are relevant to the community. Priority-setting participants proposed focusing on resiliency-based programs (e.g. a return to connecting culture, the land and medicine) as one approach for moving forward.

Call to action

We present the following Canadian call to action, which outlines a focused direction to support the implementation and success of population-level and environmental

initiatives targeting physical activity in rural, remote and northern communities (Table 3). This call to action emerged from the priority-setting meeting, which was informed by both the evidence synthesis and the experts' critical reflection—one that is based on their current policy and practice expertise. This call to action, which is intentionally coordinated across policy, practice and research domains, also reflects recommendations from the National Collaborating Centre for Aboriginal Health⁵² to promote cultural relevancy and anti-oppressive practices as they relate to communication, knowledge generation and leadership.

To support timely knowledge translation with practitioners and policy makers, an earlier version of the evidence synthesis and the outcomes of the priority-setting conference were posted on the public website of the Alberta Policy Coalition for Chronic Disease Prevention, a partner in a funded project on policy interventions to address obesity and chronic diseases.

Strengths and limitations

There are potential limitations to this analysis. First, categorizing review articles by

type of setting proved to be challenging because the terms used—"rural and remote," "rural" and "reserve"—were often conflated in the literature, despite having different operational meanings. Similarly, Canadian priority-setting participants used the terms "remote" and "northern" synonymously in their deliberations, yet these terms are used differently in the international literature dealing with rural and remote health. Second, the review process did not account for data quality as an inclusion criterion [i.e. to offset the limited number of review articles available; as well, while 13 directly related to non-urban settings (rural, remote, northern and natural), 24 were not directly related to these settings but mentioned rural or remote communities in their recommendations]. Thus, some included review articles may be of poor quality. Third, as this synthesis reported on evidence explicitly outlined within the review articles, relevant information reported at the study level might not have been captured.

The strength of this initiative lies in its integrated knowledge translation approach: we deliberately brought scholarly evidence together with experiential evidence

TABLE 3
Canadian call to action on the promotion of physical activity in rural, remote and northern settings

Policy	Increase long-term sustainable funding and develop innovative funding models to reinvest in promoting physical activity in rural, remote and northern communities. For example, flexible opportunities are needed for community members and practitioners to respond to local priorities and support communities across Canada to share success stories and best practices in a meaningful and accessible way, including the ability to work together across language barriers.
	Create opportunities to collaborate with community members, practitioners and researchers living and working in rural, remote and northern communities in policy development, implementation and evaluation.
Practice	Develop and implement training opportunities to strengthen local capacity and recognition and inclusion of Indigenous models of leadership to promote physical activity over both the short and long terms.
	Identify and engage a broad range of physical activity practitioners and informal leaders to collaborate in the development of culturally appropriate programs and policies (e.g. youth in the community and Indigenous elders). Contribute to the development of a culturally appropriate evidence base (recognizing different ways of knowing and learning) by fostering a dynamic system for sharing best practices and success stories across Canada.
Research	Work closely with community leaders, practitioners and policy/decision makers to identify gaps in knowledge and act as knowledge brokers between practice and policy domains. Promote the use of research methods in implementation and evaluation research that are designed to capture the unique context of different rural, remote and northern communities (e.g. qualitative and mixed methods as well as Indigenous research methods). Use of these methods will support scaling up initiatives across settings by identifying what works for who, where and why.

from practice and policy to shed light on this critical health equity issue. Synthesis findings were contextualized and enhanced by experts' knowledge to support future research and action on physical activity in non-urban settings. We recognize and are currently acting on the need to continue to engage stakeholders with additional perspectives to be part of future discussions and strategic planning on facilitating physical activity in rural, remote and northern settings.

To this end, we will be hosting a follow-up priority-setting conference to make headway on this new Canadian call to action. The meeting will convene a wider group of researchers, practitioners and policy makers working in the area of physical activity in rural, remote and northern settings to critically analyze this call to action; highlight examples of current practices and new gaps for each type of setting addressed in the call to action; and form working groups to begin addressing the specific actions noted in the call.

The need for anti-oppressive practices in the development and sharing of knowledge for the benefit of non-urban population groups, particularly Indigenous groups, will also be addressed at this meeting. Specifically, we will seek leadership and guidance from Indigenous community leaders (or members), local practitioners and experts in developing and hosting the event so as to not reproduce Canada's colonial legacy.

Conclusion

Access to supportive settings for physical activity is critical for promoting health and well-being. The lack of policy, practice and research action on physical activity and features of the physical, built and natural environments in rural, remote and northern settings is a significant threat to population health equity in Canada. To begin to address this challenge, we brought together experts from the research, policy and practice domains to develop a Canadian call to action based on a synthesis of evidence reviews that focused on physical activity promotion in rural, remote or northern communities. The call to action outlines a focused direction to support the implementation and success of population-level and environmental initiatives targeting physical activity in rural, remote and northern communities. Coordinated action across

policy, practice and research domains will be essential to the success of these recommendations.

Acknowledgements

This work was funded by Health Canada through the Canadian Partnership Against Cancer's (CPAC) Coalitions Linking Action & Science for Prevention (CLASP) initiative. The authors respectfully acknowledge the Association pour la Santé Publique du Québec for their valuable insights and help with the priority-setting meeting. We also thank the anonymous peer reviewers and editors who provided careful feedback to help us strengthen the manuscript.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Authors' contributions and statement

All authors reviewed and approved the final manuscript. All authors except KK participated in the priority setting meeting. CN led the design and analysis of the review of reviews, chaired the priority setting meeting, drafted recommendations, and contributed to drafting and finalizing the manuscript; KA conducted the review of reviews, drafted recommendations, and contributed to drafting and finalizing the manuscript; KR contributed to drafting the recommendations and finalizing the manuscript; KK drafted the manuscript; and SB, WC, TG, JG, and JM presented evidence at priority setting meeting and contributed to drafting and finalizing the manuscript.

The content and views expressed in this article are those of the authors and do not necessarily reflect those of the Government of Canada.

References

1. Global Advocacy Council for Physical Activity, International Society for Physical Activity and Health. The Toronto charter for physical activity: a global call for action. *J Phys Act Health*. 2010;7(Suppl 3):S370-85. doi: 10.1123/jpah.7.s3.s370.

2. Statistics Canada. Canadian Health Measures Survey: Directly measured physical activity of Canadians, 2012 and 2013. Ottawa (ON): Statistics Canada; 2015 Feb 18 [cited 2017 Nov]. Available from: <http://www.statcan.gc.ca/daily-quotidien/150218/dq150218c-eng.pdf>
3. Sallis JF, Floyd MF, Rodriguez DA, Saelens BE. Role of built environments in physical activity, obesity, and cardiovascular disease. *Circulation*. 2012;125(5):729-37. doi: 10.1161/CIRCULATIONAHA.110.969022.
4. Davison KK, Lawson CT. Do attributes in the physical environment influence children's physical activity? A review of the literature. *Int J Behav Nutr Phys Act*. 2006;3(1):19. doi: 10.1186/1479-5868-3-19.
5. Cunningham GO, Michael YL. Concepts guiding the study of the impact of the built environment on physical activity for older adults: a review of the literature. *Am J Health Promot*. 2004;18(6):435-43. doi: 10.4278/0890-1171-18.6.435.
6. Abraham A, Sommerhalder K, Abel T. Landscape and well-being: a scoping study on the health-promoting impact of outdoor environments. *Int J Public Health*. 2010;55(1):59-69. doi: 10.1007/s00038-009-0069-z.
7. Policy Opportunity Windows Enhancing Research Uptake in Practice (POWER UP!), Coalition Linking Action and Science for Prevention (CLASP). 2016 Knowledge, Attitudes, and Beliefs Survey. Edmonton, AB: School of Public Health, University of Alberta; 2016.
8. Frost SS, Goins RT, Hunter RH, et al. Effects of the built environment on physical activity of adults living in rural settings. *Am J Health Promot*. 2010;24(4):267-83. doi: 10.4278/ajhp.08040532.
9. Martin SL, Kirkner GJ, Mayo K, Matthews CE, Durstine JL, Hebert JR. Urban, rural, and regional variations in physical activity. *J Rural Health*. 2005;21(3):239-44. doi: 10.1111/j.1748-0361.2005.tb00089.x.

10. Eberhardt MS, Pamuk ER. The importance of place of residence: examining health in rural and nonrural areas. *Am J Public Health*. 2004; 94(10):1682-6. doi: 10.2105/AJPH.94.10.1682.
11. Canadian Fitness and Lifestyle Research Institute. 2010-2011 Physical Activity Monitor. Bulletin 14: Barriers to children's participation in physical activity Ottawa (ON): Canadian Fitness and Lifestyle Research Institute; 2014 [cited 2017 Nov 17]. Available from: <http://www.cflri.ca/sites/default/files/node/1334/files/CFLRI%20PAM%202010-2011%20Bulletin%2014%20EN.pdf>
12. Federation of Canadian Municipalities. Cities and communities: partners in Canada's future Ottawa, Canada: Federation of Canadian Municipalities; 2015 [cited 2017 Nov 17]. Available from: https://www.fcm.ca/Documents/reports/FCM/Cities_and_Communities_Partners_in_Canada_Future_EN.pdf.
13. Markey S, Breen S, Lauzon A, Gibson R, Ryser L, Mealy R, editors. State of rural Canada 2015. Camrose (AB): Canadian Rural Revitalization Foundation; 2015 [cited 2017 Nov 17]. Available from: <http://sorc.crrf.ca/wp-content/uploads/2015/10/SORC2015.pdf>
14. National Collaborating Centre for Methods and Tools. Evidence-informed public health: What is Evidence-Informed Public Health? Hamilton (ON): National Collaborating Centre for Methods and Tools, McMaster University; [cited 2017 Feb 9]. Available from: <http://www.nccmt.ca/professional-development/eiph>
15. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol*. 2005; 8(1):19-32. doi: 10.1080/1364557032000119616.
16. Reading C, Wien F. Health inequalities and social determinants of Aboriginal peoples' health. Prince George (BC): National Collaborating Centre for Aboriginal Health; 2009 [cited 2018 Feb]. Available from: <https://www.ccsa-nccah.ca/docs/determinants/RPT-HealthInequalities-Reading-Wien-EN.pdf>
17. Boehm J, Franklin RC, Newitt R, McFarlane K, Grant T, Kurkowski B. Barriers and motivators to exercise for older adults: a focus on those living in rural and remote areas of Australia. *Aust J Rural Health*. 2013; 21(3):141-9. doi: 10.1111/ajr.12032.
18. Olsen JM. An integrative review of literature on the determinants of physical activity among rural women. *Public Health Nurs*. 2013;30(4):288-311. doi: 10.1111/phn.12023.
19. Sandercock G, Angus C, Barton J. Physical activity levels of children living in different built environments. *Prev Med*. 2010;50(4):193-8. doi: 10.1016/j.ypmed.2010.01.005.
20. Bauman AE, Reis RS, Sallis JF, Wells JC, Loos RJ, Martin BW. Correlates of physical activity: why are some people physically active and others not? *Lancet*. 2012;380(9838):258-71. doi: 10.1016/S0140-6736(12)60735-1.
21. Calogiuri G, Chroni S. The impact of the natural environment on the promotion of active living: an integrative systematic review. *BMC Public Health*. 2014;14:873. doi: 10.1186/1471-2458-14-873.
22. Casagrande SS, Whitt-Glover MC, Lancaster KJ, Odoms-Young AM, Gary TL. Built environment and health behaviors among African Americans: a systematic review. *Am J Prev Med*. 2009;36(2):174-81. doi: 10.1016/j.amepre.2008.09.037.
23. Ding D, Gebel K. Built environment, physical activity, and obesity: what have we learned from reviewing the literature? *Health Place*. 2012;18(1):100-5. doi: 10.1016/j.healthplace.2011.08.021.
24. Feng J, Glass TA, Curriero FC, Stewart WF, Schwartz BS. The built environment and obesity: a systematic review of the epidemiologic evidence. *Health Place*. 2010;16(2):175-90. doi: 10.1016/j.healthplace.2009.09.008.
25. Foster S, Giles-Corti B. The built environment, neighborhood crime and constrained physical activity: an exploration of inconsistent findings. *Prev Med*. 2008;47(3):241-51. doi: 10.1016/j.ypmed.2008.03.017.
26. Galvez MP, Pearl M, Yen IH. Childhood obesity and the built environment. *Curr Opin Pediatr*. 2010;22(2):202-7. doi: 10.1097/MOP.0b013e328336eb6f.
27. Hanson S, Berkowitz B. Does the built environment influence physical activity? Examining the evidence – Special Report 282. Washington (DC): Transportation Research Board; 2005.
28. Humpel N, Owen N, Leslie E. Environmental factors associated with adults' participation in physical activity: a review. *Am J Prev Med*. 2002;22(3):188-99. doi: 10.1016/S0749-3797(01)00426-3.
29. Kaczynski AT, Henderson KA. Environmental correlates of physical activity: a review of evidence about parks and recreation. *Leisure Sci*. 2007;29(4):315-54. doi: 10.1080/01490400701394865.
30. Lovasi GS, Hutson MA, Guerra M, Neckerman KM. Built environments and obesity in disadvantaged populations. *Epidemiol Rev*. 2009;31:7-20. doi: 10.1093/epirev/mxp005.
31. Matson-Koffman DM, Brownstein JN, Neiner JA, Greaney ML. A site-specific literature review of policy and environmental interventions that promote physical activity and nutrition for cardiovascular health: what works? *Am J Health Promot*. 2005;19(3):167-93. doi: 10.4278/0890-1171-19.3.167.
32. Moran M, Van Cauwenberg J, Hercky-Linnewiel R, Cerin E, Deforche B, Plaut P. Understanding the relationships between the physical environment and physical activity in older adults: a systematic review of qualitative studies. *Int J Behav Nutr Phys Act*. 2014;11:79. doi: 10.1186/1479-5868-11-79.
33. McCrorie PR, Fenton C, Ellaway A. Combining GPS, GIS, and accelerometry to explore the physical activity and environment relationship in children and young people – a review. *Int J Behav Nutr Phys Act*. 2014;11:93. doi: 10.1186/s12966-014-0093-0.
34. Ferdinand A, Sen B, Rahurkar S, Engler S, Menachemi N. The relationship between built environments and physical activity: a systematic review. *Am J Public Health*. 2012; 102(10):e7-e13. doi: 10.2105/AJPH.2012.300740.

35. Papas MA, Alberg AJ, Ewing R, Helzlsouer KJ, Gary TL, Klassen AC. The built environment and obesity. *Epidemiol Rev.* 2007;29:129-43. doi: 10.1093/epirev/mxm009.
36. Renalds A, Smith TH, Hale PJ. A systematic review of built environment and health. *Fam Community Health.* 2010;33(1):68-78. doi: 10.1097/FCH.0b013e3181c4e2e5.
37. Saelens BE, Handy SL. Built environment correlates of walking: a review. *Med Sci Sports Exerc.* 2008;40(7 Suppl):S550-66. doi: 10.1249/MSS.0b013e31817c67a4.
38. Starnes HA, Troped PJ, Klenosky DB, Doehring AM. Trails and physical activity: a review. *J Phys Act Health.* 2011;8(8):1160-74. doi: 10.1123/jpah.8.8.1160.
39. Van Cauwenberg J, De Bourdeaudhuij I, De Meester F, et al. Relationship between the physical environment and physical activity in older adults: a systematic review. *Health Place.* 2011;17(2):458-69. doi: 10.1016/j.healthplace.2010.11.010.
40. Van Holle V, Deforche B, Van Cauwenberg J, et al. Relationship between the physical environment and different domains of physical activity in European adults: a systematic review. *BMC Public Health.* 2012;12(1):807-23. doi: 10.1186/1471-2458-12-807.
41. Johnston L, Doyle J, Morgan B, et al. A review of programs that targeted environmental determinants of Aboriginal and Torres Strait Islander health. *Int J Environ Res Public Health.* 2013;10(8):3518-42. doi: 10.3390/ijerph10083518.
42. Shilton TR, Brown WJ. Physical activity among Aboriginal and Torres Strait Islander people and communities. *J Sci Med Sport.* 2004;7(1 Suppl): 39-42. doi: 10.1016/S1440-2440(04)80276-7.
43. Towns C, Cooke M, Rysdale L, Wilk P. Healthy weights interventions in Aboriginal children and youth: a review of the literature. *Can J Diet Pract Res.* 2014;75(3):125-31. doi: 10.3148/cjdpr-2014-006.
44. Teufel-Shone NI, Fitzgerald C, Teufel-Shone L, Gamber M. Systematic review of physical activity interventions implemented with American Indian and Alaska Native populations in the United States and Canada. *Am J Health Promot.* 2009;23(6):S8-32. doi: 10.4278/ajhp.07053151.
45. Young TK, Katzmarzyk PT. L'activité physique chez les Autochtones au Canada. *Appl Physiol Nutr Metab.* 2007;32 Suppl 2F:S165-78. doi: 10.1139/H07-164.
46. Gladwell VF, Brown DK, Wood C, Sandercock GR, Barton JL. The great outdoors: how a green exercise environment can benefit all. *Extrem Physiol Med.* 2013;2(1):3. doi: 10.1186/2046-7648-2-3.
47. Maller C, Townsend M, Brown P, St Leger L. Healthy parks, healthy people: the health benefits of contact with nature in a park context. A review of current literature. *George Wright Forum.* 2009;26(2):51-83.
48. Thompson Coon J, Boddy K, Stein K, Whear R, Barton J, Depledge MH. Does participating in physical activity in outdoor natural environments have a greater effect on physical and mental wellbeing than physical activity indoors? A systematic review. *Environ Sci Technol.* 2011;45(5):1761-72. doi: 10.1021/es102947t.
49. Statistics Canada. Dictionary, Census of Population, 2016. Rural area (RA). Ottawa (ON): Statistics Canada; 2016 Nov 16 [modified 2017 Jan 31; cited 2018 Feb 9]. Available from: <https://www12.statcan.gc.ca/census-recensement/2016/ref/dict/geo042-eng.cfm>
50. ParticipACTION. Are Canadian kids too tired to move? The 2016 ParticipACTION report card on physical activity for children and youth. Toronto (ON): ParticipACTION; 2016 [cited 2017 January 31]. Available from: <https://www.participaction.com/sites/default/files/downloads/2016%20ParticipACTION%20Report%20Card%20-%20Full%20Report.pdf>
51. Active Healthy Kids Canada. Are we driving our kids to unhealthy habits? The 2013 Active Healthy Kids Canada Report Card on Physical Activity for Children and Youth. Toronto (ON): Active Healthy Kids Canada; 2013 [cited 2017 Nov 17]. Available from: http://dvqdas9jty7g6.cloudfront.net/reportcard2013/Active-Healthy-Kids-2013-Report-Card_en.pdf
52. Hunt S. Review of core competencies for public health: An Aboriginal public health perspective. Prince George (BC): National Collaborating Centre for Aboriginal Health; 2015.
53. Canadian Partnership Against Cancer. Canadian Partnership Against Cancer. Pathways to policy: Lessons learned from the Coalitions Linking Action and Science for Prevention (CLASP) initiative – For physical activity and built environment policy. Toronto (ON): Canadian Partnership Against Cancer; 2016 [cited 2017 Nov 17]. Available from: https://content.cancerview.ca/download/cv/prevention_and_screening/prevention/clasp/documents/pathwaystopolicy.pdf