

# Implementation of Physical Activity Interventions in Rural, Remote, and Northern Communities: A Scoping Review

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## Abstract

Compared with urban centers, rural, remote, and northern communities face substantial health inequities and increased rates of noncommunicable disease fuelled, in part, by decreased participation in physical activity. Understanding how the unique sociocultural and environmental factors in rural, remote, and northern communities contribute to implementation of physical activity interventions can help guide health promotion policy and practice. A scoping review was conducted to map literature describing the implementation of physical activity interventions in rural, remote, and/or northern communities. Databases MEDLINE, PsycINFO, EMBASE, CINAHL, and SPORTDiscus were searched using a predetermined search strategy. Outcomes of interest included community demographics, program characteristics, intervention results, measures of implementation, and facilitators or barriers to implementation. A total of 1672 articles were identified from a search of databases, and 8 from a targeted hand search. After screening based on inclusion and exclusion criteria, 12 articles were summarized in a narrative review. Prominent barriers to physical activity program implementation included transportation, lack of infrastructure, sociocultural factors, and weather. Facilitators of program success included flexibility and creativity on the part of the implementation team, leveraging community relationships, and shared resources. Few papers reported on traditional implementation outcomes such as fidelity, dose, and quality. There is a lack of rigorous implementation evaluations of physical activity interventions delivered in rural, remote, or northern communities. Positive aspects of rural life, such as social cohesion and willingness to share resources, appear to contribute to successful program implementation.

## Keywords

exercise, rural health, population health, health behavior, physical activity, implementation

### What do we already know about this topic?

Rural, remote, and northern communities face numerous challenges with the implementation of health promotion initiatives and have decreased physical activity participation when compared to urban centers.

### How does your research contribute to the field?

This review increases our understanding of the characteristics of rural, remote, and northern communities that can support physical activity programming by examining previous interventions.

### What are your research's implications toward theory, practice, or policy?

Community cohesiveness and willingness to share resources are unique aspects of rural, remote, and northern communities positively contributing to successful program or policy implementation.

## Background

Increasing physical activity is consistently shown to be a cost-effective, simple, and accessible health promotion strategy for reducing the risk of noncommunicable disease and premature mortality.<sup>1</sup> Despite the well-established benefits,

there are substantial global, national, and provincial inequities in physical activity participation—not everybody has an equal opportunity to make healthy choices.<sup>2</sup>

Implementing and sustaining physical activity interventions in geographically diverse communities requires careful consideration of the social-ecological factors shaping intervention



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success to bridge the gap between development and adoption.<sup>3,4</sup> Because population health programming is dependent upon evidence-based interventions being implemented and sustained “at-scale,” a robust and diverse evidence base on the adoption of proven interventions in real-world environments are needed to address health inequities.<sup>5</sup> Studies measuring implementation are concerned with measures such as if the program and its elements are executed as planned, known as fidelity; how much of the program was delivered or received, known as dose delivered/received; and how well different program components are delivered, known as quality.<sup>6</sup>

Existing evidence on the promotion of physical activity has focused on urban settings with less attention given to rural, remote, or northern settings. Geographical terms of rural, remote, and northern are somewhat nebulous and vary by sector. Rurality is typically defined based on population size (often less than 10 000 people),<sup>7</sup> while remote communities are typically defined based on distance to a population center, reflecting access to health services and economic activity.<sup>8</sup> In Canada, northern regions are those that lie above the 60th parallel—namely the Yukon, Northwest Territories, and Nunavut. Colloquially, each province defines the less inhabited northern region as the “provincial north,” such as northern British Columbia or northern Ontario. These areas tend to be more sparsely populated, have increased cultural diversity, and include a higher relative percentage of Indigenous people, which together increase the complexity of population and public health service delivery. Rural, remote, and northern communities face challenges in the implementation of health promotion initiatives due to dispersed geography, limited access to health care providers and exercise professionals, and various built environmental factors, contributing to decreased access to active transportation and leisure-time activity options.<sup>9,10</sup>

The design of public health interventions for these communities must also consider differences in sociocultural conceptualizations of health and well-being, ultimately recognizing that what works in urban centers may not result in effective behavior change for rural, remote, or northern communities. In a recent systematic review and meta-analysis, Cleland et al<sup>11</sup> identified significant gaps in the evidence base pertaining to the promotion of physical activity in rural communities, with no pooled effect from 12 interventions on physical activity or sedentary behavior. Inadequate adaptation of interventions to the rural community context may

contribute to this lack of effectiveness. Understanding and evaluating the implementation of interventions is prudent to contextualize how the environmental and sociocultural factors of rural life can facilitate or act as a barrier to implementation success.

The objective of this review is to examine and map literature that evaluates the implementation of physical activity interventions in rural, remote, and/or northern communities to increase understanding of the factors that support or hinder implementation. This knowledge will support researchers, knowledge users, and health system decision makers to develop effective physical activity promotion interventions and policies.

## Methods

A scoping review methodology was chosen because we were unsure of the scope and breadth of this research and anticipated a range in study size, quality, and location. This review was conducted to inform the development of a physical activity research agenda in northern British Columbia, Canada,<sup>12</sup> identify gaps in evidence, and clarify key concepts related to physical activity and implementation evaluation. As proposed by Haddaway et al,<sup>13</sup> engaging knowledge users in reviews helps ensure syntheses are conducted with the greatest relevance to all stakeholders. The current mapping of literature was conducted by a collaborative team of academic researchers, health system decision makers, and a not-for-profit community advocacy organization.

Arksey and O'Malley<sup>14</sup> and Levac and colleagues<sup>15</sup> 6-step scoping review guidelines informed the scoping review protocol, which was reviewed by all authors. We adopted aspects of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement for protocol and reporting guidelines where appropriate to suit a scoping review methodology.<sup>16</sup> Although released after the literature search was completed, the PRISMA Extension for Scoping Reviews was used to guide final reporting.<sup>17</sup>

### Step 1: Identify the Research Questions

This scoping review was guided by the following primary research question: What are the factors influencing implementation of physical activity interventions in rural, remote, and/or northern communities? A secondary research question

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**Table 1.** Overview of Search Strategy.

Topic	Search terms
Population	rural OR remote OR northern OR Indigenous OR Aboriginal OR First Nation OR remote area OR rural communit* OR remote communit* OR northern communit*
Physical activity	activit* OR exercise* OR physical activit* OR fitness OR aerobic training OR strength training OR cardiovascular training OR sport OR walking OR leisure activities OR active living OR active aging OR outdoors OR nature OR recreation
Implementation	program evaluation OR evaluation studies OR implement* OR fidelity OR adherence OR compliance OR process evaluation intervention OR effectiveness OR implementation evaluation OR dose OR expose* OR uptake OR program OR innovation
Study design	qualitative OR quantitative intervention
Search limits	English language, published between 1990 and present

was to identify the definitions of rural, remote, and northern commonly used in population and public health literature.

### Step 2: Identifying Relevant Studies

A 2-step search strategy was used. First, databases MEDLINE, PsycINFO, EMBASE, CINAHL, and SPORTDiscus were searched for peer-reviewed articles published from 1990 to August 7, 2018. We did not anticipate any relevant literature published before 1990 based on the relatively recent emergence of the field of implementation science, and based on the outcomes of a systematic review on effectiveness of physical activity interventions in rural communities that identified no studies prior to 1996.<sup>11</sup> This also follows the search limits used in a similar review on the implementation of physical activity interventions in school settings.<sup>18</sup> The search strategy included terms for population, physical activity, and implementation (Table 1). Variations for keywords were combined with Boolean operator “OR” and key concepts were combined using “AND.”

Second, hand searches of reference lists of included papers were completed for additional articles. A targeted search (by study name or primary authors) was conducted individually for each manuscript meeting inclusion criteria to account for any implementation data reported separately from other outcomes. The reference lists of relevant review papers were also examined.

### Step 3: Study Selection

All authors reviewed the search strategy and criteria for study selection. Abstract and title screening was completed independently by two reviewers (KW, RK), with discussion to reach consensus where necessary. Final approval for all included articles was obtained by the senior author (CP).

Study inclusion criteria were as follows: (1) studies of any methodology or a combination (qualitative and quantitative); (2) physical activity intervention including any activity

reasonably deemed to meet definitions of physical activity (eg, walking, running, fishing, kayaking) in order to include activities more common in rural areas and avoid an urban-centric focus. Also included were behavior change interventions, public health campaigns, or other health promotion initiatives focused on physical activity. Multicomponent interventions were also eligible for inclusion; (3) intervention delivered in a rural, remote, and/or northern community, defined by any criteria to be inclusive of varying definitions and to satisfy the secondary research question; (4) studies with adults or children (or a combination thereof) as participants; (5) English language; and (6) studies that measured or sought to understand implementation of a physical activity intervention or program (fidelity, dose delivered/received, quality), process evaluation, and/or barriers and facilitators associated with program implementation.

Study exclusion criteria were as follows: (1) studies combining both urban and rural communities, with no specific rural, remote, or northern focus; (2) studies with no measure of process evaluation or implementation (eg, those only reporting effectiveness); (3) studies not related to physical activity or active living; and (4) studies including a sample or research question focused only on a clinical population (eg, clinical exercise intervention) and not on population health or chronic disease prevention.

### Step 4: Charting the Data

Variables of interest included information on the community and population of study, program characteristics, results of the intervention, and effectiveness of implementation. Data were extracted into a predetermined table that was revised iteratively. Data were extracted and charted by one researcher initially (KW) and confirmed by a second (RK) and the entry revised as necessary. Charting was completed on a pilot of 5 studies to ensure consistency with the research question and reviewed by the senior author (CP). Consistent with scoping review guidelines, risk of bias and study quality were not assessed.<sup>14</sup>

### **Step 5: Collating, Summarizing, and Reporting Results**

Results were summarized and reported based on the themes identified in the charting process and are presented narratively. Studies are organized based on setting: school, workplace, and community.

### **Step 6: Consultation**

As our research team includes a combination of researchers, research trainees, and knowledge users (community organization, health service providers, health system decision makers), integrated consultation between researchers and knowledge users occurred throughout this review. This included collaborative identification of the research question and development of the review protocol along with a discussion of key themes. All authors reviewed the final manuscript.

## **Results and Synthesis**

### **Article Search**

As depicted in Figure 1, the search identified 1672 articles from electronic databases and an additional eight articles were identified through a targeted search of reference lists and key authors. Following removal of duplicates and screening based on inclusion/exclusion criteria, 12 articles were summarized for inclusion in the narrative review.

### **Community and Participant Characteristics**

Studies took place in the United States ( $n=5$ ),<sup>19-23</sup> Australia ( $n=3$ ),<sup>24-26</sup> Canada ( $n=2$ ),<sup>27,28</sup> and South Africa ( $n=1$ ),<sup>29</sup> with one study comparing communities in the United States and Australia.<sup>30</sup> Community or county population ranged from 180 to 77 468 people and was not reported in seven of the included articles. Nine articles identified the community or population of interest as rural, two as remote, and one indicated the study took place in a northern community. Four studies included either Indigenous adults ( $n=2$ )<sup>25,27</sup> or children ( $n=2$ ).<sup>24,28</sup>

### **Intervention Characteristics**

One of the included interventions was conducted in a workplace<sup>27</sup> and two in school-based settings (Table 2).<sup>24,28</sup> Nine were primarily community-based interventions, with the interventions being delivered at various locations such as churches, seniors housing facilities, homes, and community centers (Table 3). One intervention was community-based and used school facilities for an indoor walking program.<sup>22</sup> Another study described two interventions: one delivered in schools and another for older adults in the community.<sup>29</sup>

One intervention was based in a primary care setting.<sup>30</sup> The types of interventions included walking groups,<sup>22</sup> structured group activity,<sup>25</sup> multicomponent lifestyle intervention programs,<sup>23,27,30</sup> theory-based behavior change,<sup>20,21,26,29</sup> and a structured civic engagement curriculum.<sup>19</sup>

### **Effectiveness of Interventions**

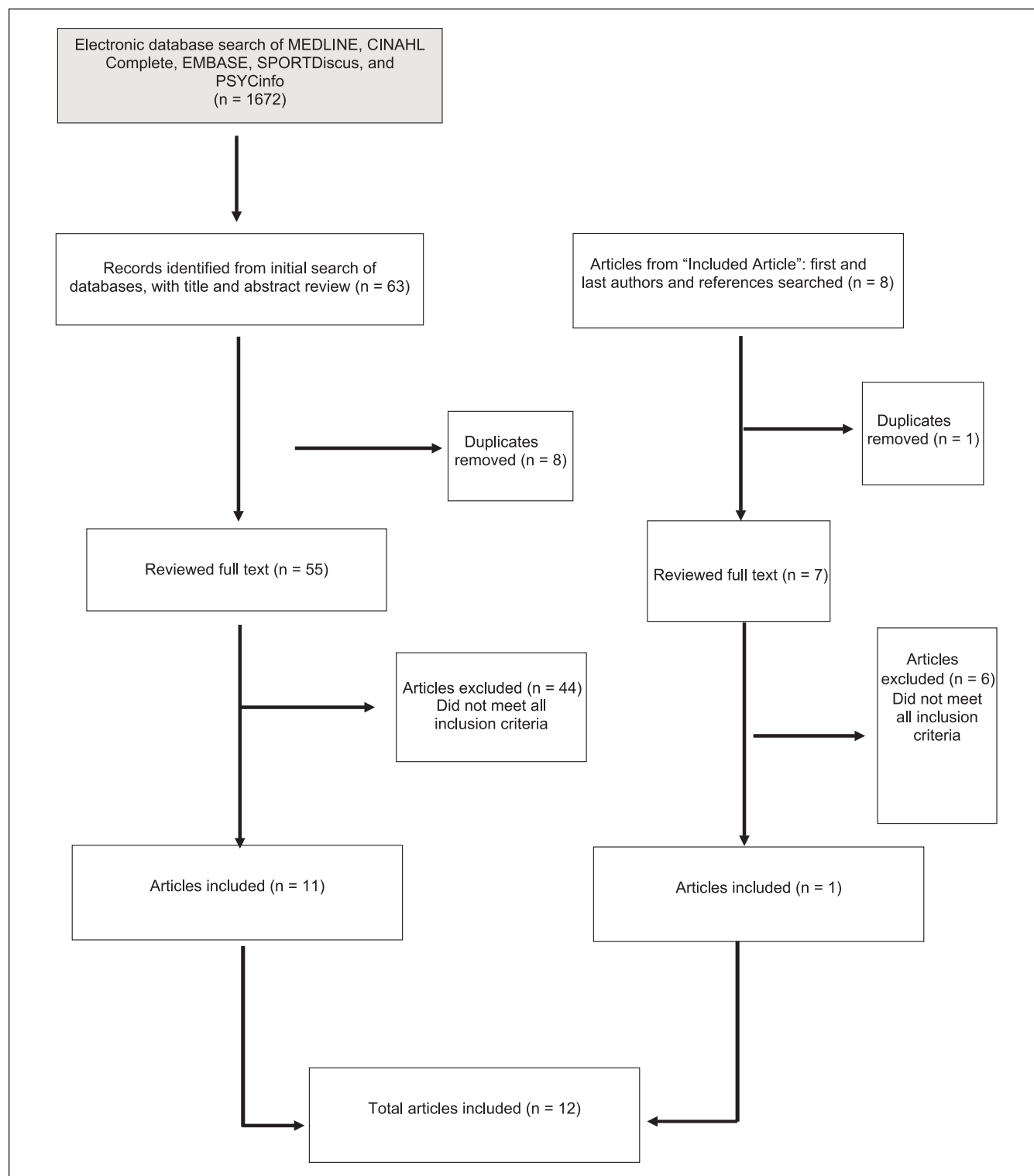
Seven of the included studies did not report any results describing the effectiveness of the intervention on physical activity or health outcomes, or indicated they were reported elsewhere.<sup>19,22,25-29</sup> McMahon et al<sup>20</sup> demonstrated modest increases in physical activity and reduced fall risk following eight weekly sessions with older adults. Similarly, Strand et al<sup>21</sup> found increases in physical activity in older adults using an exergaming intervention. Studies focusing on lifestyle factors to reduce risk factors for diabetes had mixed results on health and physical activity outcomes.<sup>23,30</sup> A study completed in a small remote community showed increased school attendance and an increase in community pride and happiness.<sup>24</sup>

### **Level of Implementation**

One included study reported using an implementation framework to guide process evaluation,<sup>26</sup> and one study created an index of procedural consistency to monitor fidelity.<sup>20</sup> Dose received was the most commonly reported implementation outcome and was generally conceptualized through measures of attendance or completion. Adherence or completion rates were reported in four studies although there was little consistency among measures. Blackford et al<sup>26</sup> reported 74.6% of participants finishing a 6-month behavior change intervention with motivational interviewing; another study reported that nearly half of participants completed over 75% of the program.<sup>23</sup> A structured activity program with older adults reported a very high attendance record of 90%, with attrition of only 7%,<sup>20</sup> while another program focusing on older adults had a completion rate of 67.6%.<sup>21</sup> Some studies reported a low level of attendance, with 8 of 12 participants not able to attend a single session in a rural community, and an average attendance of 7 sessions out of a possible 32.<sup>25</sup> Other less structured programs reported utilization rates as estimates of adherence, and several studies reported low usage levels or dissatisfaction with logging of activities.<sup>22,23,26-28,30</sup>

### **Factors Influencing Implementation**

In school and workplace settings, time allocated to fit within existing schedules and flexibility was the most commonly reported barrier to intervention delivery.<sup>24,27-29</sup> Support provided by the research team, including training, equipment, and strong communication pathways, was the most common facilitator.<sup>18,24,27</sup>



**Figure 1.** Flow chart of articles included in scoping review on implementation of physical activity interventions in rural, remote, and northern communities.

For community-based interventions, transportation including limited access to and cost of public transport, safety, and distance were noted barriers. One study reported providing

transportation was an important facilitator.<sup>23</sup> Resources, including access to facilities (particularly during inclement weather), and a lack of appropriate infrastructure and trained



**Table 2.** Summary of Program Characteristics, Implementation Outcomes, and Effectiveness of Physical Activity Interventions Delivered in School or Workplace Settings in Rural, Remote, and Northern Communities.

Authors	Community characteristics	Population demographics	Intervention characteristics	Effectiveness of intervention	Measures of implementation	Factors influencing implementation
Naylor et al <sup>18</sup>	Three communities—180, 500, 900 residents. Coastal, only accessible by float plane.	First Nations Communities	Action Schools BC. Training and resources for teachers, student leadership training, telephone consultations, action plan, weekly activity logs.	Not reported	<p>Action plans created, weekly activity logs used to compare actual physical activity to proposed number of activities, focus groups.</p> <p>Fidelity: schools delivered 93% of target amount of physical activity, activities planned across all 6 zones.</p> <p>Dose: average 140.1 minutes of physical activities opportunities delivered per week (range, 121.3–175.5 minutes).</p> <p>Quality: not reported</p>	<p>Adherence to physical activity logging was low (34%, range, 27%–53%); most physical activity opportunities through classroom action and other zones, actions planned across all 6 zones.</p> <p>Facilitators: support/ease of implementation, participants suggested enhancing community partnerships, parent education and focus on First Nations traditions, support (training and resources) and ease of implementation, would continue program if enough support.</p> <p>Barriers: difficulty with time, equipment, and older students, lack of time and school resources, high staff turnover, evaluation requirements, low levels of staff knowledge.</p>
Peralta and Cinelli <sup>24</sup>	200 residents, nearest service center several hours by car.	Age 8 to 18 years, 100% Indigenous	2-week sports-based social program in school, developed with Aboriginal-controlled community organization..	Program had positive benefits for kids (knowledge, increased school attendance); individuals and community gained pride and happiness.	<p>Semi-structured interviews and focus groups.</p> <p>Fidelity: not reported</p> <p>Dose: not reported</p> <p>Quality: not reported</p>	<p>Facilitators: a cultural component, clear communication between school, program designers, and Aboriginal organizations involved in program. Flexibility in classrooms was needed which was hard to achieve.</p> <p>For sustainability, need to link better with current curriculum.</p>
Seaton et al <sup>27</sup>	Not reported	Age 18 to 66 years, 100% male, 11.7% Indigenous	POWERPLAY workplace intervention. 3-month program included educational materials, incentives, and challenges. Led by workplace representatives.	Not reported	<p>Postprogram employee survey, workplace led interviews, field notes on program implementation.</p> <p>Fidelity: not reported</p> <p>Dose: not reported</p> <p>Quality: not reported</p>	<p>Majority of employees felt supported by workplaces.</p> <p>Variable participation depending on worksite.</p> <p>Participants disliked having to track activities as part of challenges, program needed to be flexible for workplace.</p> <p>Facilitators: employer enthusiasm, time dedicated to the program, relationship quality between employer/employees, friendly competition. Launch, incentive prizes, and competitions were effective for engagement.</p> <p>Barriers: Time for leads to deliver program was hard during busy times; doing eating and physical activity changes at the same time was too much for some.</p>

**Table 3.** Summary of Program Characteristics, Implementation Outcomes, and Effectiveness of Physical Activity Interventions Delivered in Rural, Remote, and Northern Areas in a Community Setting.

Authors	Community characteristics	Population demographics	Intervention characteristics	Effectiveness of intervention	Measures of implementation	Factors influencing implementation
Blackford et al <sup>26</sup>	Not reported	Survey: mean age 61 years, 64.4% female Interviews: mean age 61.5 years, 62.5% female	Behavior change intervention based on self-determination theory, motivational interviewing, educational booklet, exercise chart, Web site with progress tracker, 6 months in length.	Not reported	Online survey, exit interviews, field notes by staff. Fidelity: all participants scheduled to receive 6 motivational calls. Majority of participants did not use monthly activity planner in booklet (78.1%) or progress tracker via Web site (65.1%). Dose: 74.6% finished 6-month program, 18.5% of participants withdrew during 6-month intervention, further 6.5% lost to follow-up. Average 3 telephone contacts each, 13.9% no calls, 53.7% 1-3 calls, 32.3% completed 4 or more calls. Printed resources encouraged physical activity (60.3% booklet, 61.1% exercise chart). Quality: not reported	Web site was least preferred resource; being face-to-face, providing more incentives could have retained the noncompleters. Recruitment using cold calling was time and resource intensive, most attrition due to health or personal issues, loss of interest. Web site not used due to design issue rather than mode.
Cené et al <sup>23</sup>	55 315 (Franklin), 57 370 (Halifax), 77 468 (Wilson)	Mean age 57 years, 75% female	Power 2 Prevent (P2P). Interactive curriculum and group sessions, led by trained community health ambassadors to encourage healthy lifestyles. 7.5 month (12 sessions of 60-90 minutes) behavioral intervention.	No significant changes in physiological measures (blood pressure, blood glucose, body mass index); nonsignificant increase in physical activity; significant increase in physical activity knowledge.	Questionnaires (pre/post curriculum, pre/post session), individual interviews. Fidelity: not reported Dose: of 104 participants, 43% attended more than 75% sessions Quality: not reported	Long time frame impacted retention. Exceeded community health ambassador recruitment goals. Facilitators: structure, resources, facilitator characteristics, 60- to 90-minute sessions were ideal; smaller group sizes were better for interactions; providing information in easy to understand language; providing transportation was key to participation; hiring/training locals to be community health ambassadors (led the groups) was key—allowed best explanations of the material (culturally relevant). Barriers: low literacy in the community made it less likely participants would use tools provided facilitator burden; pre/post curriculum questionnaires delivered, lack of time to deliver pre/post session questionnaires; nonconsistent administration of trackers (literacy concerns).
Draper et al <sup>29</sup>	Not reported	Not reported	Healthnutz (children), Live It Up (older adults). Physical activity health promotion program set in schools or health clinics. Based on Pender's Health Promotion model.	Positive change in perceptions of physical activity, increased awareness of the importance of physical activity and adoption of healthier lifestyles.	Focus groups, situational analysis, informal observations, interviews with program coordinators. Fidelity: observations and exercise demonstration perceived as successful program delivery. Dose: not reported Quality: not reported	Implementation went as planned and was thought to be sustainable (provided demonstration). Participants received social interaction, sense of belonging, and increased quality of life from the program. Facilitators: the program was well received due to the researcher's interactions with community and stakeholders; being under resourced previously helped increase receptiveness of program, extensive consultation with local government in formative and implementation phases enabled success (ownership and involvement in program). Made use of existing community strengths and assets (existing networks), low cost. Barriers: transportation unreliable and costly, but still used due to safety concerns, especially older adults with mobility issues. Teachers/instructors needed help finding ways to incorporate physical activity into school timetable.

(Continued)

Table 3. (continued)

Authors	Community characteristics	Population demographics	Intervention characteristics	Effectiveness of intervention	Measures of implementation	Factors influencing implementation
McMahon et al <sup>20</sup>	Not reported	Mean age 83.6 years, 93.3% female	Ready–Steady. 8 weekly 90-minute small group physical activity sessions. Mobile health app, promotion of fall-reducing physical activity. Guided by wellness motivation theory.	Physical activity and fall risk measures had modest improvements. 75% of participants increased physical activity to better their balance and strength. Helped participants use community resources (81%), increased perceived social support (62%), and improved physical activity readiness (75%) and self-regulation (75%).	Attendance and attrition records, questionnaire, field notes, specification of content, observation of intervention delivery, index of procedural consistency.  Fidelity: intervention delivered very well 87% of the time, to a considerable degree 13% of the time. Lower index of procedural consistency associated with topics discussed for shorter or longer durations than anticipated.  Dose: mean attendance was 90% (intervention: 7.3/8 sessions, control: 7.1/8 sessions). Quality: not reported	Participants evaluated intervention as acceptable (4.54-4.68 out of 5). Implementation went as planned with few changes; increased use of community resources, social support, readiness, and self-regulation.  Facilitators: community partner suggestions and advice, community partners contributed to understanding contextual relevance. Accessible community centers and timing of classes improved attendance.
Reddy et al <sup>30</sup>	Montana: 9202 (Beaverhead), 11 696 (Custer). Greater Green Triangle (GGT): 220 000	Montana: mean age 53.6 years GGT: age 40 to 75 years	Montana Cardiovascular Disease and Diabetes Prevention (CDDP) program, 16-weeks. Greater Green Triangle Diabetes Prevention Project. (GGT DPP), 12 months (intervention + follow-up). Structured group lifestyle modification programs.	Montana CDDP: significant decrease in weight, 70% achieved physical activity goal of > 150 min/week. GGT DPP: Significant reductions in weight, waist circumference, metabolic risk factors.	Focus groups. Fidelity: not reported Dose: not reported Quality: not reported	Australian study (GGT DPP) had retention of 75%, people dropped out in middle due to family/health crisis or cost concerns. Keeping participants enthusiastic through winter was a significant challenge  Facilitators: knowing others in program impacted group dynamics and recruitment, leveraging existing relationships, especially during winter months, needed support from key people in the community to establish program, direct recruitment through primary care and successful participants was most successful; giving participant feedback was a good incentive, postintervention support was key.  Barriers: Access to facilities (rural issue), access to places with enough space, needed creative problem solving, few qualified instructors; credibility was hard to get at the beginning (wanted it from primary care physicians); main structural barriers were timing of classes and travel distance.
Riley-Jacome et al <sup>22</sup>	63 094 (Columbia County), 48 159 (Greene County)	Not reported	Walk with Us. Feasibility of using schools after school hours as indoor walking facility, 9 weeks.	Not reported	Survey, utilization rates, registration forms, daily logs, individual's pedometer diaries, focus groups.  Fidelity: not reported Dose: 76 participants averaged 6.52 days of walking, range 1 to 26 days walked. Average 7.4 hours of walking over 9-week program, 2.5 times per week. Most active participants (29%) averaged 15.84 days of walking. Quality: not reported	Costs were not a concern—existing budgets were sufficient; lack of formal registration was limiting for evaluation; schools were reluctant if they lacked a coordinator or administration. Administrators were very supportive; unregistered participants attended less than registered. Older participants, those who lived closer tended to walk more.  Facilitators: being able to walk regardless of weather and feel safe were noted benefits for participants; no need to stop for traffic lights, saying hi to others; when walking indoors, walk nonstop; flexibility of route to take and speed; inexpensive and effective way to increase physical activity in rural communities with limited physical activity facilities. Having walking partners facilitated physical activity fostered community spirit.  Barriers: distance to school buildings, conflict with other activities, lack of personnel to run program.

(Continued)



**Table 3. (continued)**

Authors	Community characteristics	Population demographics	Intervention characteristics	Effectiveness of intervention	Measures of implementation	Factors influencing implementation
Seguin et al <sup>19</sup>	Not reported	Age 23 to 84 years, 80.8% female	HEART. Resident-led civic engagement for built environmental change. 13-month intervention including leader training (6 months) and implementation (7 months).	Significant improvements in environmental awareness, no significant differences in knowledge, motivation, self-efficacy, or group efficacy for community change.	Plan developed in each community, including benchmarks and action plans. Attendance logs at each curriculum meeting. Focus groups postintervention, group progress toward each benchmark. Fidelity: all HEART clubs accomplished 3 or more benchmarks, (Town 1: 4 of 8 achieved, Town 2: 4 of 7 achieved; Town 3: 3 of 7 achieved). Dose: not reported Quality: not reported	High meeting attendance (88%); at 6 months, participants satisfied with groups progress and experience in HEART club. Facilitators: Extensive communication between researchers and group leaders in each town; involving members connected to local organizations (eg, Rotary club leaders); stakeholder support, positive group dynamics, and group leadership. Ease of working and accessing resources in small community. Barriers: competing responsibilities, lack of community support, limited financial resources, pushback from stakeholders.
Strand et al <sup>21</sup>	Not reported	Age 70 to 79 years, 87% female	Living well through Intergenerational Fitness and Exercise (LIFE). Theory based program (whole person wellness model, transtheoretical model). 25-week program of exergaming at meal sites or senior apartment complexes, fitness newsletters.	Self-reported physical activity significantly increased for those inactive at start; overall 22% increase in self-reported physical activity by all participants (not statistically significant), self-reported increases in quality of life.	Written evaluations, open-ended questions. Fidelity: not reported Dose: not reported Quality: not reported	67.6% program completion rate. Attrition due to health, limited time, participation in other exercise classes, and moving. Physical activity and socialization were the most liked features; technical issues with the Wii equipment was the most disliked feature. 42.9% of sites continued using the Wii after the intervention was done. Location was found to play a role in this likelihood—if they had no other place to do physical activity on site.
Sushames et al <sup>25</sup>	1 rural community, 1 regional city	Mean age 36.6 years, 58% female, 100% Indigenous	Group physical activity sessions (1-hour), 4×/week for 8 weeks	Not reported	Semi-structured interviews, program attendance. Fidelity: not reported Dose: Attendance was low, 8/12 did not attend a single session and average of 7 sessions (rural community); 12/22 did not attend single session and average of 5 sessions (regional city). Quality: not reported	Facilitators: inclusion of family members and kinship (snowball recruitment), peer support, guidance, relationship with researcher. Barriers: work commitment (shift work, working out of town); access to transportation; access to facilities (no indoor facilities were available, outdoor classes canceled due to weather); costs associated with travel; sorry business or mourning; menstruation; lack of family and peer support, shame/stigma of being active.

Note. HEART = Healthy Eating and Activity in Rural Towns; GGT = Greater Green Triangle region.

staff were commonly listed barriers to implementation.<sup>22,30</sup> Studies described a need to leverage existing relationships, networks, and resources to ensure program success and overcome barriers. A common thread through many of the studies was the need to be creative.<sup>29,30</sup> Strong community relationships were noted as a facilitator for both recruitment and cohesiveness among group program participants.<sup>23-25,29,30</sup> Participants of some studies reported increased comfort due to hiring local facilitators and provision of training, particularly among vulnerable groups or populations with a lower socioeconomic status.<sup>22,29</sup>

None of the included studies linked level or characteristics of implementation with study outcomes.

## Discussion

The purpose of this scoping review was to determine the factors that impact implementation of physical activity interventions in rural, remote, and/or northern communities. Limited resources are compounded by weather concerns and geographical distance in rural, remote, and northern areas, which appear to be best addressed through strong community connections and iterative adaptability on the part of the investigators and program implementation team. While there are common individual-level barriers to health behaviors in both urban and rural communities, barriers are often amplified in rural environments due to low socioeconomic status, access to health services, and limited infrastructure.<sup>9,30</sup> The accessibility of facilities was a common barrier noted to implementation of interventions, in addition to factors such as safety, weather dependency, and limited transportation options. One study utilized school hallways for walking and noted this tailored approach was successful in addressing salient barriers due to improved safety, reduced cost, and accessibility regardless of the weather.<sup>22</sup> Taken together, results suggest the need to consider the sociocultural and environmental factors unique to each community that shape physical activity opportunities, behavior, and program implementation.

Each study included in this synthesis utilized different measures and outcomes of implementation effectiveness. Most included studies reported aspects of fidelity and dose, typically measured by adherence, and implementation barriers and facilitators, a finding consistent with other reviews.<sup>31,32</sup> There was little commonality or similarity between interventions, and none were implemented at scale. Given the above findings, we are unable to make recommendations about which interventions are more or less likely to succeed in translation from lab to rural, remote, or northern community. Previous reviews of implementation studies on noncommunicable disease prevention have found a similar lack of detailed reporting of implementation strategies, implementation outcomes or measures, and research methods.<sup>32</sup> In a review of reviews on the promotion of physical activity in nonurban settings, Nykiforuk and colleagues<sup>33</sup> were not able

to conclude a definitive evidence-based focus for intervention implementation, presenting a call to action for policy, practice, and research focused on rural, remote, and northern communities. There are clear gaps in our understanding of how, when, and where to best target physical activity interventions and policies for rural residents.<sup>11,34</sup>

Although often less-resourced and seemingly disadvantaged when compared with urban centers in many ways, rural communities have distinct characteristics and strengths that can be leveraged to support the implementation of community-based interventions. Individuals living in rural areas tend to be more connected to their communities, report greater happiness, and have a social identity tied to rural living.<sup>35</sup> This increased social cohesion can facilitate partnerships and the sharing of resources.<sup>36</sup> Similarly, people living in rural communities often have a differing definition of health and physical activity than do people living in urban areas, one that focuses on the ability to work, reciprocate in social relationships, and maintain functional independence.<sup>37,38</sup> Accessing existing networks and partnerships was noted in several included papers as a facilitator of program implementation, highlighting the need for interventions to be developed locally and to explore how the local context and community characteristics can facilitate program success.

A secondary objective of this review was to map the definitions of the terms rural, remote, and northern as used in this field of population health. Due to the lack of information presented in the included papers, we were unable to properly address this question. Based on the population range in the included studies (180-77468), there appears to be a wide range of definitions used, reflecting the lack of consensus on this issue. Some studies in the United States indicated the population of counties, making the population of individual towns or communities where participants live unclear. Seven of the included papers did not mention population size or describe what basis was used to classify participants or a community as rural, remote, or northern. Only two studies described relevant geographical factors such as distance to service centers or accessibility.<sup>24,28</sup> Rurality is inherently complex and multifaceted, often based on a combination of population, geographical, and service factors. Because rural can mean many things in different contexts, the aspects of rurality being studied and the definition being used would have enabled a more robust comparison of implementation data.<sup>39</sup> For example, in the present area of research, explaining the context in terms of access to physical activity infrastructure, financial and information resources, and weather considerations would aid in understanding barriers and facilitators to program implementation.

Government classifications of community size can influence policy decisions, health service delivery, and frameworks on an international, national, provincial, and regional scale. The current Statistics Canada definition of a rural community is a population size of less than 1000, with a density below 400 people per square kilometers,<sup>40</sup> whereas the

Census Bureau of the United States identifies rural communities as those that are outside of urbanized areas (greater than 50 000 people) or clusters (2500-50 000 people).<sup>41</sup> While these classifications oversimplify complex sociocultural issues, they do provide a framework and would offer some degree of consistency for which to compare studies. Based on the findings of this review, we would urge authors to provide further information or justification for the classification of their community setting and participant demographics to enhance transferability of research findings to other contexts.

The provincial and territorial northern regions of Canada have a greater relative population percentage of Indigenous people. In Canada, this includes First Nations, Inuit, and Metis people. Although we expected the Indigenous perspective to emerge as a theme in this review, our search revealed only one study including Indigenous participants<sup>27</sup> and three interventions in Indigenous communities.<sup>24,25,28</sup> A similar paucity of studies has been reported in reviews focused solely on the effectiveness of physical activity interventions among Indigenous populations in Canada, Australia, and the United States.<sup>42-44</sup> Common in these studies was the identification of the need for extensive local partnerships and leadership, community engagement, and ensuring cultural safety. Indigenous communities face some of the same built environmental barriers to implementation as other rural communities, although barriers are amplified by historical, cultural, economic, and social factors that contribute to decreased participation in health-promoting behavior and an increased burden of noncommunicable disease. It is essential to look beyond environmental factors and consider the influence of power relations on physical activity behavior for Indigenous populations.<sup>45</sup>

Although we report a limited number of studies describing implementation outcomes of physical activity interventions delivered in rural, remote, and/or northern communities, the findings contribute an increased understanding of the factors impacting the delivery of physical activity interventions in these communities. For researchers, this review highlights a lack of robust implementation evaluations of physical activity interventions to advance the science of moving interventions from efficacy trials into rural and remote communities. A focus on scaling interventions to rural, remote, and northern communities is particularly important to address health inequities due to systemic differences in access to health services and greater barriers to physical activity. Partnerships between communities, researchers, and knowledge users based on participatory or engaged research methods were identified as a facilitator of successful implementation and ultimately enhanced sustainability; a key takeaway from this review is the importance of these partnerships to support programming and ensure community buy-in. For knowledge users engaged in population and public health, the outcomes of this report can be used to

highlight some of the unique characteristics of rural, remote, and northern communities. This knowledge can be used to support program or policy design and evaluation, promote sustainable resourcing for such initiatives, and support grant-ing program development.

## Limitations

Grey literature was not included in this review, and it is possible implementation data for some physical activity interventions was not captured. We decided not to place any restrictions on study inclusion based on population size or location, and included any study where authors self-identified a rural, remote, and/or northern community. This was done to be inclusive of the varying definitions and characteristics of these terms. This approach has been taken by previous authors<sup>11</sup>; however, using a standard criterion may have better supported comparison of studies. The population sizes in the included studies varied substantially and some may in fact represent a “small urban” type environment. We would encourage investigators to more fully describe the context of their work and, if relevant, include justifications for classifications of rural, remote, and northern to better enable synthesis and comparison.

## Conclusions

The results of this review highlight a lack of implementation evaluations of physical activity interventions in rural, remote, and northern communities. The co-production of interventions with community members and knowledge users may enable consideration of how context-specific facilitators can be utilized creatively to support implementation, helping to reduce health inequities and improve population health.

## Authors' Note

Anne Pousette is also affiliated with Promotion of Wellness in Northern BC.

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