

# Promotion of Physical Activity in Rural, Remote, Northern, and Natural Settings in Canada



Report on Evidence Synthesis Findings and Outcomes  
from a National Priority-Setting Conference

Policy Opportunity Windows: Enhancing Research Uptake in Practice (POWER UP!)





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## **SUGGESTED CITATION**

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## The Challenge

Regular physical activity is an important determinant of health and well-being. Increased physical activity is known to decrease the risk of developing different chronic diseases, cancers, and improve overall well-being (1-3). Despite these benefits, nearly 80% of Canadian adults do not participate in the recommended 150 minutes of moderate-to-vigorous physical activity each week (4).

Research confirms that an individual's physical activity levels are influenced by a number of different factors (5-7). For example, there is increasing recognition that the wider physical, built, and natural environments (see Box 1 for definitions) in which we live, work, and play can significantly impact our physical activity behaviours, weight status, and overall health (8). Policies and other environmental interventions (such as providing opportunities for active transportation) can play a meaningful role in creating supportive settings that promote health and well-being by making it easier for individuals to incorporate physical activity into their day (5).

A 2008 systematic review found that the most consistent environment associations identified for physical activity were related to aspects of the built environment (9). For example, neighbourhood walkability and access to local recreational facilities were associated with healthy body weights (9). However, current evidence on the promotion of physical activity at the community (or environment) level has been primarily focused on urban settings, with less attention dedicated to settings outside of cities and metropolitan areas (10, 11).

This is problematic as evidence on urban form and built environment interventions to promote health does not adequately attend to the realities of those living outside of urban areas (11). For example, physical activity interventions focused on walkability to address obesity and sedentary behaviours among rural populations have little empirical evidence or theoretical development to draw upon (12, 13). Compounding this challenge, recent literature has revealed that populations outside of urban areas have access to fewer resources than their urban counterparts, and thus, may be at a greater risk for certain health issues such as cardiovascular disease, obesity, and type 2 diabetes (10).

### Box 1: Key definitions

Within the literature, the terms physical, built, and natural environment have been variously defined. For the purpose of clarity, we define (14):

**Physical environment** as the objective and 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, and crime and safety (15).

**Built environment** as features of the environment which are influenced by human design and generally includes three main components: transportation systems, land development patterns, and microscale urban design (16).

**Natural environment** as the aspects of the natural world untouched by human influence. Natural environments can be viewed as a continuum between wild nature and areas under some human influence, such as urban green spaces (17, 18).

Considering these issues and challenges, it is important for interventions that target rural, remote, or northern communities to carefully consider – and address – a number

of unique contextual factors occurring in these settings. These contextual factors include the physical, built, and natural environments, along with the social and cultural realities of rural, remote, and northern communities.

Failure to consider the unique contexts of non-urban settings may perpetuate inequities in the capacity and support for those working in rural and remote settings to promote the health of their populations relative to urban areas. Further, consideration of rural and remote contexts may contribute to more effective policies and environmental interventions to promote health.

In light of this challenge, in 2015, we conducted an evidence synthesis to understand what was currently known about promoting physical activity in rural, remote, northern, and natural settings. Second, in November 2015, we hosted a priority setting conference with a diverse set of experts from across Canada. The purpose of this conference was to begin the process of moving towards an applied research direction in rural and remote/northern settings to support research, policy, and practice. This report presents on the findings from the evidence synthesis and outcomes from the priority setting conference, concluding with recommended next steps for policy, practice, and research.

Before proceeding, we believe it is important to outline why our evidence synthesis broadly reviewed rural, remote, northern, and natural settings, while our priority setting conference focused on rural and remote/northern settings. We used the broader grouping of settings (i.e., rural and remote/northern) in the priority setting conference for a number of reasons. First, although the literature tended to report separately on interventions undertaken in natural settings versus those undertaken in populated settings, this distinction is not reflective of the practical realities of these communities. Thus, because natural environments are integral to both rural and remote/northern settings, we did not treat them as a separate environment during the priority setting conference. Second, we grouped together remote and northern settings based on initial discussions with key practice-based stakeholders leading up to the conference, despite distinctions made in the international literature. Through these discussions, we came to realize that these terms (i.e., remote and northern) are often understood to mean the same thing in a Canadian context. However, we recognize that these terms may have different conceptualizations in international contexts.

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## Policy Snapshot

There is a high level of support among policy influencers (such as decision-makers, bureaucrats, media, and policy advocates) in Canada for policies and interventions that promote physical activity by targeting the built and physical environment. POWER UP!'s 2014 Knowledge, Attitudes, and Beliefs (KAB) Survey (19) found that:

- 94% of policy influencers supported changing neighbourhood and community design to encourage informal physical activity in everyday life (19).
- 96% of policy influencers supported implementing transportation policies designed to promote physical activity through measures such as safe routes, cycle facilities, and providing adequate lighting (19).

Similarly, the same 2014 KAB Survey (19) revealed that the Canadian public is also supportive of policies and interventions that promote physical activity by targeting the built and physical environment, and in some policy areas even more so than policy influencers:

- 77% supported zoning bylaws to restrict the supply of junk food near schools (compared to 66% support among policy influencers) (19).
- 59% supported limiting the number of fast food restaurants per kilometer (compared to 55% support among policy influencers) (19).

Despite positive attitudes among policy influencers and the public towards policies and interventions targeting the built environment to promote physical activity, few municipalities have a formal physical activity-oriented policy in place. For example, only 16% of municipalities in Canada had a formal transportation master plan (20). However, communities between 1,000 and less than 10,000 residents were less likely to have a transportation master plan compared to communities with over 100,000 residents (7% compared to 60%, respectively) (20).

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## Evidence Synthesis

We conducted an evidence synthesis titled “*Promotion of Physical Activity in Rural, Remote, Northern, and Natural Settings*” (14) (see: Appendix A for a full copy), which examined the current status of the literature on physical activity and features of the built, physical, and natural environments in settings outside of urban areas. Below is a summary of that report.

### Methods

We sought review articles from a variety of sources including four major databases (Ovid Medline, CINAHL, Academic Search Complete, and SPORT-Discus), four grey literature sources (Active Living Research, Bridging the Gap/Robert Woods Johnson Foundation, Children and Nature Network, and Ohio Leave No Child Inside Collaborative), a review of references from key articles, Google Scholar, as well as additional reviews provided by the research team (please see the evidence synthesis (14) found in Appendix A for a detailed description of methods). Review articles were required to meet the following criteria to be included: (i) English and French language reviews, including narrative reviews and summary papers; (ii) published after 2000; (iii) examine research, strategies, and/or interventions related to physical activity in the context of the physical, built, and natural environments, and; (iv) report on findings and/or implications that are relevant to non-urban settings, including rural, remote, northern, and natural settings (14).

In total, we identified 36 reviews relevant to the aims of the synthesis (14). Of the 36 reviews, only four had a specific focus on rural and/or remote locations. In addition, we identified five articles that had an Indigenous health focus, which included findings relevant to remote, northern, and/or reserve settings. The remaining 24 articles were not specific to rural or remote settings. However, these articles did include some mention of findings and/or implications relevant to rural and remote settings and were thus included.

### Summary of Key Findings

The synthesis indicated that although additional research is needed, rural settings experience unique environmental facilitators and barriers to physical activity (10, 21). For example, a review from Australia found that people living in rural and remote settings were more likely to identify social and environment barriers to physical activity, such as poor built environment, dogs, and weather (21). Further, included reviews also identified differences in the relationship between physical activity and the built environment in rural settings (10, 21).

In regards to promoting physical activity in indigenous remote, northern, and/or reserve communities, we identified a limited number of interventions that incorporated an environmental component, particularly within a Canadian context. Findings from our evidence synthesis indicate that there is a need for more culturally relevant research and evaluation (22) across a greater variety of geographic and cultural contexts (23, 24).

Last, we identified a limited number of reviews exploring physical activity in natural settings, which focused on: the health benefits of contact with nature (25); landscape as a resource for wellbeing (17); the physiological benefits of green exercise (26); and the effects of participation in physical activity in natural environments versus indoor settings (27). These reviews suggest there is a lack of awareness of the role natural environments can play in promoting physical activity and enhancing health (25), particularly when these settings are considered as a feature of rural or remote/northern communities. Further, there is concern regarding the sustainability of natural settings and the environmental impact of increased human presence (26), also implicating intervention design for communities nested 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 (14). Furthermore, there is a need for significant additional primary research using scientifically robust methods to address current research gaps and limitations (14).

# Priority Setting Conference

Following completion of the evidence synthesis, we held a one-day priority setting conference with 28 invited experts on physical activity in rural and remote/northern settings representing the spectrum of research, policy, and practice from across Canada. The aim of this conference was to develop a set of priorities for practice and policy action, and to set an applied research direction on physical activity in rural, remote, and northern communities to support that action. We distributed the evidence synthesis to all participants prior to the priority setting conference.

## Priority Setting Conference Process

The priority setting conference was facilitated using a collaborative process that encouraged participants to generate priorities for action in rural and remote/northern settings based on their own experience and the research evidence. Conference facilitation comprised three phases:

- *Invited presentations to ‘set the stage’.* The conference opened with presentations from five invited speakers in both rural and northern/remote settings (see: Appendix B for a complete list of speaker and facilitator bios). These expert presentations set the stage for the small group discussions to follow by presenting on what is currently known on this topic and unravelling the true nature of the issue (e.g., what are the ‘real’ contextual issues around the promotion of physical activity in rural and remote/northern settings).
- *Small group ‘deep dialogue’.* Following the presentations, two simultaneous small group discussions took place, one with experts from rural settings, and the other with experts from remote/northern settings. The aim of these setting-specific discussions was to identify key priorities for their setting based on the experts’ experiential knowledge and understanding of the research evidence, considering also the information shared by presenters and the dynamic group dialogue.
- *Large group ‘top’ priority setting.* To close the conference, participants reconvened as a large group to share their small-group priorities and to identify remaining or overarching issues. Then, participants selected their top 3-5 priorities for action using a dot-mocracy process (see: Appendix C), which allowed each participant to voice their opinion. The outcome of the dot-mocracy process was also vetted with the large group, and discussion points noted. These priorities were used as the foundation for a ‘Canadian’ call to action, the details of which are presented below.

## Priority Setting Conference Outcomes

The meeting 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, identified for each setting, represent the immediate and longer-term evidence needs and priorities of practitioners and scientists working in these distinct settings.

### Rural Settings

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

- Involve communities in identifying research and policy priorities that promote physical activity in rural settings to ensure that outcomes are: (i) meaningful to communities, and (ii) actionable for researchers, practitioners, and policy-makers.
  - Increase funding opportunities that create spaces for collaboration between community members, practitioners, researchers, and policy-makers.
2. *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 promising practices and gaps.
  - Simultaneously understand, act, and move forward on what is already known on promoting physical activity in rural settings despite an emerging, but still limited, evidence base.
3. *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

1. *Frame physical activity in rural, remote, and northern communities from a holistic lens*
- Frame physical activity from a holistic lens (e.g., as an integral part of daily life) to assist practitioners and policy-makers in identifying a broader range of opportunities to showcase the value of physical activity.
  - Integrate a physical activity lens alongside other specific community initiatives (e.g., when promoting mental wellness).
  - Develop culturally appropriate programs. For example, taking an indigenous people's lens to promote physical activity may focus on the connection between land and food; or the role of physical activity in healing, resiliency, and wellbeing.
2. *Create more leadership, mentorship, and resource development opportunities*
- Create opportunities to support local physical activity practitioners and community members, including youth who are promoting physical activity in their communities, in order to enhance long-term sustainability.
  - Identify a broader pool of physical activity practitioners such as youth, community ambassadors, and recreation leaders to support initiatives.

- Identify existing training opportunities that support physical activity practitioners (e.g., the University of Alberta Recreation and Sport program trains people within their own communities to develop their own expertise).
- Carefully consider how capacity building is defined, who decides what capacity is needed, who the trainers are, and who needs support.

### *3. Compile experiences in a database*

- Develop and share an inventory of different programs, activities, and policies happening across Canada to promote physical activity in remote/northern settings.
- Incorporate local knowledge and the 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 of best practices to multiple cultural and geographical contexts.

## Issues and Challenges

Priority setting conference participants identified a number of important issues and challenges that are currently encountered in efforts to promote physical activity in rural and remote/northern settings:

- *Defining rural.* We identified a lack of clarity and transparency in how the term rural is conceptualized in the literature. This is problematic as it may limit the usefulness of conclusions that can be drawn from the research evidence, and the generalizability or applicability of study findings to other rural settings (10, 28). Considering this, conference participants (along with the authors from the reviews included in the evidence synthesis) have called for further research to provide clear, consistent, and transparent definitions for the term ‘rural’ (10, 28, 29) to effectively share lessons learned across settings.
- *Insufficient resourcing.* Participants from all domains (practice, policy, and research) emphasized that there are insufficient resources dedicated to promoting physical activity in rural, remote, and northern settings in Canada.
- *Lack of Canadian examples and research.* We found there is a paucity of Canadian research articulating the relationship between physical activity and the physical, built, and natural environments in rural, northern, and remote settings (14). This is problematic as the lessons learned within one country may not translate to other settings given the unique contexts within countries. However, participants emphasized that this lack of documented examples does not mean that there is not a wealth of existing practice and policy work already taking place. Participants stressed the need to document and share success stories and best practices in a more systematic way, with a focus on grey literature.

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## Call to Action

Action to promote physical activity in rural and remote/northern settings implicates research, policy, and practice primarily in the public health and social services, municipal planning, recreation and parks sectors, but also requires consistent inter-sectoral work (e.g., transportation and agricultural sectors, among others). While coordinated action is needed, the priorities from the working groups can be summarized by domain as:

### Policy

- Increase long-term sustainable funding and develop innovative funding models to reinvest in promoting physical activity in rural and remote/northern communities. For example, flexible opportunities are needed:
  - for community members and practitioners to respond to local priorities; and
  - to support communities across Canada to share success stories and best practices in a meaningful and accessible way.
- Create opportunities to collaborate with community members, practitioners, and researchers living and working in rural and remote/northern communities in policy development, implementation, and evaluation.

### Practice

- Develop and implement training opportunities to strengthen local capacity 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 an evidence base 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 and remote/northern communities (e.g., qualitative and mixed methods). Use of these methods will support scaling up initiatives across settings by identifying what works for who, where, and why.

In addition to these priorities for action, we have identified immediate next steps to continue this critical national discussion. We will continue to engage stakeholders with additional perspectives to be part of future discussions and strategic planning on facilitating physical activity in rural and remote/northern settings. These stakeholders include: NGOs and non-profit organizations; planning associations; community members including elders and youth, clinicians; recreation and parks associations; and municipal organizations. Our second priority setting conference will be held in 2017 to take forward our call to action and identify tangible next steps.

## Conclusion

Access to supportive settings for physical activity is an important means to promote health and well-being by making it easier for individuals to incorporate physical activity into their day. 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. Our findings are reinforced by recent Canadian reports in this field. For example, both the 2015 State of Rural Canada report and the 2016 Pathways to Policy report by the Canadian Partnership Against Cancer emphasized the importance of engaging rural communities as active participants in designing the future of their communities (11, 30). In particular, the 2015 State of Rural Canada report (30) echoed our concern with the lack of attention on rural settings, stating '*We have been neglecting rural Canada ... Fundamentally, we have forgotten how to re-invest in rural and small town places*' (p.ii). Further, the

2016 ParticipACTION Report Card similarly recommended the development of leadership and community capacity building opportunities to support physical activity in rural and remote communities (31).

To begin to address this health equity challenge we brought together experts from across the research, policy, and practice spectrum to develop a 'Canadian' call to action. The call to action presented in this report outlines a focused direction to support the implementation and success of population-level and/or environmental initiatives targeting physical activity in rural and remote/northern communities. We will continue to build and act on this 'Canadian' call to action by engaging additional perspectives from diverse backgrounds in this important and timely discussion. Coordinated action across policy, practice and research domains will be essential to the success of these recommendations.

## References

1. World Cancer Research Fund/American Institute for Cancer Research. Policy and action for cancer prevention. Food, nutrition, and physical activity: a global perspective. Washington, DC: AICR; 2009.
2. Canadian Society for Exercise Physiology. Canadian physical activity guidelines: 2011 scientific statements. Ottawa, ON: Canadian Society for Exercise Physiology; 2011. p. 1-4.
3. The Toronto Charter for Physical Activity: A Global Call for Action. *Journal of Physical Activity and Health*. 2010;7(s3):S370-S3.
4. Statistics Canada. Directly measured physical activity of adults, 2012 and 2013. *Health Fact Sheet*. Ottawa, ON: Statistics Canada Catalogue no. 82-625-X.
5. 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.
6. 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.
7. Spence JC, Lee RE. Toward a comprehensive model of physical activity. *Psychol Sport Exerc*. 2003;4(1):7-24.
8. Raine KD, Muhajarine N, Spence JC, Neary NE, Nykiforuk CI. Coming to consensus on policy to create supportive built environments and community design. *Can J Public Health*. 2012;103(Suppl 3):S5-S8.
9. Raine K, Spence JC, Church J, Boulé N, Slater L, Marko J, et al. State of the evidence review on urban health and healthy weights. Ottawa, ON: Canadian Institute for Health Information; 2008.
10. Frost SS, Goins RT, Hunter RH, Hooker SP, Bryant LL, Kruger J, 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.
11. 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.
12. Kegler MC, Painter JE, Twiss JM, Aronson R, Norton BL. Evaluation findings on community participation in the California Healthy Cities and Communities program. *Health Promot Int*. 2009;24(4):300-10.
13. Penney T, Rainham D, Dummer T, Kirk S. A spatial analysis of community level overweight and obesity. *J Hum Nutr Diet*. 2014;27(s2):65-74.
14. Policy Opportunity Windows Enhancing Research Uptake in Practice (POWER UP!). Evidence synthesis: promotion of physical activity in rural, remote, northern, and natural settings. Edmonton, AB; 2015.

15. 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.
16. 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.
17. 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.
18. 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.
19. Policy Opportunity Windows Enhancing Research Uptake in Practice (POWER UP!), Coalition Linking Action and Science for Prevention (CLASP). Knowledge, attitudes and beliefs survey (KAB). Edmonton, AB; 2015.
20. Active Healthy Kids Canada. Don't let this be the most physical activity our kids get after school. The active healthy kids Canada 2011 report card on physical activity for children and youth. Toronto, ON; 2011.
21. 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.
22. 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.
23. 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.
24. Young TK, Katzmarzyk PT. Physical activity among aborigines in Canada. *Applied Physiology, Nutrition, & Metabolism/Physiologie Appliquée, Nutrition et Métabolisme.* 2007;32 Suppl 2F:S165-78.
25. Maller C, Townsend M, Leger S, Henderson-Wilson C, Pryor A, Prosser L, et al. Healthy parks, healthy people: the health benefits of contact with nature in a park context. A review of current literature. *The George Wright Forum.* 2009;26(2):51-83.
26. 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.
27. 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.

28. Olsen JM. An integrative review of literature on the determinants of physical activity among rural women. *Public Health Nurs.* 2013;30(4):288-311.
29. Sandercock G, Angus C, Barton J. Physical activity levels of children living in different built environments. *Prev Med.* 2010;50(4):193-8.
30. Markey S, Breen S, Gibson R, Lauzon A, Mealy R, Ryser L. The state of rural Canada 2015. Camrose, AB: Canadian Rural Revitalization Foundation/Fondation Canadienne pour la Revitalisation Rurale; 2015.
31. ParticipACTION. Are Canadian kids too tired to move? The 2016 ParticipACTION report card on physical activity for children and youth. Toronto, ON; 2016.

# Appendix

**15 Appendix A: Evidence Synthesis on the Promotion of Physical Activity in Rural, Remote, Northern, and Natural Settings**

**40 Appendix B: List of Speaker and Facilitator Bios**

**44 Appendix C: Dotmocracy Priority Setting Process**

# Appendix A: Evidence Synthesis



POWER UP

## Evidence Synthesis:

Promotion of Physical Activity in Rural,  
Remote, Northern, and Natural Settings

OCTOBER 2015

### OVERVIEW

Regular physical activity (PA) is an important determinant of healthy weights (1). The Canadian Physical Activity Guidelines recommend that adults receive at least 150 minutes of moderate-to-vigorous PA each week (2). Many Canadians, however, are not achieving recommended PA levels (3). From an ecological perspective, it is widely recognized that individuals' PA behaviors are influenced by multiple levels of determinants (4-6), including the wider physical (or built) and natural environments in which individuals live, work, and play. Policies and environmental interventions can be used to create supportive settings that promote health by making it easier for individuals to integrate PA into their day (4).

Within the literature, the terms physical, built, and natural environment have been variously defined. Davison and Lawson (7) define the physical environment (PE) as objective and 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 PA, and crime and safety (7). Similarly, the built environment (BE) denotes features of the environment influenced by human design. As outlined by Cunningham and Michael (8), the built environment consists of three main components: transportation systems, land development patterns, and microscale urban design (8). The natural environment (NE), in turn, refers to aspects of the natural world untouched by human influence. In many ways, NEs can be viewed as a continuum between wild nature and areas under some human influence, such as urban green spaces (9, 10).

To-date, much of the literature on the promotion of PA at the environment level has focused on urban settings, with less attention paid to settings outside of cities and metropolitan areas (11). This is problematic as some studies have found that populations outside of urban areas have access to fewer

resources than their urban counterparts and may be at a greater risk for certain health issues (11, 12). Further, an understanding of regional and geographic differences has the potential to increase equity in access to and provision of supportive PA environments. It may also contribute to more effective interventions and policies to promote PA in a wider range of settings (13). With this in mind, the aim of this synthesis was to examine the literature on PA and features of the BE, PE, or NE in settings outside of urban areas.

## METHODS

This synthesis involved the collection of review articles from four databases (Ovid Medline, CINAHL, Academic Search Complete, and SPORT-Discus) and four grey literature sources (Active Living Research, Bridging the Gap/Robert Woods Johnson Foundation, Children and Nature Network, and Ohio Leave No Child Inside Collaborative). Additional reviews were provided by the research team, as well as identified through a search of Google Scholar, Pub-med related references, and a review of references from key articles. To be included in this synthesis, reviews had to meet the following criteria: (1) English and French language reviews, including narrative reviews and summary papers; (2) published after 2000; (3) examine research, strategies, and/or interventions related to PA in the context of the PE, BE, or NE, and; (4) report on findings and/or implications that are relevant to non-urban settings, including rural, remote, northern, and natural settings (i.e. national parks and wilderness areas). For reviews to be included, they had to discuss findings and/or implications relevant to the settings of interest within the body of the article. It is also important to note that information related to behavioral factors and the social environment was excluded from this synthesis. However, information specifically related to crime and safety, although often considered to be part of the social environment, was retained as such information is often referenced within the PE/BE literature (11).

The first round of the screening process involved reviewing titles and abstracts to remove irrelevant articles. The second-level screening consisted of a full-review of remaining articles to ascertain relevance in relation to the inclusion criteria. Two reviews included in the second level screening (14, 15) referenced earlier versions that were more comprehensive. For this reason, the earlier versions of these articles were retrieved and included in the synthesis (16, 17).

## SYNTHESIS OF EVIDENCE

Thirty-six reviews were deemed relevant to this evidence synthesis. Four reviews had a stated focus on rural settings, with one review discussing both rural and remote locations. Another 24 articles discussed findings and/or implications pertinent to the rural setting. These reviews were included in the synthesis despite not having an explicit focus on rural settings. In addition, this synthesis identified five articles with an Aboriginal or Indigenous health focus, which included findings relevant to remote, northern

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and/or reserve settings. Communities on-reserve were included in this synthesis because they are often located in non-urban settings and experience barriers related to community infrastructure and lack of access to health resources (18, 19). Lastly, four reviews were relevant to natural settings outside of urban areas, such as natural parks and wilderness areas. Natural settings described as being located in rural areas were included as part of the rural settings category. Further, one review (9) was included in both the rural and natural settings category.

## Rural Settings

### *Reviews with a Stated Rural Focus*

Four reviews had a stated focus on the rural setting within their objectives or aims (11, 13, 20, 21), with one review discussing both rural and remote settings in combination (21). Reviews explored the effects of the BE on PA (11), determinants of PA (13), barriers and motivators to PA (11, 21), and differences in PA amongst rural, urban, and suburban BEs (20). Populations described in the reviews included older adults (21), adults (11), women (13), and children and adolescents (20). Relevant studies included in the reviews took place predominately in the United States, as well as in Canada and Australia. One review also included studies from Sweden, Cyprus, Iceland, Italy, and Norway (20). For a summary review characteristics and relevant findings, see Table 1.

*Defining Rural.* The four reviews did not outline explicit criterion within their methods regarding how 'rural' was to be defined within included studies. For example, in the Frost et al. review, a study met the criterion for a rural focus if it identified the population as 'rural' (11). Overall, reviews reported significant diversity among included studies in terms of how the term 'rural' was defined. For example, Olsen et al. (13) noted that one study restricted the sample to communities that had populations of less than 1,000 with no towns within a certain radius, while another included towns with up to 49,999 residents (13). Further, as Olsen et al. (13) notes, some studies described the population as rural, but did not provide information on how the term was defined. According to the reviews, this diversity may limit the usefulness of conclusions that can be drawn from the body of literature and the generalizability of study findings to other rural settings (11, 13). Considering this, reviews called for additional research that provides clear and consistent definitions for the term 'rural' and that transparently outlines how different population groups, such as rural, urban, and suburban, are categorized within the data (11, 13, 20).

*Barriers and Motivators.* Three of the four reviews reported findings relevant to environmental barriers and/or motivators to PA in rural settings within the context of the PE/BE. Relevant barriers identified within the reviews include lack of sidewalks (11, 13), no or poor footpaths

(21), uneven road surfaces (11, 21), poor lighting/lack of streetlights (13, 21), and busy roads (13). Further barriers identified include safety concerns (i.e. crime, hunters) (11, 13, 21), the weather (13, 21), traffic (11, 21), dogs or wild animals (13, 21), and lack of physical access to facilities, transportation (11, 13, 21), and parks (11). The Boehm et al. (21) and Frost et al. (11) review also reported on environmental motivators/facilitators of PA, including accessible recreational facilities (i.e. increasing the number of facilities and providing convenient facilities) (11, 21), women only facilities (11), good walking conditions (11, 21), improving outdoor lighting (11), offering more public transportation (11, 21), and building more sidewalks, tracks, parks, and trails (11, 21).

While evidence was limited, results from the reviews suggest that rural populations may experience unique PE/BE barriers to and motivators of PA. For example, Boehm et al. (21) compared barriers and facilitators to exercise in older adults within the world, rural and remote, and Australian literature. This review found that rural and remote people were more likely to identify social and environmental barriers to exercise, such as a poor built environment, dogs and the weather (21). Ultimately, reviews indicated that while further research is required, there is a need for policy to address BE barriers to PA (i.e. transportation, safety) among specific populations, such as rural women (13), for environmental barriers and facilitators to be considered in program design (21), and for PA practitioners to explore strategies for overcoming environmental barriers (11).

*Associations between PA and the BE.* The Frost et al. (11) review examined quantitative associations between the BE and PA of adults in rural settings. According to this review, 11 elements of the BE were highlighted in the literature: sidewalks, street lighting, private and public recreational facilities, parks, malls, aesthetics, crime/safety, traffic, walking destinations, trails, and access to the environment (11). Positive associations with PA were demonstrated by pleasant aesthetics (four of four studies) and safety/crime (six of nine), as well as the presence of recreational facilities (five of ten), trails (four of six), and parks (three of six) (11). The review also reported positive relationships related to walkable destinations, though this was only the case in two of five studies exploring this factor. As the review outlined, inconsistent and mixed findings were found for sidewalks, shoulders on the road, traffic and street lighting, suggesting a need to further explore the relationship between these BE elements and PA (11). The review did not find significant associations related to the use of shopping malls for PA (11).

To understand differences in adult PA between rural and urban settings, Frost et al. (11) compared the above findings with 18 urban studies included in a report compiled by the Robert Wood Johnson Foundation. The review reported that positive associations among the urban studies were found between adult PA and sidewalks, parks, and walkable destinations (11). The

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review also concluded that aesthetics produced positive associations with adult PA in both the rural and urban literature. Further, there were more positive associations between adult PA and safety/crime, traffic, and trails in the rural literature compared to the urban (11). Overall, the review found preliminary evidence suggesting that features of the BE associated with PA in adults differ between rural and urban settings. However, the review calls for further research to more clearly define the term ‘rural,’ and to further develop and refine measures specific to rural areas (11).

*Differences in PA between Rural, Urban, and Suburban BEs.* The Sandercock et al. review (20) explored differences in PA levels of children living in different BEs according to land use, with a focus on rural, urban, and suburban settings. As outlined by the review, only one study out of 13 assessments found that rural children were significantly more active than their urban counterparts (20). Accordingly, the authors concluded that the PA levels of children do not significantly differ between rural and urban children, though they are careful to note that the simple rural/urban distinction is problematic (20). However, the review did find limited evidence of higher PA levels among rural children under age 13 (20), and reported differences in the types of PA that children participated in, with younger, rural children spending more time outdoors and in unstructured play (20).

Of the 18 studies included in the Sandercock et al. review (20), six studies expanded beyond a rural/urban dichotomy to include suburban and/or small town settings and/or populations. Across these studies, geographical sub-categories were operationalized in different ways. For example, one study classified the built environment according to urban, small city, and rural locations, while another categorized children according to where they were situated in relationship to metropolitan areas (urban, suburban, and rural) (20). Overall, Sandercock et al. (20) found that children from suburban/small town settings had higher PA levels compared to urban and sometimes rural children. As the review outlines, this may be due to the fact that the BE in suburban and small towns has a mix of rural and urban characteristics (20). However, the review was also careful to note that households in suburban areas tended to have higher socio-economic status and fewer ethnic minority residents (20). Sandercock et al. (20) highlighted the relevance of this given that ethnic minority status and low socio-economic status are negatively associated with PA in adults. Ultimately, the review states that there is a need for more detailed classification systems to explore PA differences within different BEs, as well as a need for studies to take into account socio-economic status, racial factors, and seasonal effects (20).

*Limitations and Future Research.* Taken together, the four reviews revealed a number of limitations and areas for future research relevant to the promotion of PA in rural settings. First, these reviews noted concerns with the design of included studies, such as the use of cross-

section designs, use of self-reported data, and the small effect sizes of included studies (11, 20). Another key limitation noted by the reviews was the lack of consistency in how 'rural' was defined amongst included studies. This lack of consistency may limit the usefulness of the available literature and the generalizability of findings to other rural areas (11, 13). Further, the Sandercock et al. review (20) noted that the use of a simple rural/urban distinction amongst studies was an over-simplification with the potential to lead to errors within studies (20). In terms of limitations specific to individual reviews, Boehm et al. (21) did not provide a discussion of how the terms 'rural' or 'remote' were defined.

The four reviews reported a number of areas for future research. First, all reviews concluded that additional research on PA in rural settings is needed (13, 21), particularly within the context of the BE (11, 20). Reviews also called for additional studies to include more complex categorizations of the built environment and a wider range of geographic locations, cultures, ethnicities, and age groups (13, 20). In addition, reviews highlighted the need for more rigorous research designs and larger studies using objective measures. It is important to note that the majority of studies took place within the United States. As findings from rural United States may not be fully generalizable to rural Canada, additional research is required within the Canadian context.

#### *Reviews from the Wider PA Literature with Relevant Findings and/or Implications for the Rural Setting*

In addition to the four reviews outlined above, 24 articles discussed findings and/or implications related to PA and features of the environment pertinent to the rural setting, despite not having this setting as a primary focus of the review. Ultimately, it was difficult to draw conclusions from this wider literature given the diversity of topics discussed and populations examined. However, these reviews do outline important considerations for future research, and thus, were included in this synthesis. For instance, some of the reviews noted the limited amount of research taking place in rural settings and the need for research that considers geographic variation and rural/urban dwelling (4, 5, 8, 16, 22-28). In addition, reviews highlighted the importance of understanding how geographic differences influence the relationship between the BE and health behaviours, as well as the need to develop population-specific environmental interventions that account for rural settings (27, 29, 30). For a summary review characteristics and relevant findings, see Table 2.

#### **Remote, Northern and Reserve Settings**

The literature review revealed five reviews related to Aboriginal or Indigenous health, which included findings relevant to remote, northern, and/or reserve settings. Four reviews explored interventions to promote PA (or PA as a domain of obesity or a wider set of health outcomes) and one provided a review

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of patterns and correlates of PA among Aboriginal peoples in Canada and the United States, as well as an overview of intervention studies (31). Reviews included studies with populations from Australia (32, 33), the United States (31, 34, 35), and Canada (31, 34, 35). For a summary of review characteristics and relevant findings, see Table 3.

#### *Environmental Interventions to Promote PA*

The five reviews discussed a number of interventions with an environmental component aimed at promoting PA. For the purposes of this synthesis, environmental interventions had to include a component relevant to the PE, BE, and/or NE. Towns et al. (35), for example, identified seven interventions aimed at promoting healthy weights among Aboriginal children and youth. Of these, two were multi-component nutrition and PA interventions involving an environmental or policy change. However, only one of these interventions, described in the next paragraph, included an environment component specifically related to PA (35).

Of the relevant interventions outlined in the reviews, both Town et al. (35) and Young and Katzmarzyk (31) included the Kahnawake School Diabetes Prevention Project (KSDPP), which was a complex, multi-component intervention located on the Kahnawake reserve outside of Montreal (31). As outlined by Towns et al. (35), the intervention aimed to reduce rates of obesity and type 2 diabetes by modifying knowledge, attitudes, and behaviours regarding PA and healthy diets, as well as changing school environments and increasing the healthfulness of school meals. In terms of environmental components, the KSDPP project involved implementing new cycling and walking paths in the community, as well as strengthening school nutrition policy (31, 35). In regards to impact on PA levels, Towns et al. (35) reported that the KSDPP increased PA levels in some years, but that PA levels returned to baseline by year eight (35).

In addition, the Johnston et al. (32) and Shilton and Brown (33) reviews reported on the development of local infrastructure related to PA (32, 33). Specifically, these reviews described the development of swimming pools in two remote Aboriginal communities, which aimed to improve primary health outcomes and increase school attendance. Ultimately, the Shilton and Brown review (33) concluded that while this intervention did not specifically focus on PA, it may have positive implications in this area (33). Indeed, such interventions may illustrate the importance of implementing comprehensive strategies that meet a range of community needs to promote health and overall wellbeing in often resource-limited remote communities.

The review by Teufel-Shone (34) reported on a range of PA interventions within Canada and the United States. The majority of the interventions (72%) were implemented within reservation, reserve, or pueblo communities. According to the review, 48 (75%) of the 64 interventions described an environmental

resource or policy component aimed at modifying aspects of the social or physical environment. Of these 48 programs, six involved developing fitness centers that offered access to exercise equipment and two involved the construction of walking paths. For example, Alaska's Native Medical Center's diabetes primary prevention program included the installation of fitness equipment in community centers, as well as additional changes to the social environment (34).

### *Limitations and Areas for Future Research*

The five reviews relevant to remote, northern, or reserve settings outlined several limitations relevant to this synthesis regarding their included studies, along with specific areas for future research. For example, reviews highlighted the need for more scientifically rigorous and culturally relevant research and evaluation (34), noted the limited number of peer-reviewed articles with interventions targeting wider environmental levels (32, 35), as well as called for research on a greater variety of geographic and cultural contexts (31, 35). Reviews also discussed limitations specific to their analyses, generally focusing on methodological weaknesses and the need for greater precision in study foci. For example, two reviews noted that they did not include grey literature (32, 35). Further, the Johnston et al. (32) review acknowledged that their analysis may be imprecise due, in part, to differences between Indigenous and Western perspectives and the lack of local knowledge regarding the included interventions.

In addition, this evidence synthesis found limited research exploring environmental determinants of PA and evidence of intervention effectiveness (31). Moreover, throughout the reviews, limited detail was provided regarding the environmental components of multi-pronged interventions. Additional research is required within a Canadian context to explore environmental determinants and barriers to PA in Aboriginal remote, northern and reserve communities, and in remote and northern communities overall, as well as to better understand the relationships between the PA and the PE, BE and NE in these settings.

### **Natural Settings**

Four reviews were relevant to the promotion of PA in natural settings located outside of urban areas, such as national parks and wilderness areas. These reviews explored topics including the health benefits of contact with nature (17), landscape as a resource for wellbeing (9), the physiological benefits of green exercise (36), and the effects of participation in PA in NEs versus indoor settings (37). For a summary of review findings and relevant characteristics, see Table 4.

Review findings relevant to natural settings located explicitly outside of urban areas were limited. However, the included reviews made a number of insights worthy of note. For example, Maller et al. (17) highlighted the importance of parks as settings and infrastructure for sport and recreation, such as

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walking, running, and cycling. This review also suggested that there is a lack of awareness regarding opportunities for enhancing health that are offered by larger wilderness parks, such as national parks, and highlighted the potential for large wilderness areas to offer a dual purpose of environmental conservation and self-reliant recreation (17). In a similar vein, Gladwill et al. (36) discussed the sustainability of natural settings outside of urban areas, noting that while it is important to ensure access for all to these settings, the pressure of too many people visiting such areas could have a detrimental environmental impact, detracting from the health benefits of such settings in the process. Finally, in terms of future research, Abraham et al. (9) called for better understanding of the health promoting impacts of different landscape characteristics, such as forests located outside of cities. Similarly, Thompson et al. (37) noted that while the impact of different natural areas (i.e. greenspaces, wilderness areas, wildlife reserves) on wellbeing is beginning to be understood, their specific relationship with PA still needs to be investigated (37).

## CONCLUSIONS

This evidence synthesis examined the literature on PA and features of the PE, BE, or NE in settings outside of urban areas. Overall, this synthesis found limited evidence, particularly within a Canadian context and for remote, northern, and natural settings. In terms of rural settings, findings from this synthesis indicate that while further research is required, rural settings experience specific environmental barriers and facilitators to PA, and differences in the relationship between PA and the BE appear to exist across rural and urban settings (11, 21). In addition, this evidence synthesis identified interventions with an environmental component aimed at promoting PA in Aboriginal remote, northern and/or reserve communities, as well as broadly explored emerging ideas regarding the promotion of PA in natural settings, such as national parks and wilderness areas.

This synthesis identified a number of opportunities for future research. In relation to rural settings, more clarity and transparency is needed regarding how terms such as 'rural' are defined. As outlined by the reviews, the current diversity of definitions within the literature limits the generalizability of findings and the conclusions that can be drawn from the literature on PA in rural settings (11, 13). Further, as noted by Sandercock et al. (20), there is also a need to examine differences in types of PA and PA levels across different built environments (i.e. urban, rural, suburban), using more detailed systems of classification and accounting for factors such as socio-economic status, seasonal effects, and racial factors.

In addition, this synthesis found a need for more evidence within a Canadian context articulating the relationship between PA and the PE, BE and/or NE in Aboriginal remote, northern and reserves, as well as remote and northern settings more generally. Further, there is a continued need to explore barriers and facilitators to PA experienced by populations in these settings, as well as for research examining

intervention effectiveness (31). Interestingly, reviews listed under the rural settings category did not explicitly discuss findings and/or implications related to Aboriginal populations in remote, northern, or reserve communities, pointing to a potential gap in the PA and PE/BE literature. This synthesis also found that while reviews are beginning to explore the impact of natural settings (i.e. national parks and wilderness areas) on PA, their specific relationship with PA requires further investigation (37).

In drawing conclusions from this evidence synthesis, it is important to consider the potential limitations of this analysis. First, categorizing reviews by setting was challenging because the terms used to describe settings (i.e. rural and remote, rural and reserve) were sometimes conflated within the literature. Second, the search strategy used to inform this synthesis, while deliberately broad, still may not have been comprehensive enough to capture all of the literature relevant to the many different non-urban settings of interest. Third, this synthesis did not factor data quality into the inclusion criteria. As such, some of the included reviews may be of poor quality. Lastly, this synthesis discussed setting information based on what was stated explicitly within reviews, making it likely that relevant information from the individual source studies may have been missed. To address this limitation, future syntheses should extract information directly from the individual studies included within the reviews.

Given the importance of access to supportive settings for PA, the paucity of literature on PA and features of the PE, BE and NE in non-urban settings, particularly within a Canadian context, represents a significant threat to supporting population health from an equity perspective. Continued efforts are needed to synthesize and translate available evidence to inform the work of Canadian practitioners and policy-makers. Further, additional primary research using robust methods is required to address current research gaps and limitations.

**Table 1.** Reviews with a Stated Rural Focus

Author	Title	Journal	Year	Type	Objectives	Population	Relevant Findings and Implications
Boehm et. al. (21)	Barriers and motivators to exercise for older adults: a focus on those living in rural and remote areas of Australia	Australian Journal of Rural Health	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 falls prevention exercise programs	Older adults (50 years +)	<ul style="list-style-type: none"> <li>-The review included 25 articles exploring barriers and facilitators to exercise for older adults. As outlined by the review, five of the articles discussed rural or remote locations worldwide. None of the included articles focused on rural or remote locations in Australia.</li> <li>-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.</li> <li>-Relevant environmental facilitators identified include accessible facilities and a conducive built environment (i.e. presence of paved roads, good walking conditions).</li> <li>-The review states that the environment is a significant issue for rural and remote literature, which needs to be carefully considered in program design.</li> <li>-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.</li> </ul>
Frost et al. (11)	Effects of the built environment on physical activity of adults living in rural settings	American Journal of Health Promotion	2010	Systematic Review	To conduct a systematic review of the literature to examine the influence of the built environment (BE) on the physical activity (PA) of adults in rural settings	Adults (18+)	<p><i>Qualitative Study Findings</i></p> <ul style="list-style-type: none"> <li>-According to the review, qualitative methods were used to identify barriers and motivators to PA among rural populations in 7 out of 20 of the studies.</li> <li>-Identified barriers to PA include: traffic, safety, and uneven roads, as well as lack of sidewalks, indoor facilities, parks, and transportation.</li> <li>-Identified motivators to increase PA 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.</li> </ul> <p><i>Quantitative Study Findings</i></p> <ul style="list-style-type: none"> <li>-The review reports that 16 studies outlined quantitative findings.</li> <li>-The review states that of the 11 BE elements identified in the reviewed studies, those that demonstrated significant positive associations with PA included: aesthetics (four of four studies), safety/crime (six of nine), recreational facilities (five of 10), trails (four of six), parks (three of six).</li> </ul>

							<p>Positive relationships were found related to walkable destinations in 2 out of 5 studies.</p> <ul style="list-style-type: none"> <li>-Inconsistent and mixed findings were found for sidewalks, shoulders on the road, traffic and street lighting.</li> <li>-No significant association was found around the use of shopping malls for PA.</li> </ul> <p><i>Conclusions</i></p> <ul style="list-style-type: none"> <li>-The review found preliminary support for the understanding that features of the BE associated with PA differ between rural and urban settings, but highlights a need for more research.</li> <li>-Calls for the term 'rural' to be more clearly defined within the literature.</li> </ul>
Olsen, J.M. (13)	An integrative review of literature on the determinants of physical activity among rural women	Public Health Nursing	2013	Integrative Review	To examine the following research question: what are the determinants of PA levels among rural women in the United States?	Rural women	<ul style="list-style-type: none"> <li>-21 studies were included in the review.</li> <li>-The review reported on three themes of physical environment determinants that acted as barriers to PA: access, safety, and structures.</li> <li>-The review notes that the term rural was diversely defined within the included studies and highlights a need for additional research to more clearly and consistently define the term.</li> </ul>
Sandercock, Angus, & Barton (20)	Physical activity levels of children living in different built environments	Preventative Medicine	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 old)	<ul style="list-style-type: none"> <li>-This review found that the literature does not show major differences in the PA levels of children from rural and urban environments, though there is some evidence for higher PA in children under 13 years old in rural settings.</li> <li>-The review did find, however, that where discrete samples of suburban or small town children were analyzed, they tended to have higher PA levels than their urban or rural peers.</li> <li>-The review also found differences in the types of PA that children from different environments engage in.</li> <li>-The review outlines that the 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.</li> <li>-The review notes that further research aimed at assessing PA differences in 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.</li> </ul>

**Table 2.** Reviews from the Wider PA literature with Findings and/or Implications Relevant to Rural Settings

Author	Title	Journal	Year	Type	Objectives	Population	Relevant Findings and Implications
Abraham, Sommerhalder & Abel (9)	Landscape and well-being: a scoping study on the health-promoting impact of outdoor environments	International Journal of Public Health	2010	Scoping Review/Qualitative Literature Review	-To provide a scoping study of publications on the health-promoting influence of landscape	Not reported	-The review indicates that in order to be perceived as an option for physical activity, rural green landscapes should be aesthetically appealing to their users.
Bauman et al. (38)	Correlates of physical activity: why are some people physically active and others not?	The Lancet	2012	Review of reviews	-To present knowledge about correlates and determinants of physical activity in adults and children	Age ≥18 years and children (aged 5–13 years depending on the study) or adolescents (aged 12–18 depending on the study)	-This review reports that density of exercise facilities and urbanization (i.e., urban versus rural residences) are positively associated with physical activity.
Calogiuri and Chroni (10)	The impact of the natural environment on the promotion of active living: an integrative systematic review	BMC Public Health	2014	Integrative Systematic Review	-To review the existing literature on the relationship between the natural environment (NE) and PA	Healthy, non-athletic adult population above 16 years of age	-This review states that perceived ability to walk to local NEs was a predictor of PA among older adults living in rural areas. -The review also reports that differences between rural and urban environments have been identified, with the NE-PA relationship being stronger for people living in urban rather than rural areas, likely due to differences in land-use mix and connectivity.
Casagrande et al. (27)	Built environment and health behaviors among African Americans: a systematic review	American journal of preventive medicine	2009	Systematic Review	-To quantify the existing literature, acknowledge gaps in the literature that could affect future research, and to surmise any salient environmental characteristics that are associated with diet, physical activity, and obesity among African Americans that may be important targets for environmental interventions	Not reported	-This review states that features of the built environment may vary considerably among rural, urban, and suburban locations. The review indicates that these geographic differences are important to understand when conceptualizing and assessing the ways in which the built environment affects health behaviours (i.e. PA, diet, obesity). -The review calls for more investigation of the rural environment.

Cunningham & Michael (8)	Concepts guiding the study of the impact of the built environment on physical activity for older adults: a review of the literature	American Journal of Health Promotion	2004	Comprehensive review	-To identify theoretical models and key concepts used to predict the association between built environment and seniors' physical activity on the basis of a comprehensive review of the published literature	Seniors	-This review reports on findings from one study relevant to the rural setting. The review states that this study is notable because it is the only study within the review that focused on a rural community.
Ding & Gebel (24)	Built environment, physical activity, and obesity: what have we learned from reviewing the literature?	Health & place	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	Not reported	-This review indicates that more rigorous studies among specific population subgroups, such as seniors, ethnic minorities, and rural residents, are needed.
Feng et al. (25)	The built environment and obesity: a systematic review of the epidemiologic evidence	Health Place	2010	Literature review	-To evaluate the extant literature for evidence of association between the built environment and obesity	Not reported	-This review included 7 rural studies (related to physical activity, land use, transportation, and/or the food environment overall). -This review indicates that current literature has focused narrowly on metropolitan areas, while smaller towns, exurban areas, and rural communities have been neglected.
Foster & Giles (39)	The built environment, neighborhood crime and constrained physical activity: an exploration of inconsistent findings	Preventative Medicine	2008	Review	- To summarize the individual, social and built environment characteristics that influence whether people feel safe and examines the association between real and perceived crime related safety and their association with PA	Not specified	- This review reports on findings relevant to the rural setting. - Reports that 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 neighborhood walkability may confound the relationship between disorder and PA. -The review indicates that the degree of urbanization (i.e. urban, suburban, and rural) may affect exposure to factors that influence safety perceptions.
Galvez, Pearl & Yen. (28)	Childhood obesity and the built environment: a review of the literature from 2008-2009	Current Opinion in Pediatrics	2010	Review	-To review the strength of the most current evidence with respect to the built environment and childhood obesity	Children (up to 18 years)	-The review reports on findings relevant to the rural setting. -The review states that future research is needed in diverse populations that vary by key socio-demographics, including gender, race/ethnicity, income, and that consider subjective and objective measures of neighborhood level factors across urban, suburban, and rural areas.

Hanson & Berkowitz (40)	Does the built environment influence physical activity? Examining the evidence	Special Report, Institute of Medicine of the National Academies	2005	Report of the Evidence	-To review the broad trends affecting the relationships among physical activity, health, transportation, and land use and summarize what is known about these relationships	Not reported	-This special report reports on findings relevant to the rural setting.  -The report suggests that effective policies are likely to differ for different population groups (e.g., children, youths, 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, Owen & Leslie (41)	Environmental factors associated with adults' participation in physical activity: a review	American journal of preventive medicine	2002	Review	-To explore quantitative studies examining the associations of particular environmental attributes with physical activity behaviors	Adults	-The review reports on findings from one study relevant to the rural setting.
Kaczynski & Henderson (16)	Environmental correlates of physical activity: a review of evidence about parks and recreation	Leisure Sciences: An Interdisciplinary Journal	2007	Review	-To review and critically examine evidence related to PRSs as features of the built environment and the relationship they have to PA	Not reported	-This review reports on findings relevant to the rural setting. -The review states that most of the active living research related to parks and recreation to date has involved middle class, mostly white adults living in urban and suburban settings.
Lovasi et al. (30)	Built environments and obesity in disadvantaged populations	Epidemiologic Reviews	2009	Review	-To evaluate whether built environments might explain racial, ethnic, and socioeconomic disparities in obesity and derive implications from this evidence about which built environment changes might reduce obesity-related health disparities	Disadvantaged populations (low socioeconomic status, black race, or Hispanic ethnicity)	-This review reports on findings relevant to PA in the context of the BE 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. (42)	A Site-specific Literature Review of Policy and Environmental Interventions that Promote Physical Activity and Nutrition for Cardiovascular Health: what works?	American Journal of Health Promotion	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 CVH, and summarize recommendations	Not reported	-This review reports on findings relevant to PA in the context of the BE and the rural setting.

Moran et al. (43)	Understanding the relationships between the physical environment and physical activity in older adults: a systematic review of qualitative studies	International Journal of Behavioral Nutrition & Physical Activity	2014	Systematic Review	-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' PA behaviors, and compare the emerging themes and factors according to the qualitative method used	Participants' average age was 65 years or older.	-The review reports on findings relevant to the rural setting.
McCrorie , Fenton & Ellaway (5)	Combining GPS, GIS, and accelerometry to explore the physical activity and environment relationship in children and young people – a review	International Journal of Behavioral Nutrition and Physical Activity	2014	Review	-To synthesize and summarize the research that has used the combination of GPS, GIS, and accelerometry to investigate the physical environment/PA relationship among young people and identify gaps in knowledge that future research should address	Young people (5-18 years old)	-The review reports on findings relevant to the rural setting.
O. Ferdinand et al. (23)	The relationship between built environments and physical activity: a systematic review	American Journal of Public Health	2012	Systematic Review	-To systematically review the literature examining the relationship between built environments and PA or obesity rates	Not specified	-This review includes 8 studies relevant to the rural setting. -The review indicates that studies of rural populations are lacking, especially on park or trail use, school playgrounds usage, and inactivity.
Papas et al. (44)	The built environment and obesity	Epidemiologic Reviews	2007	Review	-To examine the published empirical evidence for the influence of the built environment on the risk of obesity	Children and adult populations	-The review reports on one study relevant to PA in the context of the BE and rural settings. -The review reports that caring studies out across large areas, creating metrics equally appropriate to different setting (rural, urban, and suburban) is challenging.
Renalds et al. (22)	A systematic review of built environment and health	Family & Community Health	2010	Systematic Review	-To review and summarize the literature on BE as it pertains to health	Not reported	-Examines the relationship between the BE and PA, obesity, social capital, and mental health. This review indicates that, overall, most studies were conducted in an urban setting and that it is not known what findings would result in a rural setting. -The review suggests that longitudinal studies and studies conducted in a rural setting are needed.

Saelens & Handy (45)	Built environment correlates of walking: a review	Medicine & Science in Sports & Exercise	2008	Review	-To review what the research so far tells us about the characteristics of the built environment that correlates with walking and discusses outstanding questions and policy implications	Not reported	-This review reports on findings relevant to the rural setting.
Sallis et al. (4)	Role of built environments in physical activity, obesity, and cardiovascular disease	Circulation	2012	Review	-To describe multilevel ecological models of behavior as they apply to physical activity, describe key concepts, summarize evidence on the relation of built environment attributes to physical activity and obesity, and provide recommendations for built environment changes that could increase physical activity	Not reported	-The review notes that for rural residents, traffic safety, recreation facilities, and trails were most consistently associated with physical activity. -This review indicates that there are fewer studies focusing on rural populations, even though rural residents are at high risk of poor health outcomes.
Starnes et al. (26)	Trails and physical activity: a review	Journal of Physical Activity and Health	2011	Literature Review	-To examine whether trails (e.g., presence of existing trails, new trail construction, or trail promotion campaigns) have positive effects on physical activity	Not specified	-The review reports on findings relevant to the rural setting. -According to the review, a general limitation among 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). -The review states that future studies should include this type of information so that inferences about generalizability of findings could be made.
Van Cauwenberg et al. (29)	Relationship between the physical environment and physical activity in older adults: a systematic review	Health & Place	2011	Systematic Review	-To provide a comprehensive overview of studies investigating the relationship between the physical environment and total PA and the following PA domains: recreational PA, total walking and cycling, recreational walking and transportation walking in older adults	Older Adults	-This review reports on findings relevant to the rural setting. -The review states that most of the included studies focused on urban older adults, although it has been shown that urban/rural dwelling has a moderating effect on the PE/PA relationship.

Van Holle et al. (46)	Relationship between the physical environment and different domains of physical activity in European adults: a systematic review	BMC Public Health	2012	Systematic review	-To provide an overview of the available European evidence during the last decade	European adults (18-65y).	<p>-This review reported that for the urbanization degree, there was convincing evidence for a negative relationship, which means that people living in less urbanized areas tended to be more physically active. With that said, the review found a positive relationship between urbanization and transportation cycling and total walking.</p> <p>-According to the review, the counter-intuitive evidence regarding the urbanization degree may be possible given occupational or domestic-oriented activities like gardening made the largest contribution to the total PA measures in the involved studies, and suburban or rural places lend themselves more to such pursuits than urban ones.</p>
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**Table 3.** Remote, Northern and Reserve Settings

Author	Title	Journal	Year	Type	Objectives	Population	Relevant Findings and Implications
Johnston et al. (32)	A review of programs that targeted environmental determinants of Aboriginal and Torres Strait Islander Health	International Journal of Environmental Research and Public Health	2013	Literature Review	-To identify Aboriginal health interventions that targeted environmental determinants of health	Aboriginal People and Torres Strait Islanders	--Developing infrastructure for physical activity was reported as a strategy for several programs. -The review includes 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.
Shilton & Brown (33)	Physical activity among Aboriginal and Torres Strait Islander people and communities	Journal of Science and Sport in Medicine	2004	Paper/review of recently published evidence	-To present recently published evidence on effective interventions for promoting PA among this population group	Aboriginal People and Torres Strait Islanders (ATSI) people	-The review found a limited number of PA interventions in the peer-reviewed literature. -One of the interventions included in the review did not focus specifically on PA, but had relevance to the promotion of PA. According to the review, this study assessed the impact of opening swimming pools in two remote Aboriginal communities. While participation in PA 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 more well-designed research into the effectiveness of innovative strategies for increasing PA among ATSI people.
Towns et al. (35)	Healthy weights interventions in Aboriginal children and youth: a review of the literature	Canadian Journal of Dietetic Practice and Research	2014	Literature Review	-To identify and describe interventions aimed at reducing overweight or obesity risk among Aboriginal children and youth and to present evidence of their effectiveness	Aboriginal children and youth (0-18 years) or family health	-This review explored seven interventions. Of these interventions, the Kahnawake Schools Diabetes Prevention Project (KSDPP) was the only one with a significant environmental component relevant to PA. -The intervention attempted 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 in school meals. The intervention included classroom activities and teacher training as well as community activities. -The KSDPP also strengthened an existing school nutrition policy and implemented new cycling and walking paths in the community. - The cross-sectional components of the KSDPP found that physical activity increased in some years. However, these had returned to baseline by year 8.

Tuefel-Shone et al. (34)	Systematic review of physical activity interventions implemented with American Indian and Alaska Native Populations in the United States and Canada	American Journal of Health Promotion	2009	Systematic Review	To describe physical activity (PA) interventions implemented in American Indian/Alaska Native (AI/AN) populations in the United States and Canada	-American Indians, Alaska Natives, Aboriginal people of Canada, Native Hawaiians, and/or Native U.S. Samoans	-According to the review, 48 (75%) of the 64 interventions described an environmental resource or policy component aimed at modifying aspects of the social or physical environment. - Of these 48 programs, six involved developing fitness centers that offered access to exercise equipment and two involved the construction of walking paths.
Young & Katzmarzyk (31)	Physical activity of Aboriginal people in Canada	Applied Physiology, Nutrition, & Metabolism	2007	Review Paper	-Summarizes available information on patterns of physical activity, their determinants and consequences, and the results of various interventions designed to increase the physical activity of Aboriginal peoples in Canada and the United States	First Nations, Inuit, and Métis in Canada	-The review discusses the Kahnawake Schools Diabetes Prevention Project (KSDPP), which is located in a Mohawk community located outside of Montreal. -The review describes the intervention as including a school nutrition and healthy lifestyle education program, community-wide events, and environmental changes such as the building of a recreation path to promote walking and running. -The review echoes Levaseque et al. (2005)'s characterization of the intervention as a complex package with multi-setting strategies implemented through dynamic exchanges between a diversity of community partners. -The review calls for more research in a number of areas related to PA in Aboriginal groups. For example, the review suggests there is a need for more studies to identify determinants of and barriers to physical activity in a variety of environmental and cultural contexts.

**Table 4.** Natural Settings

Author	Title	Journal	Year	Type	Objectives	Population	Relevant Findings and Implications
Abraham, Sommerhalder & Abel (9)	Landscape and well-being: A scoping study on the health-promoting impact of outdoor environments	International Journal of Public Health	2010	Scoping Review/ Qualitative Literature Review	-To provide a scoping study of publications on the health-promoting influence of landscape	Not reported	<p>-The review states that landscape can be imagined as a continuum between “wild” nature and designed environment, such as urban and rural forests, green spaces, parks, gardens, waters, and neighborhood areas.</p> <p>-The review states that, as many of the studies in the review illustrate, forests play an important role when it comes to outdoor physical activity outside cities, including walking, hiking, kayaking, and fishing. According to the review, people use forests for physical activity mainly to recreate and exercise.</p> <p>-The review also notes that more research in this field is called to better understand the health-promoting impacts of different landscape characteristics.</p>
Gladwell et al. (36)	The great outdoors: How a green exercise environment can benefit all	Extreme physiology & medicine	2013	Literature Review	-To consider the declining levels of physical activity, particularly in the Western world, and how the environment may help motivate and facilitate physical activity	Not reported	<p>-The review notes that the management of countryside, forests and more extreme environments needs careful consideration including ensuring access for all, but without the pressure of too many people visiting these areas, as this would potentially destroy the natural environment that elicits these health benefits</p> <p>-According to the review ,the challenge for researchers in this field is not only determining whether knowledge of nature’s health benefits can act as a motivator for behaviour change, but also ensuring that the increased use of ‘nature as a therapy’ is accompanied by a conservationist approach to ensure preservation of the environment.</p>
Maller et al. (17)	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	2008	Narrative Review	-To review the potential and actual health benefits of contact with nature	Not reported	<p>-The review states that, 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, running, cycling, ball games, sailing, surfing, photography, birdwatching, bushwalking, rock climbing, camping.</p> <p>-The review states that there is a prevailing lack of awareness about opportunities for enhancing health provided by larger wilderness parks, such as National Parks.</p> <p>-The review also notes that 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.</p>
Thompson et al. (37)	Does participating in physical activity in outdoor natural environments have a greater effect on	Environmental science & technology	2011	Systematic review	-To provide an objective means of elucidating the value of outdoor green spaces in motivating physical	Adults or children; no eligible studies involving children	<p>-The review notes that 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.</p> <p>-The review states that while the impact of these different</p>

	physical and mental wellbeing than physical activity indoors? A systematic review			activity and in conferring mental and physical wellbeing	retrieved	types of green space on wellbeing has begun to be investigated, the interaction of this impact with physical activity has yet to be clarified.
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## References

1. Corscadden L, Taylor A, Sebold A, Maddocks E, Pearson C, Harvey J. Obesity in Canada: a joint report from the Public Health Agency of Canada and the Canadian Institute for Health Information. 2011; Available from: <http://www.phac-aspc.gc.ca/hp-ps/hl-mvs/oic-oac/index-eng.php>.
2. Canadian Society for Exercise Physiology. Canadian physical activity guidelines, Canadian sedentary behaviour guidelines: your plan to get active every day. 2015 [cited 2015 July]; Available from: [http://www.csep.ca/CMFiles/Guidelines/CSEP\\_Guidelines\\_Handbook.pdf](http://www.csep.ca/CMFiles/Guidelines/CSEP_Guidelines_Handbook.pdf).
3. Colley RC, Garriguet D, Janssen I, Craig CL, Clarke J, Tremblay MS. Physical activity of Canadian adults: accelerometer results from the 2007 to 2009 Canadian Health Measures Survey: Statistics Canada Ottawa; 2011.
4. Sallis JF, Floyd MF, Rodriguez DA, Saelens BE. Role of built environments in physical activity, obesity, and cardiovascular disease. *Circulation*. [Review]. 2012 Feb 7;125(5):729-37.
5. 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. [Research Support, Non-U.S. Gov't]*. 2014;11:93.
6. Spence JC, Lee RE. Toward a comprehensive model of physical activity. *Psychology of sport and exercise*. 2003;4(1):7-24.
7. Davison KK, Lawson CT. Do attributes in the physical environment influence children's physical activity? A review of the literature. *International journal of behavioral nutrition and physical activity*. 2006;3(1):19.
8. 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*. [Review]. 2004 Jul-Aug;18(6):435-43.
9. Abraham A, Sommerhalder K, Abel T. Landscape and well-being: a scoping study on the health-promoting impact of outdoor environments. *International journal of public health*. 2010 Feb;55(1):59-69.
10. 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.
11. Frost SS, Goins RT, Hunter RH, Hooker SP, Bryant LL, Kruger J, et al. Effects of the built environment on physical activity of adults living in rural settings. *Am J Health Promot*. 2010 Mar-Apr;24(4):267-83.
12. Eberhardt MS, Pamuk ER. The importance of place of residence: examining health in rural and nonrural areas. *American Journal of Public Health*. 2004;94(10):1682-6.
13. Olsen JM. An integrative review of literature on the determinants of physical activity among rural women. *Public Health Nurs*. [Review]. 2013 Jul;30(4):288-311.
14. Kaczynski AT, Henderson KA. Parks and recreation settings and active living: a review of associations with physical activity function and intensity. *Journal of physical activity & health*. 2008 Jul;5(4):619-32.
15. Maller C, Townsend M, Henderson-Wilson C, Pryor A, Prosser L, Moore M. Healthy parks, healthy people: the health benefits of contact with nature in a park context. A review of current literature. *The George Wright Forum*. 2009;26(2):51-83.
16. Kaczynski AT, Henderson KA. Environmental correlates of physical activity: a review of evidence about parks and recreation. *Leisure Sciences*. 2007;29(4):315-54.
17. Maller C, Townsend M, Leger S, Henderson-Wilson C, Pryor A, Prosser L, et al. Healthy parks, healthy people: the health benefits of contact with nature in a park context. 2008; 2nd [Available from: [http://parkweb.vic.gov.au/\\_data/assets/pdf\\_file/0018/313821/HPHP-deakin-literature-review.pdf](http://parkweb.vic.gov.au/_data/assets/pdf_file/0018/313821/HPHP-deakin-literature-review.pdf)].
18. National Collaborating Centre for Aboriginal Health, Reading C, Wien F. Health inequalities and social determinants of Aboriginal peoples health. 2009; Available from: [http://www.nccah-ccnsa.ca/Publications/Lists/Publications/Attachments/46/health\\_inequalities\\_EN\\_web.pdf](http://www.nccah-ccnsa.ca/Publications/Lists/Publications/Attachments/46/health_inequalities_EN_web.pdf).

19. Foulds HJ, Bredin SS, Warburton DE. An evaluation of the physical activity and health status of British Columbian Aboriginal populations. *Applied Physiology, Nutrition, and Metabolism*. 2012;37(1):127-37.
20. Sandercock G, Angus C, Barton J. Physical activity levels of children living in different built environments. *Prev Med*. [Review]. 2010 Apr;50(4):193-8.
21. 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*. [Review]. 2013 Jun;21(3):141-9.
22. Renalds A, Smith TH, Hale PJ. A systematic review of built environment and health. *Fam Community Health*. [Review]. 2010 Jan-Mar;33(1):68-78.
23. O. 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 Oct;102(10):e7-e13.
24. Ding D, Gebel K. Built environment, physical activity, and obesity: what have we learned from reviewing the literature? *Health Place*. [Review]. 2012 Jan;18(1):100-5.
25. Feng J, Glass TA, Curriero FC, Stewart WF, Schwartz BS. The built environment and obesity: a systematic review of the epidemiologic evidence. *Health Place*. [Review]. 2010 Mar;16(2):175-90.
26. Starnes HA, Troped PJ, Klenosky DB, Doebring AM. Trails and physical activity: a review. *Journal of physical activity & health*. [Review]. 2011 Nov;8(8):1160-74.
27. 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 Feb;36(2):174-81.
28. Galvez MP, Pearl M, Yen IH. Childhood obesity and the built environment. *Curr Opin Pediatr*. 2010 Apr;22(2):202-7.
29. Van Cauwenberg J, De Bourdeaudhuij I, De Meester F, Van Dyck D, Salmon J, Clarys P, et al. Relationship between the physical environment and physical activity in older adults: a systematic review. *Health Place*. 2011 Mar;17(2):458-69.
30. Lovasi GS, Hutson MA, Guerra M, Neckerman KM. Built environments and obesity in disadvantaged populations. *Epidemiol Rev*. 2009;31:7-20.
31. Young TK, Katzmarzyk PT. Physical activity among aborigines in Canada. *Appl Physiol Nutr Metab*. [Review]. 2007;32 Suppl 2F:S165-78.
32. Johnston L, Doyle J, Morgan B, Atkinson-Briggs S, Firebrace B, Marika M, et al. A review of programs that targeted environmental determinants of Aboriginal and Torres Strait Islander health. *Int J Environ Res Public Health*. 2013 Aug;10(8):3518-42.
33. Shilton TR, Brown WJ. Physical activity among Aboriginal and Torres Strait Islander people and communities. *J Sci Med Sport*. [Review]. 2004 Apr;7(1 Suppl):39-42.
34. 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 Jul-Aug;23(6):S8-32.
35. Towns C, Cooke M, Rysdale L, Wilk P. Healthy Weights Interventions in Aboriginal Children and Youth: A Review of the Literature. *Canadian Journal of Dietetic Practice & Research*. 2014;75(3):125-31.
36. Gladwell VF, Brown DK, Wood C, Sandercock GR, Barton JL. The great outdoors: how a green exercise environment can benefit all. *Extreme physiology & medicine*. 2013;2(1):3.
37. 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. *Environmental science & technology*. 2011 Mar 1;45(5):1761-72.
38. Bauman AE, Reis RS, Sallis JF, Wells JC, Loos RJ, Martin BW, et al. Correlates of physical activity: why are some people physically active and others not? *The lancet*. 2012;380(9838):258-71.
39. Foster S, Giles-Corti B. The built environment, neighborhood crime and constrained physical activity: an exploration of inconsistent findings. *Prev Med*. 2008 Sep;47(3):241-51.

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40. Hanson S, Berkowitz B. Does the Built Environment Influence Physical Activity? Examining the evidence - - Special Report 282. Washington, DC: Transportation Research Board Committee on Physical Activity, Health, Transportation, and Land Use2005.
  41. Humpel N, Owen N, Leslie E. Environmental factors associated with adults' participation in physical activity: a review. *Am J Prev Med*. 2002 Apr;22(3):188-99.
  42. 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 Jan-Feb;19(3):167-93.
  43. 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. [Review]*. 2014;11:79.
  44. Papas MA, Alberg AJ, Ewing R, Helzlsouer KJ, Gary TL, Klassen AC. The built environment and obesity. *Epidemiol Rev. [Review]*. 2007;29:129-43.
  45. Saelens BE, Handy SL. Built environment correlates of walking: a review. *Med Sci Sports Exerc*. 2008 Jul;40(7 Suppl):S550-66.
  46. Van Holle V, Deforche B, Van Cauwenberg J, Goubert L, Maes L, Van de Weghe N, et al. Relationship between the physical environment and different domains of physical activity in European adults: a systematic review. *BMC Public Health. [Article]*. 2012;12(1):807-23.

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## Appendix B: List of Speaker and Facilitator Bios

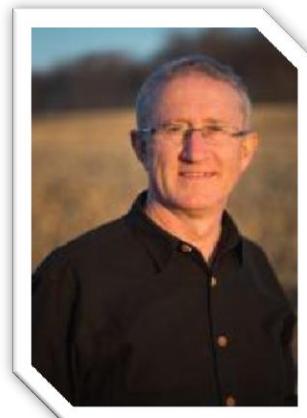
### Speaker Bios

#### Sara Brown



**Sara Brown, P. Eng.** was raised in the Northwest Territories (NWT), and although school and work have taken her to various locations in the south, she has always considered herself a Northerner and keeps getting drawn back. After completing her Engineering Degree at Queen's University, she started out in construction and consulting. After having numerous municipal clients, Sara took her first job as a Municipal Engineer in Iqaluit almost 20 years ago. In that role, Sara has dealt with the varied issues facing communities as a Manager of Engineering, Director of Public Works, and Senior Administrative Officer with a number of communities throughout Ontario, Alberta, Nunavut, and the NWT. Sara is now CEO of the Northwest Territories Association of Communities (NWTAC), which advocates for and supports NWT communities to be all that they want to be. NWTAC is pleased to be starting the important initiative with Health and Social Services of the Government of the Northwest Territories to develop tools to help communities actively participate in increasing the overall health of their residents.

#### Wayne Caldwell



**Wayne J. Caldwell, Ph.D., RPP, MCIP** is Director of the School of Environmental Design and Rural Development at the University of Guelph. His interests include planning for agriculture and community-based approaches to economic and environmental issues within rural communities. His most recent books include *Planning for Rural Resilience* (University of Manitoba Press) and *Building Decisions, Together: A Facilitation Guide for Community Engagement* (Municipal World). He has served as Chair or President of a number of local, provincial, and national organizations.

## Tracey Galloway



**Tracey Galloway, PhD** is a human biologist in the Department of Anthropology at the University of Toronto. Her research examines health issues that are priorities for residents and health service providers in northern Indigenous communities. Much of her research focuses on chronic disease prevention through healthy lifestyles. From 2008 to 2012, Tracey served as a researcher for the Inuit Health Survey, which is a comprehensive assessment of adult and child health in Canada's circumpolar regions. She is a member of the Expert Advisory Panel of the Nunavut Food Security Coalition and is studying the effects of the shift from Food Mail to Nutrition North Canada. Since 2012, Tracey has worked with Gwen Healey, Executive Director of the Iqaluit-based *Qaujigiartit*, on a project examining health promotion activities for children and youth in Nunavut. In addition, she is working on a new CIHR-funded collaboration with Gwen called Nunavut Health and Nunavut Tunngavik Incorporated, to examine cancer care services in Nunavut. Finally, she is participating in a Yukon-based project with the Council of Yukon First Nations, also funded by CIHR, examining the delivery of federal health programs such as the Canadian Perinatal Nutrition Program and Aboriginal Head Start from a community-centered perspective.

## Jason Gilliland



**Jason Gilliland, PhD** is the Director of the Urban Development Program and Professor of Geography, Health Studies, and Paediatrics at Western University. He is also a Scientist with the Children's Health Research Institute and the Lawson Health Research Institute. Dr. Gilliland is an award-winning teacher and researcher who is known internationally for his research on urban planning and public health issues. In 2012, he was awarded the title of "Faculty Scholar" at Western University for "sustained excellence in all scholarly activities." In 2009, he was recognized by the Canadian Association of Geographers for significant research achievement by an early career scholar for his contribution to research on "children in the city". In 2012, he was honored with the ESRI Canada Award for Excellence in GIS for "innovation in the field of Geographic Information Systems". Dr. Gilliland's current research examines the relationship between modern urban planning and development practices, and the rise of children's health and quality of life issues such as healthy eating, physical inactivity, obesity, play, injury, mental health, and sleep. His work is funded by organizations such as the Canadian Institutes of Health Research, the Canadian Cancer Society, and the Heart and Stroke Foundation of Canada. He has published over 100 articles, chapters, reviews, and reports, which have appeared in leading international venues, such as the *American Journal of Public Health*, *Health & Place*, and *Annals of the Association of American Geographers*.

## Jonathon McGavock



**Jonathan McGavock, PhD** is the Robert Wallace Cameron Chair in Evidence-based Child Health in the Department of Pediatrics and Child Health in the Faculty of Medicine at the University of Manitoba. Jonathan also holds an Applied Health Chair from the Canadian Institutes of Health Research in Resilience and Obesity in Children. He established the Centre for Physical Activity and Cardiometabolic Health at the Manitoba Institute of Child Health to study the prevention and management of type 2 diabetes in youth. Additionally, his group applies novel MRI technology to uncover the mechanisms through which physical activity reduces the risk for type 2 diabetes in youth. Jonathan has been partnering with several First Nations communities over the last four years to help establish programs to prevent and manage type 2 diabetes in children and adolescents.

## Facilitator Bios

### Candace Nykiforuk



**Candace Nykiforuk, PhD, CE** is an Associate Professor in the School of Public Health, University of Alberta and a CIHR/PHAC/AI-HS Applied Public Health Chair in community environments and healthy public policy. She is also the Co-Lead of the POWER UP! project. Dr. Nykiforuk's research program is called the Policy, Location, and Access in Community Environments (PLACE) lab, where she and her team focus on using settings-based approaches to implement and assess population health interventions on built, social, and policy environments, relative to health and health equity outcomes. She is an applied health geographer and population health researcher, which means that community impact or "making a difference in the community," is as important to her, as scholarly impact. Candace's research typically is conducted in partnership with practitioners and decision-makers in communities or other various settings. Community and NGO partners help to define project research questions, and in turn, Candace's research helps to address the issues that they are working with in daily practice.

### Kim Raine



**Kim Raine, PhD, RD, FCAHS** is a Professor in the School of Public Health, University of Alberta and is the Co-Lead of the POWER UP! project. Dr. Raine's research program, Promoting Optimal Weights through Ecological Research (POWER), explores the social and environmental determinants of the merging obesity epidemic. This includes the ways in which social conditions and people's behaviours (particularly food and eating behaviours) interact to transmit obesity and chronic disease through social means. With knowledge of how social forces may be shaping the health of people and communities, her current research priorities are on intervening on the social conditions contributing to obesity and chronic diseases. This can best be accomplished if stakeholders are made aware of the relationships demonstrated through research initiatives and stimulated to act on them.

## Appendix C: Dotmocracy Priority Setting Process

Dotmocracy is a participatory facilitation tool that engages participants in creating a top priority list using a collective ranking process (1). The first stage in Dotmocracy is to learn more about the issue the group is focusing on and present the questions the group will answer through Dotmocracy (1). The second stage is to create a list of potential answers to the issue by brainstorming as a group (1). The final stage is for participants to voice their opinion on the ideas generated using sticker dots to identify their top priorities (1). The top prioritized areas for action identified by the group are then announced.

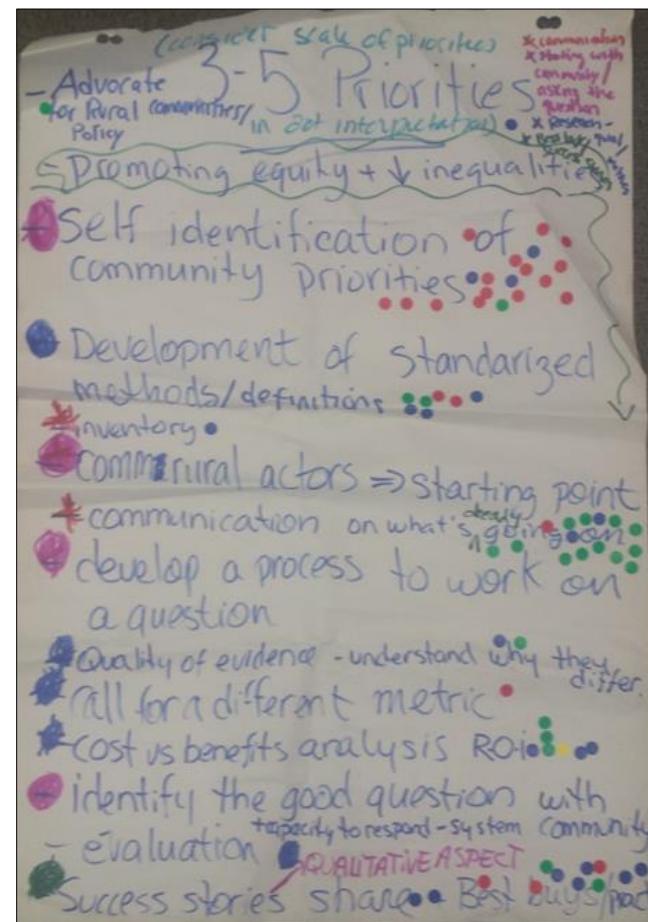
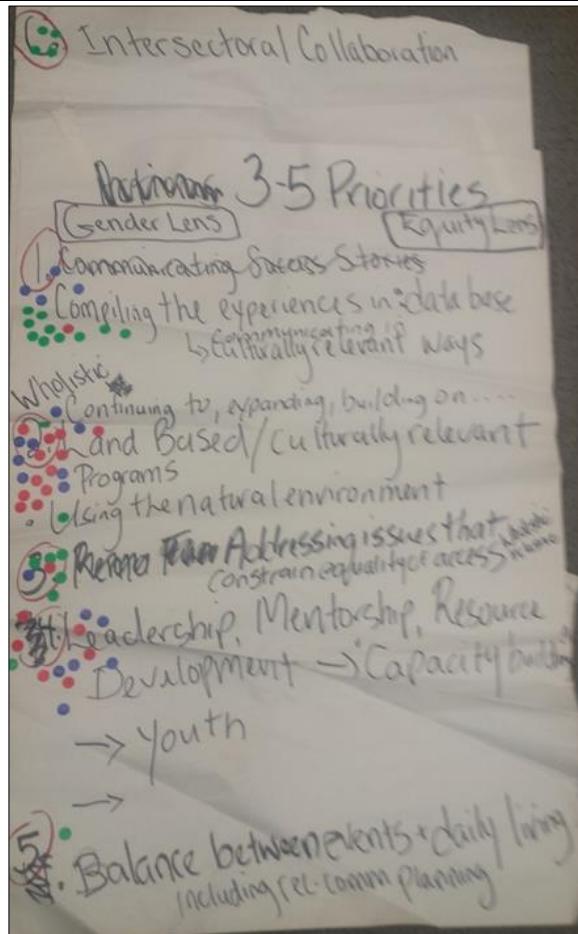
We used the long-list of priorities generated during the rural and northern/remote small group discussions as the basis for our dotmocracy voting process. Participants were given three stickers representing different priority levels (i.e., red=1<sup>st</sup> priority; blue=2<sup>nd</sup> priority; green=3<sup>rd</sup> priority) and asked to select their top three priorities for action according to setting. After the voting process, the priority areas were ranked based on how many red, blue, and green stickers they had (i.e., a priority area with the most number of red stickers was included on the top priority list).

The results of the dotmocracy process are captured in *Table 1* below.

*Table 1: Dotmocracy Priority Setting Process for Northern/Remote and Rural Communities*

Northern/Remote Brainstorm	Rural Brainstorm
Long-list of Priorities <ul style="list-style-type: none"><li>• Gender lens</li><li>• Equity lens</li><li>• Compiling the experiences in a database</li><li>• Communicating in culturally relevant ways</li><li>• Holistic, continuing to expand, build on, land based/culturally appropriate programs</li><li>• Using the natural environment</li><li>• Addressing issues that constrain equality of access</li><li>• Leadership, mentorship, resource development → capacity building</li></ul>	Long-list of Priorities <ul style="list-style-type: none"><li>• Advocate for rural communities/policy</li><li>• Consider scale of priorities</li><li>• Promoting equity and decrease inequalities</li><li>• Self-identification of community priorities</li><li>• Development of standardized methods/definitions</li><li>• Inventory</li><li>• Comm. Rural actors -&gt; starting point</li><li>• Communication on what's really going on</li><li>• Develop a process to work on a question</li><li>• Quality of evidence – understand why they differ</li></ul>

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| <ul style="list-style-type: none"> <li>• Youth</li> <li>• Balance between events and daily living including recreation and community planning</li> </ul> | <ul style="list-style-type: none"> <li>• Call for a different metric</li> <li>• Cost vs benefits analysis (ROI)</li> <li>• Identify the 'good question' with community</li> <li>• Evaluation and capacity to respond – system</li> <li>• Success stories to share – qualitative aspects.</li> <li>• Best buys/impacts</li> <li>• Starting with community assessing the question</li> </ul> |
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## Reference

1. Diceman J. Dotmocracy 2013 [Available from: <http://dotmocracy.org/>.



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