

Activating Canadians

by

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Ethics Statement

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Abstract

Physical inactivity pervades British Columbia. Only 16.7% of British Columbians meet the recommended 150 minutes of moderate to vigorous physical activity per week. Although this low rate of physical activity has numerous detrimental impacts on society, the impact that is of greatest concern to the provincial government is the cost that physical inactivity exacts on the health care system. Physical inactivity costs the government of British Columbia over a billion dollars annually. Although much of the fault and responsibility of physical inactivity lies at the feet of individuals, governments at all levels must create a social, cultural, and built environment that is conducive to physical activity. This capstone project evaluates three policies aimed at increasing the physical activity of British Columbians and recommends that the provincial government re-establish the Active Communities Grant Program and promote physical activity apps.

Keywords: physical activity, physical inactivity, British Columbia, public policy, policy analysis

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Chapter 1. Introduction

What is the most popular and cliché New Year's resolution? The most common resolution revolves around the theme of going to the gym more often, getting more exercise, or living a healthier lifestyle. Although New Year's resolutions are not particularly successful at changing behavior, the fact that being more active tops the list of resolutions sheds light on a commonly perceived problem in North American society: physical inactivity.

Physical inactivity is indeed a problem. Statistics Canada (2017) estimates that only 16.7% of Canadian adults log 150 minutes of moderate to vigorous physical activity per week, the level of activity recommended by the Canada Physical Health Guidelines (Canadian Society for Exercise Physiology 2011) and the World Health Organization (2018). The ramifications of physical inactivity are wide-reaching, invading the domains of person health, public finances, economic productivity, and social trust (Humphreys, McLeod, and Ruseski 2014; Janssen 2012; ParticipACTION n.d.; McInnes, n.d.).

Opportunities for physical activity abound. Some forms of physical activity are part of people's day-to-day lives: walking the dog, mowing the grass, or climbing the stairs to the office. Other forms of activity – playing in a recreational hockey league or visiting the gym – require people to take time out of their regular routine to be active. Modern innovations such as motorized vehicles, washing machines, and computers have exponentially increased human productivity and standards of living, freeing up time and money for people to engage in activities that they enjoy.

So why are British Columbians so physically inactive? What can the provincial government do to incentivize and increase rates of physical activity? The answers to both questions are complex and multi-faceted. Although there is no single reason why inactivity permeates society and there is no policy panacea to solve this policy problem, this capstone endeavours to answer these two questions. Chapter 2 outlines the policy problem in more depth. Chapter 3 and half of chapter 5 endeavour to answer the question of why most British Columbians are relatively inactive. Chapter 4 and half of chapter 5 examines policies that have been proposed, implemented, or evaluated to reduce physical inactivity. Chapters 6 through 9 describe, evaluate, and recommend a

set of policies aimed at increasing rates of physical activity. Chapter 10 concludes this capstone and highlights the central findings of the entire research project.

Chapter 2. Physical Activity in British Columbia

Physical activity is defined as the exertion of the human body past 1.5 metabolic equivalent tasks (Spinney and Millward 2010). A metabolic equivalent task (MET) equals the consumption of 1.5 kcal per kilogram of body weight per day (Cabane and Lechner, n.d.), which is roughly the metabolic consumption of an average human body quietly sitting at rest (Spinney and Millward 2010). Such metabolic equivalent tasks provide rough approximations of metabolic consumption. Personal characteristics such as weight, personal fitness, or physical activity technique can all influence an individual's specific MET. Sleep, for instance, has a MET of approximately 0.9 while doing desk work has a MET of about 1.5. Activities that exceed 1.5 METs can be considered physical activity.

Metabolic equivalent tasks not only establish a threshold of what constitutes physical activity but also can measure the intensity of physical activity. Low intensity physical activities—such as leisurely walking—have a MET of 1.5-3 while moderately intensive physical activities—such as biking—have a MET of between 3-6. Vigorous intensity physical activities—such as jogging or playing hockey—have a MET above 6. Sprinting is the most physically demanding activity, requiring up to 23 times more energy as sitting quietly at rest.

2.1. The Benefits of Sufficient Physical Activity

Regular physical activity at any intensity level provides two general pathways to significant health benefits. Physical activity consumes calories and improves blood flow. Children and adults of all ages in the developed world often consume a surplus of calories. Increasing activity levels burns more calories and prevents the accumulation of excess calories. Physical activity also improves blood flow throughout the body as muscle tissues require more sugar and oxygen to operate at this more intensive level. This increase in blood flow throughout the body also increases blood flow to the brain, cleans out blood vessels, and strengthens the heart.

A lack of physical inactivity contributes to numerous chronic health conditions, including obesity and a high body mass index (BMI) (Spinney and Millward 2010; Sarma

et al. 2014; McInnes, n.d.; Cabane and Lechner, n.d.; Humphreys, McLeod, and Ruseski 2014; Kosteas 2015). Humphreys, McLeod, and Ruseski (2014) and Melayne M. McInnes (n.d.) document how physical activity significantly decreases the likelihood of developing type 2 diabetes, high blood pressure, and arthritis, and, to a lesser extent, coronary heart disease, hypertension, stroke, colon cancer, breast cancer, and osteoporosis. Physical activity also improves general health outcomes including physical health, mental health, and overall quality of life (Spinney and Millward 2010; Kosteas 2015; McInnes, n.d.). Regular physical activity can also increase average life expectancy by up to 3 years and reduce the age of physical dependency by 6-7 years (Goulão and Thibault 2013).

Sport involvement and general physical fitness also have important socioeconomic impacts. They can increase hourly wages, annual earnings, productivity, cognitive skills, and life satisfaction (Humphreys and Ruseski, n.d.; Cabane and Lechner, n.d.). Physical activity provides immediate benefits as well, such as improving sleep quality, sharpening focus, providing energy and wakefulness, and improving relaxation (ParticipACTION n.d.).

The Canadian Society for Exercise Physiology recommends that adults aged 18-64 engage in at least 150 minutes of moderate to vigorous physical activity per week to derive a reasonable level of health benefits from physical activity (Canadian Society for Exercise Physiology 2011). Policymakers and Statistics Canada target and monitor this measure of physical activity. The *Physical Activity Guidelines* (the *Guidelines*) incorporates a wide body of research to identify this threshold for receiving health benefits from physical activity (Canadian Society for Exercise Physiology 2011). This new iteration of the recommended physical activity replaced earlier guidelines that recommended 60 minutes of physical activity per day at all levels of intensity. This change lowered the prescribed amount of time spend in physical activities from 420 minutes per week to 150 but increased the intensity of this physical activity from any intensity level to a moderate to vigorous intensity level. This change was based on a growing scientific consensus that higher intensity physical activity had greater health benefits than low intensity activity. It was also modified from a daily dose to a weekly dose in the hope that more flexible duration targets would increase the uptake of the targets (Tremblay et al. 2011).

Humphreys, McLeod, and Ruseski (2014) describe how this target, adopted within British Columbia, Canada, and many other international jurisdictions such as the World Health organization, is a general rule of thumb rather than a hard and fast law. As with most activities, physical activity is subject to diminishing marginal returns; the first hour of physical activity provides greater health benefits than the second hour, the second hour of physical activity provides greater health benefits than the third hour, and so on. Each individual's unique genetic predispositions also influences their need for physical activity (Humphreys, McLeod, and Ruseski 2014; Tremblay et al. 2011). The diminishing marginal benefits of physical activity and individuals' unique genetic predispositions both suggest that policy should encourage relatively inactive people to increase their level of physical activity rather than encouraging people who are already active to further increase their level of physical activity.

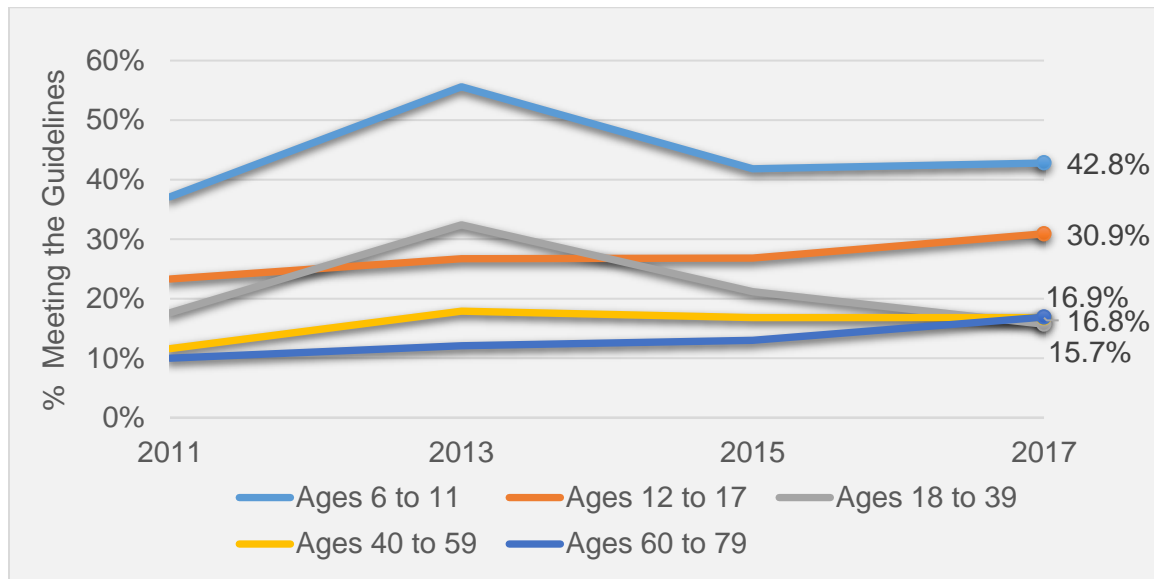
2.2. The Policy Problem

Measuring the adherence to the recommended levels of physical activity has proved challenging. People tend to inflate self-reported activity levels compared to directly measured physical activity levels, and thus these two measures cannot be directly compared to one another. This discrepancy is largely due to recall difficulty and social desirability bias (Colley 2018). Statistics Canada collects both self-reported and observed data regarding physical activity. Self-reported information is collected through the Canadian Health Measures Survey and Canadian Community Health Survey. Both surveys ask participants whether they meet the Guidelines and how much moderate to vigorous activity individuals undertake daily. In 2015, Canadians self-reported an average of 48 minutes of daily physical activity (Colley 2018). When Statistics Canada directly measured physical activity levels, however, individuals averaged only 23 minutes of daily physical activity (Colley 2018).

Although the precise measures of physical activity can be inconsistent, there is universal agreement that a significant number of Canadians fail to meet the recommended 150 minutes of weekly physical activity. In 2017, only 16.4% of all Canadians aged 18-79 participated in at least 150 minutes of physical activity on a weekly basis (Statistics Canada 2017). Historically, physical activity rates declined with age. Young children had the highest rate of physical activity while seniors had the lowest rate of physical activity.

The rate of physical activity across age cohorts has converged in the last decade. In 2017, the last year for which there is data available, physical activity among Canadians across the three adult age cohorts (18-39, 40-59, and 60-79) was essentially the same. Over this decade, the level of adequate physical activity increased in every age cohort between 2011 and 2017 except for the cohort aged 18-39.

Figure 1: Percentage of Canadians Meeting Canada's Physical Activity Guidelines by Age Cohort



Source 1: Statistics Canada, 2017

Figure 1 illustrates how young adults are increasingly eschewing physical activity. This decrease in the physical activity of young adults aged 18-39 is particularly worrying. Upon high school graduation, the opportunities for free play, organized sports, and school physical education programs dissipate, leading to lower levels of physical activity. Adults in this age cohort face many pivotal decisions—where to live, what job to pursue, and whether to marry and have children—that influence physical activity habits for the rest of their life. As adolescents transition into adulthood after graduating high school, completing a post-secondary education, moving out of their parents' house, entering the workforce, or starting a family, it is important that they continue to form active habits.

The economic costs of physical inactivity across all age cohorts is substantial. Janssen (2012), updating previous work by Katzmarzyk and Janssen (2004), estimated the total cost of physical inactivity in Canada in 2009 using a prevalence-based

approach. By estimating how much physical inactivity contributes to the seven chronic diseases that are consistently demonstrated to be associated with physical inactivity (coronary artery disease, stroke, hypertension, colon cancer, breast cancer (in women only), type 2 diabetes, and osteoporosis), the prevalence of each chronic disease, and the cost of treating each of these conditions, Janssen (2012) estimated that the total cost of physical inactivity was \$6.8 billion. This was equivalent to 3.8% of all health care costs in Canada in 2009. If the cost of physical inactivity still approximates 3.8% of health care costs, the cost of physical inactivity in British Columbia in 2019 is \$1.35 billion. This figure certainly underestimates the total cost of physical inactivity as physical inactivity may be a contributing risk factor to many more chronic conditions aside from the seven examined by Janssen (2012). The monetary health costs of physical inactivity in British Columbia fall predominantly on the public sector due to the province's universal health care system.

In summary, too few British Columbians—particularly between the ages of 18-39—engage in sufficient levels of physical activity in their leisure time. This results in poor health outcomes and large monetary costs for the public health system.

2.3. The Existing Policy Framework

Both provincial and federal governments have a history of encouraging physical activity. Much of the funding and policy focus on fitness promotion was cut between 1995-2007. This leads Craig (2011) to conclude that existing policies are inadequate to increase mass physical activity. Since Craig's (2011) evaluation, there has been a renewed emphasis on the necessity of encouraging physical activity. A national action plan for physical activity, *Active Canada 20/20*, was published in 2012 (Spence et al. 2015). In 2018, the federal government released *Let's Get Moving: A Common Vision for Increasing Physical Activity and Reducing Sedentary Activity in Canada* ("A Common Vision for Increasing Physical Activity and Reducing Sedentary Living in Canada: Let's Get Moving," n.d.). This strategic plan outlines six broad areas of focus that influence physical activity: cultural norms, spaces and places, public engagement, partnerships, leadership, and learning and progress. British Columbia has followed the national government by releasing its *Active People, Active Places: British Columbia Physical Activity Strategy* in 2015. Despite the development of these national and provincial

action plans, few concrete policies have been initiated at the national level to increase physical activity.

Concrete policy has fallen to local governments and organizations. For example, the BC Healthy Living Alliance and BC Recreation and Parks Association spearheaded a community-based walking initiative (BC Healthy Living Alliance 2007). Walking is the simplest form of physical activity. More strenuous sports—such as swimming, soccer or sprinting—or other modes of physical activity—working out in a gym or doing manual labour—require higher levels of physical skill and endurance. Walking is broadly accessible to anyone, everywhere, and without monetary cost. Those who are income poor already walk more than income rich individuals (Spinney and Millward 2010).

Such walking initiatives are well known internationally. Similar walking networks exist in the United Kingdom. The Walking the Way to Health Program initiated by the British Heart Foundation promoted walking as a key to improving physical health. The program created over 350 local health walking programs and trained over 18,000 volunteers to lead these local walking programs. Together, this program motivated approximately 150,000 to participate (BC Healthy Living Alliance 2007). Other walking programs are motivated by a love of walking and hiking rather than primarily by its health benefits. The Rambler's Association in the United Kingdom began as community walking groups that amalgamated to form a national association to advance walker's rights and allow walkers to network. Today, the Ramblers has over 107,000 members across 500 clubs and has even expanded internationally to British Columbia (Ramblers n.d.). These community-based walking programs lack proper assessment, however, raising questions about their effectiveness and replicability.

Such walking programs are effective if they utilize existing community assets, collaboratively partner with community, health and governmental organizations, and devote attention to sustaining the program (Hanson, Cross, and Jones 2016). For instance, although only 3% of individuals would respond to governmental prompts to increase their walking activities, 28% of individuals would positively respond to a prompt coming from a medical practitioner (Hanson, Cross, and Jones 2016). The study suggests that community-based, bottom-up walking initiatives are more effective than top-down approaches, although the former may neglect people who do not have wide

community networks. Such community-based programs already exist across British Columbia through recreational centres, amateur sports leagues, and familial networks.

Provincial and municipal governments have also encouraged active transport in the forms of walking or cycling in recent years, although active transportation is often not feasible for all segments of the population. While active transportation has great potential to increase the activity of urbanites – as demonstrated by cities like Copenhagen and Amsterdam – where people have short commutes to work, school, or the grocery store, it fails as a transportation option for many people living in rural or suburban communities. According to the 2016 Canadian census, 9.4% of Canadians had a long commuting time by car or public transit, defined as a commute longer than 60 minutes (Yaropud, Gilmore, and LaRoche-Cote 2019). The median length of these long commutes was 40 kilometers, a distance that makes active transportation an unrealistic commuting option. Even for those with normal commutes under 60 minutes, the median commute was 8 kilometers. Although an 8-kilometer commute may be realistic for cycling, it makes commute by foot unrealistic.

Chapter 3. Why Are Most British Columbians Not Active Enough?

3.1.1. Models of Physical Activity

There are two overarching models of physical activity that explain why British Columbians may be physically active or inactive: classical models and behavioural models.

Classical models, upon which most of the physical activity literature is based (Cabane and Lechner, n.d.), draw upon the fundamentals of economics: consumer rationality, utility, the substitution of services/goods, opportunity costs, and budget constraints. For example, Grossman (1972) uses a classical model to model health outcomes, suggesting that health—and, by extension, physical activity—is a contributing factor to one's overall utility. The consumption of other activities (e.g. watching TV) can substitute for the utility derived from physical activity.

Another classical model, adapted from Becker's (1965) theory of household production and recently articulated by Cabane and Lechner (n.d.), posits that the amount of time spent in physical activity depends on hours of work and income levels. Longer hours of work increase the opportunity costs of time for physical activity (Sarma et al. 2014).

A third popular classical theory that explains relative levels of physical activity is the Sleep-Leisure-Occupation-Transport-Home Production (SLOTH) model (Cawley 2004; Humphreys and Ruseski, n.d.; Colley 2018; Cabane and Lechner, n.d.). This model divides an individual's time into various categories. Time spent under the domain of sleep (S) activities includes time spent maintaining psychological needs, sleeping, eating, and maintaining hygiene. Physical activity is impossible during such activities. Opportunities for physical activity are also constrained in occupational (O) or home production (H) activities. Most individuals cannot incorporate more moderately intense or vigorous physical activity into their office work or cooking activities, for instance. This relegates higher intensity physical activity to the domains of transport (T) and leisure (L) time. Active transportation has been a significant focus of many new government

initiatives and academic literature, but it is not universally feasible; rural dwellers, persons with disabilities, or low-income earners face differing barriers to walk or cycle to work. Leisure time encompasses time spent in recreational and entertainment activities and is often a residual category after the four “necessary” activities (SOTH). Reminiscent of Becker’s (1965) model of household production, Humphreys and Ruseski (n.d.) posit that individuals rationally allocate time across these domains to maximize their utility based on these time and income budget constraints. Precious leisure hours will only be spent in physical activity if the utility derived from such activities is greater than the utility derived from non-physical activities. As the opportunities for physical activity are greatest during leisure time, much of the academic literature has thus investigated leisure physical activity.

The driving assumption of classical theories is that many Canadians do not engage in sufficient physical activity because they do not derive enough utility or happiness or enjoyment from these activities. Most people simply enjoy an inactive lifestyle too much to engage in sports or other activities.

Behavioural models draw upon newer strands of economics that recognize that human beings are not entirely rational (“bounded rationality”) and are influenced by peer effects, spillover effects, and myopia, among other factors. For example, Carrell et al. (n.d.) attribute insufficient rates of physical activity to negative peer effects, which Carrell terms social multipliers. Carrell et al. (n.d.) was able to isolate the peer effects on physical fitness levels and found that, although the physical activity of peers had no impact on one’s own physical activity, the physical *in*activity of peers was contagious. This finding strengthens the notion that policies aimed at combatting physical inactivity should target those who are least physically active already. Another policy implication is the importance of group physical activity in which peer effects can be leveraged to improve activity.

Spillover effects occur when policies aimed at one segment of the population indirectly affect another portion of the population. Berniell, Mata, and Valdés (2013) found positive spillover effects for physical activity within the family unit. This study found that children who took health education classes—covering topics such as physical activity, nutrition, and healthy behavior—positively influenced their fathers’ physical activity. Fathers with children enrolled in such classes were 12.4% more likely to be

physically active than fathers whose children were not enrolled in such classes. This positive spillover occurred because fathers either chose to role model the health education material for their children or they absorbed the information from their children and changed their behaviour accordingly. Interestingly, the rate of physical activity for mothers, who already have lower rates of physical activity than fathers, remained unchanged in this study, demonstrating the gendered differences in physical activity.

A central behavioral phenomenon that influences rates of physical activity is myopia. Mitchell et al. (2013) theorize that myopia or “present bias” stymies physical activity because the main benefits of physical activity – better health outcomes – are reaped in future decades, but the costs of physical activity - personal discomfort and opportunity costs - is incurred in the present. Kosteas (2015) underlines the importance of this effect, finding that people who place a greater valuation on future benefits are much more likely to engage in physical activity.

Myopia raises the question of whether physical activity is a consumption good or an investment good (Humphreys, McLeod, and Ruseski 2014; Cabane and Lechner, n.d.). Consumption goods provide utility or enjoyment immediately at the point of consumption. For example, physical activity is considered a consumption good when people play a game of soccer because they find intrinsic enjoyment in the sport. Investment goods, by contrast, provide utility at some point in the future. People may work out at gym because they know that it will provide health benefits in the future. Some activities, such as playing tennis, may provide utility both in the present and in the future whereas working out in a gym may provide future utility but may decrease current utility.

3.1.2. Socioeconomic Determinants of Physical Activity

Socioeconomic factors also influence physical activity. Income and time constraints in particular are cited as barriers to physical activity. Trade-offs often exist between time poverty and income poverty as those who work extensive hours generally earn a higher income but have less leisure time than an individual who works fewer hours. Income poverty is easily defined using Canada’s historical definition of poverty, the Low-Income Cut-Off (LICO), or Canada’s new official Market Basket Measure (MBM). Time poverty is more tricky to define but can be defined using the SLOTH model

of time allocation mentioned earlier. Spinney and Millward (2010) define time poverty as allocating at least 50% more time to occupational, transportation, and home production compared to the social median. Hence, if the median Canadian devotes 8 hours a day at work, traveling to/from work, and maintaining a home, a time-poor individual would spend at least 12 hours a day doing those same activities.

Many examinations of physical activity (e.g. Spinney and Millward (2010)) assume that increases in time or money will increase levels of physical activity through the income effect. This assumes that, as an individual's time or monetary budget expands, an individual will purchase more of every normal good and service, including physical activity. However, Humphreys and Ruseski (n.d.) consider the substitution effect as well; if time or monetary budgets expand, then individuals may elect to consume more of only a few select goods. The effects counterbalance one another, leading to ambiguity over how an increase in time or income will affect physical activity. Individuals will increase their physical activity if the income effect predominates but will decrease levels of physical activity when the substitution effect predominates.

When they compare the effects of both time and income poverty on rates of physical activity, Spinney and Millward (2010) find that both time poverty and income poverty contribute to low levels of physical activity. The participation rate in daily physical activity was 9.0 percentage points higher for income-rich individuals and 6.3 percentage points higher for the time-rich. This association holds across most subcategories of physical activity, although income-poor individuals were more likely to engage in walking and cycling (likely due to the lack of a motor vehicle). At an individual level, Spinney and Millward (2010) surmise that a lack of time, a lack of interest, and injury concerns are major barriers to sport participation. Somewhat surprisingly, expense was not a major reason; only 4.5% of income-poor individuals relinquished sports because they were too expensive (compared to 1.7% of income-rich individuals). Time poverty was a much more important factor, with 51% of time-poor individuals neglecting sports compared to only 22.8% of time-rich individuals. Based on these results, the authors conclude that time poverty contributes more to inactivity than does income poverty. This finding suggests that policy aiming to increase physical activity should endeavour to focus on making physical activities accessible and convenient rather than inexpensive.

The effect of income, however, on physical activity is not uniform. Cabane and Lechner (n.d.) find that income has a significant *positive* effect on the extensive margin (whether or not to engage in regular physical activity at all) but a significant *negative* effect on the intensive margin (how much time is devoted to physical activity if the decision to be active has already been made). In other words, although more high-income earners engage in physical activity than low-income earners, the average low-income earner who is physically active spends more time exercising than a high-income earner.

Other socioeconomic factors also influence rates of physical activity. Unmarried individuals, men, individuals without children, and more educated individuals are all more likely to be physically active than married individuals, women, individuals with children, and less educated individuals (Cabane and Lechner, n.d.). These differences reflect gendered norms around physical activity, the role of education in maintaining healthy habits, and how increases in leisure time all affect decisions of whether to be physically active or not. Physical activity may also decrease with age (Cabane and Lechner, n.d.; Statistics Canada 2017) although Garci, Lera-Lopez, and Suárez (2011) find a U-shaped distribution in the time allocated to physical activity, with the lowest rate of activity at 33 years of age.

There is some disagreement in the literature over whether safety plays an important role in influencing decisions to exercise (Wang et al. 2016; Humpel, Owen, and Leslie 2002). Safety can be ensured by infrastructure design (e.g. creating bicycle lanes along roadways), by maintaining existing infrastructure (e.g. filling in potholes in roads and sidewalks), and by policy (e.g. crime-prevention strategies so that people feel safe walking around town). While safety concerns are more pronounced in vulnerable populations such as women or seniors, some studies find no significant correlation between safety metrics and physical activity for the general population (Humpel, Owen, and Leslie 2002). While policies promoting physical activity should certainly consider citizen safety, it should be recognized that safety is often not a determining factor.

Finally, climate and weather patterns also impact physical activity rates. Although Wang et al. (2016) finds that inclement weather decreases the motivation to be physically active, Humpel, Owen, and Leslie (2002) find that day-to-day weather patterns are not statistically significant barriers to physical activity. This finding may be the result

of the availability of indoor recreational facilities. Seasonal patterns, however, do influence physical activity rates, with more activity occurring in the summer months than the winter months.

Chapter 4. Case Studies

4.1. Technological Interventions – Carrot Rewards

New technological advances and apps have the potential to overcome some of the classical, behavioral, and sociodemographic challenges to physical activity. For example, the Carrot Rewards app provided very small incentives for physical activity in Canada between 2016-2019 (M. Mitchell et al. 2018). These incentives took the form of public rewards programs such as Scene Points, Aeroplan Miles, Petro-Points, More Rewards Points, and RBC Rewards points for achieving step count targets and taking healthy living quizzes (Kothe, Lam, and Fremlin, n.d.). Based on smartphones' in-built accelerometer, the app would establish an initial personalized step count target based on past walking activity. When an individual achieved their daily step count, they received rewards points and their step count goal increased. They also received additional points for achieving their step count target for consecutive days.

This Carrot Rewards program built upon nudge theory from behavioral economics. Nudge theory posits that behavior can be changed through incentives, or nudges. Although it has been hypothesized that the magnitude of the behavioural change is associated with the magnitude of the incentive, even very small incentives can influence behavior (M. S. Mitchell et al. 2013). The financial points offered by Carrot equalled four cents per point. Incentives can also be non-monetary; simply seeing your past results or the results of others can create competition against one's former record or the performance of peers, spurring individuals to "win."

Present bias and myopia also lay behind the Carrot Rewards app. As previously mentioned, many health benefits of physical activity accrue in the future rather than immediately, leading people to undervalue physical activity. Carrot Rewards provided an immediate—or at least daily—incentive for engaging in physical activity. This bolsters the perceived immediate benefits of physical activity.

The Carrot Rewards app was also an intervention with a robust evaluation mechanism. M. Mitchell et al. (2018) collected data from 78,882 Carrot app users in British Columbia and Newfoundland over 12 weeks, although only 32,229 users satisfied

baseline and inclusion criteria. Approximately half (51%) of app users were classified as *physically inactive* because they accumulated less than 5000 steps daily before the 12-week study period. After the baseline step count was collected, participants were introduced to the Carrot app for 12 weeks and their daily and weekly step counts were recorded.

In both populations, step counts increased significantly in the first couple of weeks of the study and then declined for the rest of the study period. At the end of the 12-week study, however, the overall step count of participants had increased by 122 steps (5.01%) for all app users and 874 steps (21.14%) for formerly inactive users. Curiously, the activity of all British Columbian users increased by 218 steps but actually declined by 133 steps among Newfoundland users. Also, while inactive users increased their step count by 874 steps (21.14%), active users decreased their step count by 481 steps. All results were statistically significant ($p < 0.001$) and cut across socioeconomic variables such as age, gender or income. While the study authors have no clear rationale as to why step count decreased for Newfoundlanders or for the physically active, they suggest that seasonal effects may have contributed to this step decline; the study began in the warmer spring and summer months and ended in the cooler fall months. Further studies would have to control for seasonality to explain these step count decreases. But, if seasonality is a factor, the gains in the overall sample and the physically inactive subgroup specifically would be even more impressive.

A review of this Carrot Rewards program demonstrates how technological interventions have the potential to increase physical activity at a relatively low cost, particularly for physically inactive people. While the Carrot app relies on the accelerometers built into smartphones, other apps, such as Strava, utilize GPS within smartphones to monitor activity. Other technologies, such as Fitbit watches and other physical activity trackers, track other types of physical activity and health (Feehan et al. 2018). Although these technologies serve a similar purpose to the Carrot Rewards app or are even functionally superior, they require individuals to outlay over a hundred dollars for the device. The Carrot Rewards app is free and thus will likely attract more inactive people.

4.2. Monetary Incentives – Fitness Tax Credit

Monetary incentives are a common proposal to increase physical activity. An example of monetary incentives was the federal Children’s Fitness Tax Credit (CFTC) and the provincial children’s fitness tax credit and the children’s fitness equipment tax credit. Both the federal and provincial fitness tax credits have been discontinued.

Available between 2007-2016, the federal tax credit encouraged parents to enrol their children in physical activity programs. The non-refundable credit allowed parents to reduce their taxable income by up to \$500 if they provided receipts for physical activity programs for their children under the age of 16. Parents could only claim 15% (the lowest marginal income tax rate) of the cost of a physical activity program, effectively requiring parents to spend at least \$3333 on physical activity programs to claim the maximum amount.

Fisher et al. (2013) documented that the CFTC met with mixed success. Only 65% of parents were aware of the tax credit when it was available. Women, parents between ages 40-49, postsecondary graduates, and high-income parents were most likely to be aware of the credit. More tellingly, 22% of parents reported that the presence of the tax credit encouraged or facilitated the enrolment of their children in physical activity programs.

Additionally, Fisher et al. (2013) find that the tax credit disproportionately benefits middle- to high-income earners rather than low-income earners. This imbalance in the amount claimed by various earners stems from the fact that income is correlated with the knowledge of the benefit and hence the likelihood of claiming it. The non-refundable nature of the credit also requires tax filers to have enough income to take advantage of the benefit. Low income individuals would benefit from the credit more if the credit was refundable or if it could cover the entire cost of a physical activity program.

Rigorous evaluations of the CFTC are lacking. The federal government often conflated the cost of the program—between \$90-\$115 million annually (Department of Finance 2017)—with the success of the program. The success of the tax credit does not depend on how much money is doled out by the tax credit but whether there was an actual increase of the physical activity among children. An increase in the tax credit claimed year-over-year does not necessarily mean that physical activity rates have

increased. Higher expenditures could be the result of parents simply enrolling their children in more expensive programs without increasing the total level of physical activity. Parents may already have planned or committed to enrolling their child(ren) in a sports program regardless of the presence of the tax credit.

While questions remain about the effectiveness of the CFTC, Mitchell et al.'s review of the literature (2013) finds that most financial incentives do increase rates of physical activity. The structure of the incentives studied ranged from up-front cash incentives, reimbursements, and escalating incentives and ranged in their monetary value. These incentives increased rates of physical activity in 8 of the 11 studies examined. Although Mitchell et al. (2013) did not attempt to quantify which incentive structure is most effective or the marginal impact of another dollar incentive upon physical rates, the study found that the mere presence of an incentive increases physical activity rates by 11.55%. In contrast to Fisher et al. (2013), Mitchell et al. (2013) found that low-income individuals responded more powerfully to these incentives than middle- or high-income individuals, likely because of the types of incentive vehicles examined. Tax credits are better suited for middle- to high-income earners, while direct cash transfers benefit low-income individuals to a greater extent. All the studies examined by Mitchell et al. (2013) provided incentives for only 4-26 weeks. Further research is needed to evaluate whether these incentives would continue to elevate rates of physical activity in the long term. Interestingly, Mitchell et al. (2013) found some evidence that levels of physical activity remained higher (compared to before the implementation of the incentive) even after the incentive was withdrawn. It is likely, however, that the incentivized physical activity impact would decay as more time elapsed.

4.3. Built Infrastructure – Access to Exercise Facilities

The physical environment can also influence rates of physical activity. In recent years, there has been a sharp increase in the study of how the built, the natural, and the social environments influence healthy lifestyles within British Columbia (Gadais et al. 2018).

The built environment—the number of gyms, parks, sports venues, and other exercise venues per capita—affects the public's propensity to exercise, especially for women (Cabane and Lechner, n.d.; McInnes, n.d.). Humpel, Owen, and Leslie (2002)

and Wang et al. (2016) report that the accessibility of the built environment significantly contributes to physical activity. This result is likely driven by the fact that accessible infrastructure alleviates one of the greatest barriers to physical activity: time poverty. Accessibility is affected by both the absolute number and relative location of the infrastructure. A higher number of public sports venues, trails, tennis courts, gyms shortens the time to reach these venues. More venues also relieve strain on individual venues and may make activity more enjoyable by reducing waiting times or congestion at other nearby venues. Venues should be located on frequently traveled routes to increase their utilization. Ideally, facilities and public spaces should be within a 15 minute walk of residents' homes to optimize their use (Wang et al. 2016).

One Swedish study (Eriksson, Arvidsson, and Sundquist 2012) documents the importance of accessible exercise facilities such as indoor gyms, outdoor courts, and community recreational centres. It utilizes data collected from the Swedish Neighbourhood and Physical Activity (SNAP) study in Stockholm, which examined the association between neighbourhood walkability and physical activity. In the study, the neighbourhoods of over 2000 residents of Stockholm were defined as the geographical area within one kilometer of the participant's residence. The number of publicly- and privately-owned exercise facilities (e.g. gym/fitness centres, sports facilities, tennis courts, dance class centres, public ice rinks, squash courts, sports halls, public pools, and badminton courts) in each participant's neighbourhood was identified and counted. All participants wore an accelerometer for 7 consecutive days.

The results from the accelerometer found that individuals who had greater access to exercise facilities (operationalized as having 4 or more exercise facilities within their neighbourhood) engaged in 5.4 more minutes of moderate to vigorous physical activity per day compared to those with less access to exercise facilities (operationalized as having less than 4 exercise facilities within their neighbourhood). This increase of 5.4 minutes per day equates to an 7.8% increase in physical activity. Participants with greater access to exercise facilities were also 70% more likely than their counterparts to meet the recommended level of 150 minutes of physical activity per week. Factors such as gender, age, income, marital status, and time of year had no statistically significant impact on physical activity levels. The authors conclude that "neighbourhood may be a logical and potentially significant venue for policy interventions aimed at increasing

physical activity in the overall population as the neighbourhood has the potential to affect many people over long periods of time” (Eriksson, Arvidsson, and Sundquist 2012).

The quality of such venues is also critical to their usage. Humpel, Owen, and Leslie (2002) report that individuals are more likely to use aesthetically pleasing walking trails and sidewalks than less appealing trails and sidewalks. The beauty of the built environment is even more important than the weather conditions. Despite the importance of the physical sports infrastructure, the Government of Canada (2018) reports that only two thirds of all cultural, recreational and sports facilities were reported as being in a good or very good condition. Over 1600 projects are underway to renovate substandard venues or build entirely new facilities, but this represents only 3% of the total venues in need of repair in 2016 (Infrastructure Canada 2018; Statistics Canada 2018). Much larger investments in the built environment are required to restore the quality of physical activity infrastructure.

Wang et al. (2016) finds that convenience and quality not only are ingrained in people’s preferences but that they can be intrinsically motivating themselves. Beautiful vistas at the summit of a hike or having an ice arena next door can increase the motivation of people to hike or figure skate. This positive motivation to engage in physical activity is especially important to counteract the motivational drags of myopia, a lack of companions for physical activity, and time or income poverty.

Chapter 5. Interviews

Seven interviews were also conducted to supplement the findings from the literature and case studies. A majority of the interviewees represented advocacy groups, non-governmental organizations, and research institutions. One representative from the provincial government and one representative from a municipal government were interviewed. Finally, one representative from the sports community and private sector was interviewed. The names or affiliations of the interviewees are listed below:

- Rita Koutsodimos – Executive Director of the BC Healthy Living Alliance
- Leigh Vanderloo – Knowledge Translation Manager at ParticipACTION
- Janet Rerecich – Director of Education and Initiatives for the BC Recreation and Parks Association
- A representative from the Canadian Fitness and Lifestyle Research Institute
- A representative from the Population and Public Health Division of the British Columbia Ministry of Health
- A representative from Recreation in the city of Abbotsford
- A representative from Canlan Ice Sports

These interviews were semi-structured interviews lasting between 30-60 minutes. Although each interviewee had a different perspective on physical activity, all the interviewees were asked similar questions. The following four sections describe some of the themes gleaned from the seven interviews.

5.1. Current Policy Framework

One interviewee elaborated on the numerous federal policies that are aimed at increasing the physical activity of all Canadians: *A Framework for Recreation in Canada*, *A Common Vision for Increasing Physical Activity*, and *the Canada Sport Policy*. All these

high-level strategies outline broad strategic goals and partnerships, however, rather than setting specific and actionable policies that various levels of government could implement.

The representative of the Population and Public Health Division within the British Columbia Ministry of Health further elaborated on *Active People, Active Places: BC Physical Activity Strategy* (BC Ministry of Health 2016). This strategy was developed in 2015 with key stakeholders – members from academia, community organizations, advocacy groups, and other government departments – but with relatively little public engagement. The broad goal of this strategy was to elevate the percentage of British Columbians who meet the physical activity guidelines to 70% (as measured by inflated self-reported data) by 2023. This strategy was primarily a guidance and framework document and did not propose extensive, specific policies to achieve this goal because such policy initiatives would require inter-ministerial cooperation. Seven million dollars was earmarked for implementation of the strategy, targeting action towards the relatively inactive populations of children and youth, older adults, and Indigenous communities. Although this implementation fund has since run dry, some initiatives from the Strategy have become self-sustaining programs. The government of British Columbia is currently reviewing the effectiveness of this physical activity strategy. Rather than measuring success by percentage of British Columbians who achieve the physical activity targets, each individual initiative within the strategy is being evaluated based on criteria unique to the initiative.

One initiative within the strategy noted by the representative from the Population and Public Health Division of the British Columbia Ministry of Health, Rita Koutsodimos, and Janet Rerecich was the Active Communities Grant Program. This program, administered by the BC Recreation and Parks Association, provided municipalities and community organizations with small grants – usually under \$30,000 – to fund their own active living priorities. For instance, this grant program contributed to a new bike track on Bowen Island, more active transportation on the North shore of Vancouver, and a swimming program in Bella Bella. Fifteen grants were awarded to local and Indigenous governments across the province, and the preliminary reaction to this grant program was very good.

One reason for the success of the Active Communities Grant Program was its decentralized nature. While federal, provincial, municipal, and First Nation governments can create an environment conducive to physical activity, the greatest barrier to activity lies with individual factors. ParticipACTION's broader report on physical activity points out that 82% of Canadians think that the primary responsibility for physical activity lies with the individual (ParticipACTION, n.d.). Thus, implementing policy at the most granular level – at the municipal level or even the neighbourhood level through recreational centres and community organizations – often is the most effective way of addressing inactivity. This reality is also recognized in the *Active People, Active Places: BC Physical Activity Strategy's* focus and use of community partnership tables.

5.2. Barriers to Physical Activity

The interviewees highlighted a wide range of barriers to physical activity, although it was clear that human behavior around physical activity is complex and multifaceted. No single barrier was identified as *the* reason why Canadians are inactive.

Unsurprising, interviewees highlighted the time constraints as one of the most significant barriers to physical activity. One anonymous interviewee stated that 30% of Canadians attribute their inactivity to a lack of time. Another interviewee, however, questioned whether time constraints actually *exist* or whether these time constraints are only *perceived*. Television, social media, smartphones, and streaming services can easily fill every spare day, hour, or even minute of leisure time. This perpetual activity can fuel a perception of time constraints. Rather than asking whether people have enough free time for physical activity, a better question may be whether people prioritize physical activity in their leisure time.

This leads to the issue of motivation. If people consider physical activity as a chore or an additional activity that must be incorporated into an already busy schedule, then people will likely cite a lack of time as a limiting factor. If, however, physical activity can be built into an existing lifestyle – through active transportation or workplace wellness programs, for instance – activity rates will increase. Educational programs must also stress that every additional minute or bout of exercise contributes to better health; this approach will not intimidate people by the target of 150 minutes of moderate to vigorous activity per week. The physical activity goals are not an all-or-nothing target.

The cost of physical activities and individuals' income also impacts rates of physical activity. Some forms of physical activity are more costly than others. A full season of recreational ice hockey may cost \$600-\$700 plus equipment while the cost of a season of soccer may be limited to solely the cost of equipment. An annual gym membership and personal trainer may cost several hundred dollars, but walking programs are free. People with relatively higher incomes are better able to afford all forms of physical activity and thus are more likely to be active than low-income people, although this relationship may be confounded by the correlation between educational achievement and income.

Most interviewees mentioned other socioeconomic factors as barriers to physical activity. Gender as highlighted as another important demographic factor. Women are much less likely to be active than men, due to a number of factors. First, the current preferences of most women are not to engage in high levels of moderate or vigorous physical activity. Although women may engage in more light physical activity than men – particularly in household tasks – their preference for more light physical activity does not show up in their adherence to the physical activity guidelines, which measure moderate and vigorous activity. Secondly, childcare disproportionately falls on women, lowering their available leisure time and contributing to female time poverty. Thirdly, most adult sports programs target professional or semi-professional athletes rather than recreational players. This limits the opportunities for women in organized sports after grade school.

Age is another important demographic factor, as older British Columbians typically spend less time engaging in physical activity than younger British Columbians. The impact of gender and age is much more pronounced in specific forms of physical activity. For instance, the representative from Canlan Ice Sports described how men aged 25-40 made up the majority of participants in recreational adult hockey leagues. Low-income individuals and members of racialized communities are also less likely to be active, albeit these factors are not as prominent as gender and age.

The representative from Abbotsford Recreation also found that socioeconomic factors impacted the use of different types of physical activity facilities. Children, youth, and seniors are the most frequent users of recreational centres as they have fewer time constraints than young and middle-aged adults. Indoor recreational centres often feature

a combination of gyms, pools, tracks, fitness equipment, and small courts. Visitors are demographically varied and use these facilities more consistently throughout the day. Young to middle-aged men are the dominant demographic group that visits ice arenas, although visits to ice arenas have begun to slowly decline as ice hockey has decreased in popularity. Visits to ice arenas are also concentrated after work hours instead of being evenly distributed throughout the day. Recreational facilities in Abbotsford and in most other municipalities also offer subsidized or free recreational passes for low-income individuals to overcome monetary barriers to participation.

Many interviewees described the life cycle of physical activity. Children and youth are the most active age cohorts thanks, in part, to mandatory physical activity and health classes in schools, ample opportunities for sport in school, greater opportunities for socialization in school activities, and fewer time and monetary constraints. After graduation, young adults transition to living on their own, joining the labour force, and paying their own way; this leads to a decline in physical activity. Marriage, childbirth, and child rearing also impact adults' capacity and desire to be physically active, especially for women. By the time that adults are financially stable and have independent children, some may refocus on physical activity, but many others simply do not bother to get back into the habit of physical activity.

Although most interviewees did not explicitly mention myopia as a barrier to physical activity, the ParticipACTION representative recognized the need to underline the immediate benefits of activity. Through their "Everything Is Better" educational campaign, they outline how activity improves a wide array of life activities, everything from work to play, thinking to sleeping, and parenting to partnering.

Interviewees were somewhat divided on the degree to which education and physical literacy is a barrier to physical activity. The representative of the Population and Public Health Division stressed the importance of physical literacy, especially among children and youth, to motivate people to be active; physical literacy learned in childhood would not only benefit children and youth but would likely persist into adulthood. On the other hand, Leigh Vanderloo and most other interviewees found that Canadian adults already have a basic understanding of physical literacy, the (long-term) benefits of being active, and various opportunities to be active. Thus, unlike in many policy fields, better education may not be a critical policy focus.

5.3. Important Policy Considerations

One interviewee described physical inactivity as a “nice” policy problem. The participant did not mean it is good for people to be inactive, but that encouraging people to be more active has secondary benefits that help resolve other policy problems. For instance, encouraging active transportation has the additional benefit of reducing transportation-related greenhouse gas emissions. Engaging in sports programs can reduce social isolation and bolster social connectivity. Taking a walk during a work break can contribute to economic productivity. These secondary benefits should be incorporated into a holistic policy approach.

Most interviewees stressed the critical importance of the social component of physical activity. Social activities are far more motivating than individual activities. Social activities can range from walking with a friend or family member to playing a team sport. This human interaction transforms the often grueling or unpleasant nature of physical activity into an enjoyable experience. Although interviewees could not point to any formal research that has evaluated this link, the social benefits of physical activity may even be more important than its health benefits. Many people simply desire to spend time with friends, family members, or other people, regardless of whether the activity is playing soccer, knitting, eating, or watching Netflix. Yet, one interviewee highlighted that 37% of people have difficulty finding peers with whom to be active.

Social physical activities in the form of team sports have many advantages and disadvantages. Team sports can successfully transform physical activity and social opportunities into an enjoyable and rewarding activity. Sports also require specific skills, but many adults grow up without learning these skills in their school, social, or familial environment. Encouraging adult sport participation may disproportionately draw in people on the intensive margin rather than the extensive margin. Very basic sports programs are necessary to draw these people into sports participation. Unfortunately, governmental sports policies often are aimed at professional athletes, rather than at the recreational players, leading to a stagnation or decline in sports enrolment.

Governments and advocacy organizations frequently apply an equity lens when evaluating strategies for physical activities. Racial minorities, Indigenous Canadians, low-income individuals, women, and seniors generally have lower activity rates than

Caucasian, middle-income, middle-aged men. Thus, policy should focus on activating these sub-populations rather than simply raise the activity rate of the overall population.

The representative from Canlan Ice Sports, a private and for-profit business, also provided unique but important insight into the governmental policies to increase physical activity. Governments at all levels must settle upon their role in encouraging physical activity. Are they best suited to fund physical activity infrastructure, provide programming, aid professional sports, organize recreational sports, or establish individual sports associations? Federal and provincial governments as well as national and provincial sports associations devise broad strategies but do not have the on-the-ground capacity to provide physical activity programs; they can only encourage physical activity rates indirectly. Local municipalities can better provide opportunities for physical activity by funding, constructing, and operating facilities. Many municipalities, however, do not prioritize the construction of fitness infrastructure, are lethargic in providing fitness programs, or are excessively focused on local programs or populations. Opportunities exist for private and for-profit businesses to combine a broad strategy with program delivery either on their own or in private-public partnerships.

5.4. Discussion of Policy Options

The interviews reinforced the academic literature's conclusion that physical activity is a multi-faceted phenomenon. Although a host of potential policy options exist, there was no consensus on the single most effective policy at increasing physical activity. Top suggestions ranged from focusing on redesigning communities to encouraging active transportation to encouraging active policies and supports in the workplace. Another interviewee stated that no single policy by any single level of government would comprehensively address the problem. Increasing physical activity requires action on a number of policy fronts by all levels of government and civil society. Nonetheless, several policy options were consistently mentioned and discussed.

5.4.1. Physical Activity Apps

Two main apps have dominated the discussion on technological innovations in this policy field: the Carrot Rewards app and the ParticipACTION app.

Although Carrot Rewards operated for only a few years between 2015 and 2019, interviewees commented on the effectiveness of its nudge strategies and incentives for activity. The app was very effective at reaching a large number of people within the province and providing quantitative evidence to evaluate the success of the app. Rita Koutsodimos confirmed that the app was effective at reaching and boosting the activity levels of relatively inactive people and young women. Leigh Vanderloo's insight on ParticipACTION's app was that it disproportionately attracted women; this is an advantage, as women and girls tend to have lower rates of physical activity than men and boys.

A central concern about these physical activity apps is their overall business model. Although the government of British Columbia – among other organizations – funded the monetary incentives behind the Carrot Rewards app, the Carrot program failed to develop a sustainable business model. One possible solution would be for the government to commit greater funding for similar apps. Another possibility, raised by Rita Koutsodimos, is to explore the use of non-monetary incentives. Because the value of the monetary rewards in the Carrot Rewards program was miniscule (increments of \$0.04), these monetary rewards could be replaced by virtual achievements, rankings or points. However, it is unknown whether such non-monetary rewards would be as effective as small monetary rewards.

By contrast, the ParticipACTION app has a much more sustainable business model and is tied to a much larger organization, although the app was only recently released in 2019. The ParticipACTION app and the Carrot Rewards app share a similar two-fold goal: to develop physical literacy and to track and reward physical activity. There are two central differences between the ParticipACTION app and the previous Carrot app, however. While Carrot distributed financial incentives, ParticipACTION awards “achievements,” which earn users entries into weekly, monthly, and quarterly draws. Also, while Carrot automatically monitored only one type of physical activity – the user's step count – through the phone's built-in accelerometer, ParticipACTION requires users to directly input all the time spent in all physical activities. This provides more flexibility to the types of activities counted in the physical activity tracker, but requires more interaction from the user and allows the user to game the reward system of the app.

One interviewee raised concerns about the lower effectiveness of the ParticipACTION app compared to the Carrot app. The ParticipACTION app is less engaging and requires more purposeful attention than the latter app, two features that might limit its success. Nevertheless, users of the ParticipACTION app still averaged 10 more minutes of physical activity over the course of the week compared to non-users, according to Leigh Vanderloo.

5.4.2. Built Environment

Two interviewees described how Canada, compared to other jurisdictions, has a relatively high quantity of physical activity infrastructure – recreational centres, tennis courts, walking trails. This infrastructure, however, is under-utilized for a variety of reasons. The safety of this infrastructure may be questioned by members of vulnerable populations – women, children, and seniors. The infrastructure may be located in an inconvenient or inaccessible location. Supply side economics – the theory that demand for the infrastructure will follow its supply – has not proved to work well in this case.

Even though the quantity of infrastructure may be sufficient, the quality of much of the infrastructure is not. Many recreational facilities are approaching the end of their useful lifetime, particularly in rural and smaller suburban communities. As demonstrated by the *Canada Infrastructure Report Card* (Canada Infrastructure 2019) and confirmed by the representative from Canlan Ice Sports, ice arenas with only a single sheet of ice – arenas that are most popular in rural and suburban communities – are more likely to be in poor or very poor condition than other types of recreational infrastructure. Safety concerns and the low quality of these poorly maintained facilities also contributes to lower usage rates.

5.4.3. Workplace Wellness Programs

Workplace wellness programs were the ideal policy direction of choice for one of the interviewees and were cited as potential policy options by others. Canadian adults spend a plurality if not a majority of their waking hours at their job. Although some occupations – construction and trades workers, farmers, and professional athletes – require daily physical activity, physical activity has been socially engineered out of most other occupations.

Workplace wellness programs often target young and middle-aged adults in their programs. ParticipACTION offers a workplace wellness program that companies can purchase. These programs can include walking meetings, flexible hours to let employees work out during the day, gym memberships, or other financial benefits aimed at increasing the physical activity of employees. These wellness programs draw upon the literature that links activity with increased job productivity, decreased absenteeism, and better overall office culture.

5.4.4. Fitness Tax Credits

Most of the interviewees who mentioned fitness tax credits spoke of their ineffectiveness. The structure of tax credits – the fact that families incur costs throughout the year and are reimbursed only once a year on a tax return – does not aid families pay for physical activities at the point of sale. The tax credit was also disproportionately claimed by middle-class families and children who were already active. It failed to target children who needed support the most: the children of low-income families and children who are physically inactive. When the significant cost of such a universal tax credit is considered, Rita Koutsodimos concluded that there are many other programs that would result in far better outcomes for far less cost.

One participant – the representative from Abbotsford Recreation – dissented with this evaluation of the fitness tax credit. Based on his direct interaction with clients at local sports program and recreational centres, he found that the tax credit did draw children on the margin into more active lifestyles. It is possible that the tax credit is more effective and successful in suburban and rural communities, as these communities tend to have high birth rates and a greater share of middle- to low-income citizens.

5.4.5. Physical Literacy and Activity Classes in Schools

Investing in more physical education specialists and classes in elementary and middle schools could also increase physical activity in the long term. By instilling physical literacy and habits in children that will endure into adulthood, the rates of physical activity by adults in the future may be increased. Funding and human resources for physical education classes in schools have been cut in recent years, although these cuts have not adversely affected the rate of physical activity among adolescents.

Although increasing physical activity education in grade schools would likely increase activity rates among adults in the future, the fruits of this policy would not be borne out for years to come.

Chapter 6. Policy Options

Although little consensus existed in the literature, across case studies, or between interview participants, three policy options rose to the fore: physical activity apps, the Active Communities Grant Program, and physical activity infrastructure. All three of these policy options are described in the following sections.

6.1. Promote Physical Activity Apps

This policy option involves the Government of British Columbia forming a greater partnership with ParticipACTION to improve and advertise the ParticipACTION fitness app. Since its release at the beginning of 2019, only 78,570 users have registered on the app across Canada (ParticipACTION 2019). By contrast, the Carrot Rewards app had over a million users across British Columbia, Ontario, and Newfoundland and Labrador alone, thanks to the \$36 million the federal government spent advertising the app (Kothe, Lam, and Fremlin, n.d.). This gap between the user rates of these two apps demonstrates the unreachd potential of physical activity apps.

Advertising funding could also be coupled with modifications to the existing ParticipACTION app. These modifications would apply the successes and failures learned from the Carrot Rewards program. Although the ParticipACTION app has the capability to connect with Fitbit, Google Fit, or Garmin activity trackers, the app could directly utilize smartphones' built-in accelerometer to provide real-time data collection. The ParticipACTION app currently relies entirely on third-party apps and devices to automatically track activity and on users to manually track activity. The app could also incorporate better machine learning to automatically set goals based on past activity. More congratulatory and reminder notifications could nudge users to pursue these activity goals. Creating a social media-like capability that would allow social interaction by adding friends to the app, sharing activity levels between friends, and facilitating activity competition among friends could increase the engagement and spread of the app. Finally, although the Carrot program demonstrated the unsustainability of financial rewards, the ParticipACTION app could provide non-monetary points or rankings within the app to introduce a level of competition between users.

6.2. Re-establish the Active Communities Grant Program

The original *Active Places, Active People* strategy established an Active Communities Grant Program that disbursed small grants – under \$30,000 – to municipalities and First Nations to finance fitness programs, infrastructure, and plans. This program, however, was funded by a one-time grant that has since run dry.

This policy option proposes to establish a permanent Active Communities Fund and an annual Active Communities Grant Program. This Active Communities Fund would be topped up every year. Applicants for Active Communities Grants would be required to demonstrate that their project could improve the physical activity of the broader population by improving access to infrastructure, targeting vulnerable populations, designing active communities, and promoting public health policy. If previously awarded a grant, applicants could re-apply for an Active Communities Grant, but would also be judged on success of their previous program. The main purpose of the grant program would be to kickstart new activities, programs, and infrastructure throughout the province and to build upon successful initiatives, not to be an annual source of funding for a limited number of applicants. The grant program could also be opened to not-for-profit organizations, not strictly limited to municipalities, regional districts, and Indigenous governments.

6.3. Invest in Physical Infrastructure

As the accessibility and quality of physical activity infrastructure influences the rate of physical activity, this policy option proposes to renovate dilapidated physical activity infrastructure and construct new infrastructure in areas with a low density of physical activity infrastructure. For example, many residential areas in sprawling suburban neighborhoods lack outdoor multipurpose sports fields and courts. One third of recreational infrastructure is not in good condition; approximately 20% of single rink ice arenas, small indoor pools, outdoor pools, wading pools, and indoor skating parks are in poor or very poor condition (Infrastructure Canada 2018; Canada Infrastructure 2019).

This investment in physical infrastructure requires substantial long-term funding coordinated through various levels of government. Although local governments would decide where the infrastructure is required and contract out the construction work, the

provincial government could assist municipalities cover the cost of expensive recreational infrastructure. Provincial budgets could add recreational infrastructure spending alongside other capital infrastructure spending on education, transportation, and health infrastructure. The provincial government could also aid municipalities solicit federal infrastructure dollars.

Chapter 7. Evaluation Criteria

Six criteria are used to evaluate these policy options: cost to government, short-term effectiveness, long-term effectiveness, equity, individual motivation and empowerment, and social trust. Although most criteria will be measured through a single metric and will be weighted equally, short-term effectiveness is measured through two metrics and cost to government is double weighted.

7.1. Cost to Government

Policymakers are perpetually concerned about the cost of policy proposals as governments must constantly prioritize their limited tax dollars. In an era of economic uncertainty and slowing economic growth, governments at all levels may be hesitant to expend large sums of money to foster physical activity. By extrapolating the work of Janssen (2012), British Columbia will expend approximately \$1.35 billion in health care costs resulting from insufficient physical activity in 2019. Unfortunately, despite their potential to lead to over a billion dollars in future health care savings, policies to increase physical activity are not currently viewed as priorities by governments. Other public policy discussions will likely consume the bulk of political capital and of new expenditures. In this policy climate, low-cost policies will stand the greatest chance of implementation.

Due to the limited financial capacity and the relatively low prioritization of physical activity policy by all levels of government, this cost criterion is double weighted.

7.2. Short-term Effectiveness

Physical inactivity is an urgent, wide-spread phenomenon requiring far-reaching solutions in the short-term. The ideal measure for this criterion would be the number of people who regularly achieve the Canada's Physical Activity Guideline's recommendation of 150 minutes of physical activity per week. Due to difficulty in collecting this data and establishing direct causal relationships between increased activity rates and a specific policy, two metrics will be used to evaluate this criterion: the number of people reached and how much physical activity levels are increased. The

former measures change on the extensive margin and the latter measure change on the intensive margin.

7.3. Long-term Effectiveness

Physical inactivity is also a chronic long-term health risk. Policies must not simply create short-term activity that dissipates within a few months or years. Policies should lay a foundation for long-term structural changes in people's attitudes and habits towards physical activity. For instance, the initial Active Communities Grant Program disbursed funds to worthy projects and programs for only a single year. Although some one-time projects and programs may have a lasting effect, the likelihood of a long-term impact grows when successful projects and programs can grow year after year, rather than be shut down after a single year of operation.

7.4. Health Equity

Although the primary goal of physical activity policy is to increase the activity levels of the entire population, the greatest health benefits are realized through increasing the activity levels of traditionally inactive subpopulations. This is due to the declining marginal benefit of incremental physical activity. The traditionally inactive subpopulations include women, Indigenous Canadians, ethnic minorities, and low-income individuals. Recognizing that these subpopulations are less likely to be active, policymakers should tailor their policies and messages to appeal to these subpopulations. This health equity can be achieved by either targeting specific subpopulations that are least active (e.g. Indigenous Canadians or low-income individuals) or by simply targeting all people who are insufficiently active.

7.5. Individual Motivation and Empowerment

Policymakers attempting to increase physical activity levels should consider how policies motivate and empower individuals. Eighty-eight percent of Canadians view physical inactivity as a problem that individuals – not governments – have primary responsibility for solving (ParticipACTION 2019). Although governments and other organizations must foster a physical, cultural, and social environment that is conducive to physical activity, opportunities for activity are readily available. Almost everyone can

walk around the block or to ride a bicycle. These opportunities are simply ignored or prioritized lower than other sedentary activities like watching TV or perusing social media because of behavioral phenomena like myopia. Policy should empower individuals by increasing their motivation and capacity to be active through physical literacy, skills development, or personal goal setting.

7.6. Social Trust

Physical activity policies also enhance social trust and social cohesion. Although modern communication devices have the capacity to connect everyone to anyone, social isolation and distrust abound. Most physical activities involve multiple people and can serve to strengthen existing relationships and establish new relationships. These social interactions can decrease social isolation, build community coherence, and increase individuals' motivation to be active.

Chapter 8. Analysis

Each of the three policy options are evaluated according to the six evaluative criteria. A summary of each policy's evaluation is provided in a table at the end of each section.

8.1. Physical Activity Apps

8.1.1. Cost to Government

Tweaking and promoting the existing ParticipACTION app would have a low total cost. As the app already exists and is managed by a third party (ParticipACTION), most of the costs of this policy option stem from the cost of advertising the app. The federal government spent \$36 million in advertising to boost the usership of the Carrot Rewards app to over a million users. A comparable advertising program launched by the government of British Columbia and targeting British Columbians exclusively would cost considerably less than the federal pan-Canadian scheme. It would also likely cost less than the \$7 million invested in the *Active Places, Active People* strategy launched by the British Columbia Ministry of Health in 2016.

Long-term costs would be minimal. Unlike the Carrot Rewards app that awarded financial rewards to app users, the ParticipACTION app would reward users with achievements, app points, or congratulatory notifications that have no financial cost. The non-monetary rewards system of the ParticipACTION app corrects the unsustainable financing model of the Carrot Rewards app and makes the app more cost-effective.

8.1.2. Short-term Effectiveness

A provincial advertising campaign for ParticipACTION with similar effectiveness as the federal advertising campaign for Carrot would likely reach over 250,000 people in British Columbia within the first year. The potential audience is virtually all young adults; approximately 97% of all young adults own mobile smartphones or tablets (Canadian Radio-television and Telecommunications Commission 2018). App usage would likely increase over time, especially if the app incorporates a social platform where people can

connect with their friends, share their activity levels, and engage in competition with friends and colleagues.

Physical activity apps have proven to be effective at increasing overall levels of physical activity. M. Mitchell et al. (2018) demonstrated how the Carrot Rewards app usership increased step count by an average of 5% across all users and by over 10% for users in British Columbia specifically. The Carrot app tracked only directly measurable forms of physical activity – step count – through accelerometers rather than self-reported physical activity. This feature strengthens the reliability of results as people tend to overestimate their self-reported activity. Although the ParticipACTION app is more susceptible to self-reporting bias due to necessity of manually inputting activities into the app, users would likely increase their activity rates by a similar 5-10%.

8.1.3. Long-term Effectiveness

Little data exists around the longevity of the behavioral change prompted by physical activity apps. M. Mitchell et al. (2018) documents some behavioral decay over the 20 weeks of his study on Carrot rewards, but periods longer than 20 weeks were not analyzed. Other studies have demonstrated there may be some long-term behavioral change even after incentives are removed (M. S. Mitchell et al. 2013). If the social aspect of the ParticipACTION app can be successful, the behavioral change will likely be sustained. If the promotion of the app creates short-term excitement that fades after a few weeks of usership, then it is likely that the app will have only a short-term impact.

8.1.4. Health Equity

Although physical activity apps are not targeted towards any specific inactive sub-populations, M. Mitchell et al. (2018) found that formerly inactive users increased their activity levels much more than those who were already active; step count of the formerly inactive increased by 21% rather than the 5% observed for the overall sample. Walking is the most accessible and basic form of physical activity, and so it is the easiest form of physical activity for inactive people to engage in. It is unlikely that inactive persons would increase their involvement in more difficult forms of physical activity, such as team sports, by 21%.

The ParticipACTION app also disproportionately attracts women, a sub-population that traditionally has lower activity rates than men. Although other traditionally inactive segments of the population were not targeted or analyzed, advertisements for the app could be focused on these segments of the population.

8.1.5. Individual Motivation and Empowerment

Physical activity apps have “achieved unprecedented engagement levels that far surpass traditional wellness campaigns” (Kothe, Lam, and Fremlin, n.d., 4). Much of this success stems from the personalized nature of physical activity apps. Physical activity apps provide goals, activities, and notifications that are customizable to fit the users’ preferences, unlike impersonal policies that can only target people from a specific geographic region or with specific demographic characteristics. These apps can also bolster the individual enjoyment of physical activity. Rather than trying to simply remind people of the health benefits of physical activity (a perspective prone to myopia), these apps can make activity itself more enjoyable. It provides people with a goal that they strive to achieve and reminds them to achieve that goal, rather than allowing people to engage in physical activity simply when it suits or interests them.

8.1.6. Social Trust

Despite tailoring activities to individuals and encouraging even more smartphone use, physical activity apps can also contribute to building stronger communities. By enabling people to connect across the app through social networks, people can build virtual relationships or find potential activity companions. It allows people to compete against friends, family, and peers in how many steps or minutes of physical activity they can log.

8.1.7. Summary

Table 1: Physical Activity Apps Evaluation Summary

Criteria	Measure	Physical Fitness App
Cost to Government (double weighted)	Total Cost	Approximately \$5 million
Short-term Effectiveness	Number of People Reached	Potential audience: virtually all adults Realistic audience: 250,000 per year
	Time Spent being Active	Increase activity by 5-10%
Long-term Effectiveness	Length of Impact	Short Length
Equity	Targets the Inactive	Increase activity of the inactive by 21%
Individual Motivation and Empowerment	% of Activities Done Alone	High focus on individual physical literacy and incentives
Social Trust	% of Activities Done with Others	Most activity occurs alone

8.2. Active Communities Grant Program

8.2.1. Cost to Government

The initial Active Communities Grant Program disbursed fifteen grants worth up to \$30,000, totalling approximately \$500,000 under this one-time grant program. A renewed and expanded Active Communities Fund could receive \$1 million annually to disburse to worthy applicants. This \$1 million would be a benchmark annual cost, although the funding allocated to the fund could vary. If few local governments or organizations apply, less funding would be required. If many local governments and

organizations apply and they demonstrate significant increases in physical activity stemming from the programs or infrastructure financed by the grant, the annual allotment to the fund could be increased.

8.2.2. Short-term Effectiveness

This Active Communities Grant Program is geographically targeted, which limits its potential reach. Municipalities, First Nations, and regional districts may apply for the grant to fund projects within their own communities. The first round of funding provided 15 grants to jurisdictions serving approximately 320,000 residents across British Columbia. The majority of these residents were located in three jurisdictions: the city of Kamloops, the Regional District of Okanagan Similkameen, and the city of Nanaimo (BC Healthy Communities, n.d.). The majority of grants (ten out of fifteen) supported communities of under 5000 people and six grants were awarded to communities with approximately 1000 people or fewer. An expanded and annual Active Communities Grant Program would have the maximum potential to reach around 650,000, although the number of people who would actually benefit from these projects would probably be less than 100,000.

The effectiveness of this Active Communities Grant Program at increasing physical activity depends on which activities are funded by the grant. Previous applications used the funds for physical activity programs, strategic planning, infrastructure upgrades, and advertising. Each of these activities promotes physical activity in different ways and across different timespans. The great advantage of this program is that it allows communities to prioritize projects and programs that they foresee being successful in their communities. A one-size-fits-all, province-wide program would not be able to identify and implement these locally effective programs.

8.2.3. Long-term Effectiveness

Although the longevity of the Active Communities Grant Program will be ensured by the annual addition of \$1 million into the Active Communities Fund, the longevity of behavioral change around physical activity is conditional on the types of activities funded by the grants. The temporary hiring of fitness staff will likely not have an impact on physical activity beyond the term of employment. Developing strategic plans to

incentivize physical activity or refurbishing fitness facilities, on the other hand, will likely have long-term impacts.

8.2.4. Health Equity

This policy can easily target sub-populations that are traditionally inactive. For instance, all the grants were disbursed to rural or medium-sized communities that typically have older fitness infrastructure and fewer opportunities for active transport. Six grants were awarded to First Nations, a sub-population within British Columbia that is relatively inactive. Although the program should not focus solely on health equity, the relatively small size of the grant will continue to primarily attract small communities.

8.2.5. Individual Motivation and Empowerment

Although the Active Communities Grant Program does not target specific individuals, a majority of these grants were targeted to very small communities where the likelihood of individuals directly benefiting from funded program is high. For example, the Aq'am First Nation used its grant to purchase new gym equipment, host community gym nights, and hire a recreational worker. In a First Nation community made up of 391 members, a high percentage of these individual community members will likely benefit from this new equipment and services.

8.2.6. Social Trust

These investments in local communities are also likely to strengthen these communities and make physical activity more enjoyable. The Aq'am First Nation community gym nights exemplify how these grants can support social interaction and physical activity. Although relationships in these small communities are often already closely knit, Active Communities Grants help leverage existing relationships and social interactions with physical activities.

8.2.7. Summary

Table 2: Active Communities Grant Program Evaluation Summary

Criteria	Measure	Active Communities Grant Program
Cost to Government (double weighted)	Total Cost	Approximately \$1 million annually
Short-term Effectiveness	Number of People Reached	Potential audience: 650,000 per year Realistic audience: <100,000 per year
	Time Spent being Active	Each grant recipient picks the most effective program
Long-term Effectiveness	Length of Impact	Depends on program chosen; ranges from short to long
Equity	Targets the Inactive	Can target specific subpopulations
Individual Motivation and Empowerment	% of Activities Done Alone	Moderate increase to personal motivation
Social Trust	% of Activities Done with Others	Most activity occurs with others

8.3. Physical Infrastructure

8.3.1. Cost to Government

Investments in physical activity infrastructure are expensive, particularly for indoor facilities. For example, one new recreational centre in Port Coquitlam – featuring a leisure pool, three ice sheets, a fitness centre, a gym, two soccer fields, four tennis

courts, and other amenities – is projected to cost \$132 million (Cleugh 2016). A newly completed recreational centre in Aldergrove - with a single ice arena, an outdoor swim pool, an outdoor leisure pool, playground, waterpark, fitness centre, and walking track - cost \$30 million, with \$10 million contributed from the federal government's infrastructure fund (Langmann 2018). While outdoor facilities such as soccer fields, tennis courts, and outdoor rinks are much cheaper to build, they do not attract a comparable number of users.

Renovating aging facilities and constructing new facilities to serve growing communities would require billions of dollars of combined federal, provincial, and municipal funding. A substantial portion of this funding could originate from the federal *Investing in Canada* infrastructure plan. This plan dedicated \$180 billion over 12 years to fund infrastructure projects across Canada. Numerous reports have cited the federal government's difficulty in distributing these funds. Municipalities could tap into this funding source if they identify shovel-ready recreational infrastructure projects and apply for federal aid to make the required improvements.

These facilities additionally need annual funding for operation and maintenance. Larger recreational centres largely fund continuing expenses through user fees and membership, but the maintenance of the majority of outdoor fields and courts represent and additional expense to the public purse.

8.3.2. Short-term Effectiveness

Investing in physical activity infrastructure has a direct impact on the physical activity of wide swaths of the provincial population. Humpel, Owen, and Leslie (2002) document how the accessibility, density, and aesthetics of physical activity infrastructure increase rate of activity. The construction of new facilities can improve all three of these determinants of physical activity. According to the representative from Abbotsford Recreation, the two multi-purpose recreational centres in the city of approximately 150,000 serve approximately 1600 people *daily*. If a similar proportion of British Columbians use local recreational centers with similar regularity, 550,000 will be served by such new infrastructure. Standalone ice arenas, soccer fields, and tennis courts serve many people per day. Recreational centres provide a highly visible epicenter of physical activity opportunities; thousands of people drive past such centres daily and are

reminded of the activities that lie within. This stands in contrast with intangible physical activity apps or some Active Communities Grant projects that, although they may play a role in encouraging or planning activity, do not provide the opportunity for physical activity themselves.

Increasing the number of physical activity facilities also will increase the amount of time spent in physical activity by nearby residents. Eriksson, Arvidsson, and Sundquist (2012) document how a greater number of exercise facilities increased the proximate resident's time spent in moderate to vigorous activity by 5.4 minutes per day, or by 7.8%. People with greater access to exercise facilities were also 70% more likely than their counterparts to meet the recommended level of 150 minutes of physical activity per week.

8.3.3. Long-term Effectiveness

Although expensive to build and maintain, physical infrastructure can last a long time. Canada Infrastructure (2019) estimates that the service life of 25 years for sports fields and courts, 10-50 years for playground equipment and structures, and 40 years for buildings (including ice arenas, pools, and gyms). The new multi-use recreational centre under construction in Port Coquitlam is projected to have a lifespan of 75 years (Cleugh 2016). Basic but regular maintenance of existing facilities through robust asset management plans can extend the service life of this infrastructure at a relatively low cost.

In some instances, the service life of recreational facilities may coincide or even outlast cultural and demographic shifts. For example, the popularity of ice hockey has been declining in Canada over the past decades, leading to a decreasing need for ice arenas. Also, an aging population is decreasing the demand for high risk sports infrastructure such as ice rinks or skateboard parks but is increasing the demand for other venues such as leisure pools. Policymakers must keep these trends in mind when deciding what types of physical infrastructure to construct.

8.3.4. Health Equity

Recreational facilities are open to all members of the public, although particular programs at these facilities may appeal to particular segments of the broader population. Ice hockey programs are dominated by men while yoga classes are more popular with women. Fitness centres provide opportunities for individual activity, squash and tennis courts for one-on-one activities, and gyms and pools for larger group activities. Soccer is a popular sport among many immigrant communities. Most recreational centres provide subsidized passes so that low-income residents can access these programs as well. Recreational facilities have also been mentioned as a possible solution to reducing gang activity among young adults. Thus, although public infrastructure is rarely built to target specific demographic sub-populations, they generally serve a remarkably diverse array of demographic groups.

Improvements in the built environment will likely contribute to greater changes on the extensive than intensive margin. Those who already use poorly maintained facilities already have sufficient internal motivation to use these facilities. New or renovated facilities may indeed entice them to visit more often, but it is more likely that they will appeal more people who rarely or never used the dilapidated infrastructure.

8.3.5. Individual Motivation and Empowerment

Renovating and constructing new recreational infrastructure has a moderate impact on individual motivation and empowerment. More locations, greater accessibility, and more aesthetically pleasing infrastructure provide a greater diversity of available physical activities. They can reduce barriers – such as distance or safety concerns – or provide more enjoyable forms of activity – access to a fitness centre instead of walking around the block – but better infrastructure fails to target fundamental motivations or empower individuals.

8.3.6. Social Trust

Investments in recreational centres foster greater community development and cohesion. Recreational centres are one of the hubs for social interaction within communities. Socially isolated individuals can join drop-in yoga sessions and develop

relationships with fellow participants. A group of friends can go to the recreational centre to scrimmage with a basketball and end up playing fully fledged game against another group of friends. A regular amateur volleyball team can call up a friend to temporarily fill in a spot on their roster and introduce her to an entirely new social circle. Recreational centres and physical infrastructure make these social interactions possible in a physically safe environment.

8.3.7. Summary

Table 3: Physical Infrastructure Evaluation Summary

Criteria	Measure	Physical Infrastructure
Cost to Government (double weighted)	Total Cost	\$100 million to \$1 billion
Short-term Effectiveness	Number of People Reached	Potential audience: virtually all adults Realistic audience: 550,000 per year
	Time Spent being Active	Increase physical activity by 7-8%
Long-term Effectiveness	Length of Impact	Infrastructure lasts for approximately 40 years
Equity	Targets the Inactive	Provides programming for all demographic groups
Individual Motivation and Empowerment	% of Activities Done Alone	Moderate increase to personal motivation
Social Trust	% of Activities Done with Others	Most activity occurs with others

Chapter 9. Policy Recommendation

In the final analysis, the most effective policy is the Active Communities Grant Program (see Table 4). This program not only is cost-effective, but it is highly effective at targeting traditionally inactive sub-populations and fostering social trust due to its decentralized structure. The only drawback to this policy is that its targeted nature yields a relatively low potential audience.

The development and promotion of the ParticipACTION fitness app scored almost as well as the Active Communities Grant Program. In addition to also being low cost, it is most effective at developing a personal motivation, capacity, and knowledge to be physically active. Questions about the length of its impact was the greatest limitation of this policy.

Investments in physical infrastructure scored moderately or highly across six of the seven measures, but its enormous price tag makes it difficult to implement on a wide scale. Even though it would highly increase physical activity rates, the very high cost of the policy makes it much less cost-effective than the other two policies.

All three of these policy options, however, should be pursued in tandem. Both the Active Communities Grant Program and partnership with ParticipACTION are low-cost policies that are easy to implement. Both policies are also cost-effective ways of increasing physical activity rates at a minimal cost. The Active Communities Grant Program simply requires an annual financial commitment from the British Columbia Ministry of Health and a handful of employees to review grant applications, disburse funds, and evaluate programs. The BC Recreation and Parks Association could again oversee the distribution of the grants. As the program was in operation only a couple of years ago, the network of employees, advertising, and funds disbursement could be re-activated relatively easily. The government of British Columbia also already has a working relationship with ParticipACTION. The organization would likely welcome feedback about how to develop the effectiveness of its app and an offer to help advertise it more widely in British Columbia.

Investments in physical infrastructure should also be pursued as specific projects are identified and funds become available. The province of British Columbia and local municipalities should work together to replace aging infrastructure and construct new infrastructure in rapidly growing communities. Although the federal government has provided some infrastructure funding to municipal projects, the provincial governments should recognize the value that recreational centres provide in reducing health expenditures through increasing physical activity and in increasing social capital by reducing social isolation.

The policy matrix below highlights the trade-offs between these various policies. Each was scored on a five-point Likert scale from *1-very low*, *2-low*, *3-moderate*, *4-high*, or *5-very high* for each criterion. The data within the policy matrix are best estimates based on findings in the literature, in case studies, or in the interviews.

Table 4: Policy Matrix

Criteria	Measure	Physical Fitness App	Active Communities Grant Program	Physical Infrastructure
Cost to Government (double weighted)	Total Cost	4 - Low cost	4 - Low cost	1 – Very High Cost
Short-term Effectiveness	Number of People Reached	3 – Moderate Reach	2 – Low Reach	4 – High Reach
	Time Spent being Active	3 – Moderate Increase	4 – High Increase	3 – Moderate Increase
Long-term Effectiveness	Length of Impact	2 – Short Length	3 – Moderate Length	4 – Long Length
Equity	Targets the Inactive	3 – Moderately Targeted	4 - Highly Targeted	3 – Moderately Targeted
Individual Motivation and Empowerment	% of Activities Done Alone	4 – High	3 - Moderate	3 - Moderate
Social Trust	% of Activities Done with Others	3 - Moderate	4 - High	4 - High
Total Evaluation Score		26	28	23

Chapter 10. Conclusion

Physical inactivity is a multi-faceted and deeply ingrained problem in British Columbia, as it is in much of the developed world. Fewer than 17% of adults attain the recommended guidelines of 150 minutes of moderately intense to vigorous activity per week, and this physical activity deficit incurs over a billion dollars of health care costs annually in British Columbia. The reasons for inactivity are numerous but revolve around the characteristics and motivations of individuals. Although people understand the health benefits of physical activity, myopia saps the motivation to be active. The costs of physical activity and a lack of activity partners also take a toll on people's motivation to be active. Aging, poorly maintained, and inconveniently located infrastructure fail to entice people to be active. The greatest socioeconomic barrier to physical inactivity is a lack of time and time poverty; as public policies cannot allocate more time to income poor individuals – like they can with income – overcoming this barrier is very difficult.

Little consensus exists in the literature, in practice, or among stakeholders and experts regarding the remedy for the malaise of physical inactivity. This capstone project examined three policies – promoting physical activity apps, re-establishing the Active Communities Grant Program, and investing in physical infrastructure – and evaluated them based on their cost to government, short-term and long-term effectiveness, health equity, individual motivation and empowerment, and social trust. Although all three policies are worth pursuing, the low cost of promoting physical activity apps and re-establishing the Active Communities Grant Program suggests that these policies should be prioritized. Investments and partnerships in physical activity should be pursued as funding is available and high impact projects are identified.

Other policies could be potentially explored as well. A greater emphasis on physical literacy and activity in grade schools could positively impact adult physical activity rates. Community competitions like ParticipACTION's Most Active Community Award could be applied regionally instead of nationally. Recreational adult sports programs could be advertised and funded more effectively. School gyms could be opened up after hours to the public as a venue for physical activity.

The greatest contribution of this capstone to the existing literature and understanding of physical inactivity is the more general understanding of the policy problem and potential policy solutions. Physical inactivity is not primarily the result of inadequate education or institutional failure or wealth inequality. The problem of physical inactivity primarily rests at the feet of the inactive individual; too many individuals lack motivation to be active and place physical activity low on their list of priorities.

Because physical inactivity is fundamentally an individual problem, the most effective policies should focus on decentralizing policy making and empowering individuals to make healthy choices. “Rather than prescribing a ‘one-size-fits-all’ programme, encouraging... unique physical activity goals or individualized programmes... may be of benefit” (George et al. 2012). Governments at all levels – federal, provincial and municipal – should strive to create a social, cultural, and built environment that encourages physical activity.

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