THE PRICE OF INACTIVITY

Measuring the Powerful Impact of Sport, Physical Activity, and Recreation in Canada

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INTRODUCTION

There is an inactivity crisis in Canada.

Roughly half (51%) of Canadian adults (18 to 79 years) and 72% of children and youth (5 to 17 years) are *not* active enough to meet recommended physical activity guidelines.[1,2] These moderate-to-high levels of physical inactivity have remained stubbornly unchanged over the past few decades. Furthermore, physical activity opportunities and participation rates are *not equal* for all Canadians, fluctuating significantly based on gender, age, geographical location, disability and race/culture.[3] Canada is not alone in this regard; physical inactivity is a global issue and is one of four leading risk factors of death worldwide.[4] For instance, across 168 countries, physical inactivity was roughly 28% in 2016 and this percentage has not changed significantly since 2001.[3]

The association between regular physical activity and health, in terms of reduced risk of morbidity and mortality for certain non-communicable health conditions has been well-established in the literature.[3] More specifically, physical inactivity is a modifiable risk factor linked to health conditions such as, cardiovascular disease, hypertension, stroke, osteoporosis, breast and colon cancer, diabetes (type 2) and depression – all which can lead to significant health care costs.

Adding to these challenges, Canada (and the world) has been forced to respond to several serious crises including the growing impacts of climate change and a global pandemic, which have posed serious repercussions to both individual and community health and well-being. So far in 2023, the world has experienced the hottest temperature on record[5] and, in Canada, we have had 11.5 million hectares of devastation due to wildfires.[6] The sport, physical activity and recreation sector has played an essential part in addressing and helping to navigate and mitigate these impacts. Recreation facilities have turned into emergency shelters for people seeking refuge from heat exposure and/or as a result of evacuation due to fires and flooding. Climate change is a significant concern that is not limited to Canada. In fact, an International Intergovernmental Panel on Climate Change is looking at the effects and impacts on human health, the economy and on communities, along with mitigation and adaptation strategies.[7]

Recent changes due to environmental disasters and warnings (e.g., flooding, wildfires, snow and ice storms, heat exposure) or the pandemic (e.g., shifting to telecommuting, closures in facilities, increased sitting and screen time, increased feelings of loneliness and isolation) may contribute to declines or plateaus in sport or physical activity participation rates. For instance, outdoor sport and recreation programs, events and recess periods have been cancelled due to air pollution warnings. We also know that environmental issues and even the pandemic, for example, affected the health and well-being of some populations more than others, including individuals from lower income neighbourhoods and individuals with disabilities.[8,9] Competing with these societal factors requires additional efforts, supports and resources to try to shift activity levels by even a few percent.

> **Roughly half (51%) of Canadian adults (18 to 79 years) and 72% of children and youth (5 to 17 years) are not active enough to meet recommended physical activity guidelines.**

Improving the health and well-being of all people living in Canada requires knowledge about the ***diversity*** of the Canadian population ***over time***, including the identification of specific groups that may be at a higher risk for poor health outcomes. Research indicates that certain health conditions disproportionately affect various populations, such as women, older adults, Indigenous persons, persons with a disability and individuals from the LGBTQ2S+ community.[10,11] Ultimately, the contribution of modifiable lifestyle factors (such as physical activity) that have the potential to address poor health outcomes can be understood though credible data. This data, along with concrete, evidence-based and practical actions through targeted strategies (e.g., health promotion campaigns), and long-term financial resources are all important components for inspiring behaviour change. Without required and sustained investment, the provision of parks and outdoor spaces, and local recreation and sport facilities and services, and quality programs that are inclusive, equitable, diverse and accessible will be at risk.

> **Sport, physical activity and recreation are vital contributors to creating healthy individuals, vibrant and inclusive communities, and a prosperous economy.**

These significant issues demonstrate the need for this project. Sport, physical activity and recreation are vital contributors to creating healthy individuals, vibrant and inclusive communities, and a prosperous economy. Yet, decision-makers at all levels of government and in organizations and institutions are frequently required to justify investments in sport, physical activity and recreation. They require quantifiable outcome measures that demonstrate the value of investing in these building blocks of community. **We have synthesized the impact data identified in this report with the goal of making it *easy* for decision-makers, policy-makers, and service and delivery providers to *build the case* for sport, physical activity and recreation to help create strong, dynamic and active communities and a healthy, connected and engaged citizenry.**

The Canadian Fitness and Lifestyle Research Institute (CFLRI) and the Canadian Parks and Recreation Association (CPRA) have worked collaboratively to supply government departments and non-government organizations (including, but not limited to, organizations involved in sport, physical activity and recreation, such as education, justice, health, and the environment) with concrete, detailed evidence and information about the social, health, environmental and economic impact of sport, physical activity and recreation, collected through a credible and objective process. Given that these impact numbers in the four areas of focus assess different constructs or concepts, these amounts cannot be added together, but rather they must be considered individually as in some cases they reflect positive contributions to society whereas others represent costs.

Key Objectives and Project Activities

Table 1 describes the methodology that were employed to bring this project to fruition.

Table 1. Key objectives and project activities

Objectives	Project Activities
1.0	**Develop a framework and mechanism to understand the data required to quantify the social, health, environmental and economic impact and return-on-investment of physical activity, sport and recreation for the sector and other organizations or governments.**
1.1	**Establish an Executive Committee** of CFLRI and CPRA staff and Board members to oversee all aspects of the project.
1.2	**Develop a Framework** to identify relevant indicators related to the social, health, environmental and economic impact of sport, physical activity and recreation. For each indicator, we identified national data sources and identified the gaps that existed in that data. During the development of the Framework, we also identified and reviewed comparable international sources.
1.3	**Establish an Expert Committee** to harness the expertise from academics, governments, businesses, national organizations, and international partners on the framework, indicators, data sources and the development of tools to increase the access and usage of the findings for the project.
2.0	**Analyze and synthesis the findings.**
2.1	**Engage a contractor (Raymond Chabot Grant Thornton)** to assist with the economic and monetary conversion and analyses.
2.2	**Analyze and synthesize data** including the computation of monetary equivalent for all impacts, where appropriate.
2.3	**Conduct a population-based survey** to fill the gaps in the data, as required.
2.4	**Conduct a validation process** to ensure integrity of data and calculations.
3.0	**Develop evidence-based, easy-to-use tools and knowledge products that can be used by sector organizations, other organizations and governments.**
3.1	**Establish a Knowledge Mobilization Committee** to explore options for knowledge translation, exchange and mobilization. This includes identifying key audiences and users representing various jurisdictions and developing a dissemination and communication plan.
3.2	**Disseminate and promote** reports, documents and tools widely across various sectors.

Intended audiences

Findings from this project are applicable to a wide and diverse audience. In particular, the findings from this project will be of significant interest to the following vested groups.

Community leaders
(e.g., recreation professionals, municipal council, city planners)

Provincial/territorial and federal governments

Sector-based organizations
(those involved in sport, physical activity, and recreation but others including education, justice, health, and the environment, as examples)

Academics and researchers

International organizations and governments

Impacts of sport, physical activity and recreation

To quantify the contribution of sport, physical activity and recreation to our society, their impacts were analyzed based on four categories – social, health, environmental and economic. The direct economic impact of these activities on communities is significant: hundreds of thousands of jobs are supported across Canada related to sport and recreation, billions of dollars are invested in the construction or renewal of infrastructure, and billions of dollars are injected into the economy through tourism.

In addition to these more easily quantifiable impacts, the actual participation in sport, physical activity, and recreation generates other important benefits for individuals and communities in Canada. Literature is rich in studies documenting positive impacts related to population **health** through improved general population health, improved mental health, decreased chronic disease, and improved productivity. We also looked at the **social benefits** of sport, physical activity, and recreation in terms of the contribution to the social network, social cohesion and social capital, all of which contribute to the well-being and health of the community (e.g., increased volunteerism, reduced crime, local and community development, and the contribution to national and community pride). Finally, we only have to turn on the daily news to remind us of how critical the changes to the environment have impacted our ability to participate in sport, physical activity and recreation, and as such, another section of this report focuses on the **environmental impacts**. This section will include discussions about air pollution, active transportation, public transit and green spaces and parks.

The framework of indicators that informed this work was derived from various sources: national policies, frameworks and strategies, international work, literature and internal sources. A large set of indicators (n=77) comprised the framework and represented the four key areas identified in Figure 1. The indicators were not all captured in this document due to a lack of *nationally represented* data sources, a lack of *current* data, or *no data* available. This project is intended to be fluid, permitting CFLRI and CPRA to incorporate new or improved data as it becomes available over time. Given the focus on participation and in community sport, physical activity, and recreation, this analysis *did not* include the impact on sport, physical activity, and recreation related to gambling, media rights, some retail sales (e.g., clothing), limited impact of games, professional sport ticketing, and player transfers.

Figure 1. Framework developed for project.

References for Introduction section

[1] ParticipACTION. (2021). The 2021 ParticipACTION Report Card on Physical Activity for Adults: Moving Towards a Better Normal. Available at (accessed July 26, 2023): https://www.participaction.com/the-science/2021-adult-report-card/#/?playlistId=0&videoId=0

[2] ParticipACTION. (2022). 2022 Children and Youth Report Card on Physical Activity for Children and Youth: Lost and Found-Pandemic-related challenges and opportunities for physical activity. Available at (accessed July 26, 2023): https://www.participaction.com/the-science/children-and-youth-report-card/

[3] Guthold R, Stevens GA, Riley LM, Bull FC. (2018). Worldwide Trends in Insufficient Physical Activity from 2001 to 2016: A Pooled Analysis of 358 Population-Based Surveys with 1·9 Million Participants. *Lancet*; 6(10): E1077-E1086. Available at (accessed July 26, 2023): https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(18)30357-7/fulltext

[4] World Health Organization. (n.d.). The Global Health Observatory: Explore a world of health data. Available at (accessed July 26, 2023): https://www.who.int/data/gho/indicator-metadata-registry/imr-details/3416#:~:text=Insufficient%20physical%20activity%20is%20the,attributable%20to%20insufficient%20physical%20activity

[5] World Meteorological Organization. (2023, August 14) July 2023 Confirmed as Hottest Month on Record. Available at (accessed July 26, 2023): https://public.wmo.int/en/media/news/july-2023-confirmed-hottest-month-record

[6] Statista. (2023). Area of Land Burned by Forest Fires in Canada from 2000 to 2023 (in hectares). Available at (accessed July 26, 2023): https://www.statista.com/statistics/553520/area-burned-of-forest-fires-canada/

[7] International Intergovernmental Panel on Climate Change. Available at (accessed July 26, 2023): https://www.ipcc.ch/

[8] Egale Canada. 2020. Impact of COVID-19-Canada's LGBTQ2S Community in Focus. Available at (accessed July 26, 2023): https://egale.ca/awareness/covid19-impact-report/

[9] Canadian Disability Participation Project (CDPP). Effect of Pandemic on Individuals with a Disability: 2020. COVID-19 Disability Survey. Available at (accessed July 26, 2023): https://cdpp.ca/sites/default/files/COVID%2019%20Disability%20Survey%20Prelim%20Report%201%2025%20November%202020_0.pdf

[10] Daniel H, Butkus R. (2015). Lesbian, Gay, Bisexual, and Transgender Health Disparities: Executive Summary of a Policy Position Paper from the American College of Physicians. *Ann Intern Med*; 163(2): 135-137. Available at (accessed July 26, 2023): https://pubmed.ncbi.nlm.nih.gov/25961598/

[11] Statistics Canada. (2021). Table 13. 10-0096-01 Health Characteristics, Annual Estimates. Canadian Community Health Survey. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1310009601

ECONOMIC IMPACTS

The economic impact generated by sport, physical activity and recreation has been estimated at $37.2 billion on an average annual basis. This value reflects the annual contribution to Canada's gross domestic product from sport, physical activity, recreation and retail sales.

Economic Impacts

Quantifying the importance of sport, physical activity and recreation on the national economy requires a multi-faceted approach that considers both the direct (e.g., revenue generated) and indirect (e.g., employment) values, while also considering the additional economic impact through health, social and environmental benefits. This section provides a better understanding of the economic contribution of the sport, physical activity and recreation sector/industry – valuable information which decision-makers can use to inform policy.

This section describes the ***value*** and ***impact*** as it relates to the following:

Activities contributing generally to the economy:

- Economic activities, such as operating revenue, expenditures, and profit generated as goods and services produced within the sport and recreation industry
- Contribution of sport, physical activity and recreation on the gross domestic product (GDP)
- Impact of sport, physical activity and recreation on employment
- Contribution of sport, physical activity and recreation to tourism
- Retail activities within the sport and recreation industry

Government investments:

- Government investment in infrastructure
- Canadians' perceptions about investments in sport.

For this section, data for sport is reflected as its own category from economic accounts. It is important to understand the classifications used throughout this chapter to describe the concept of active recreation. Here, the North American Industry Classification System (NAICS) was used to identify the appropriate industry representing the active recreation sector. The NAICS was developed by statistical agencies across Canada, the United States and Mexico to summarize and compare economic activities between the three countries.[1] In Canada, the agency responsible is Statistics Canada.

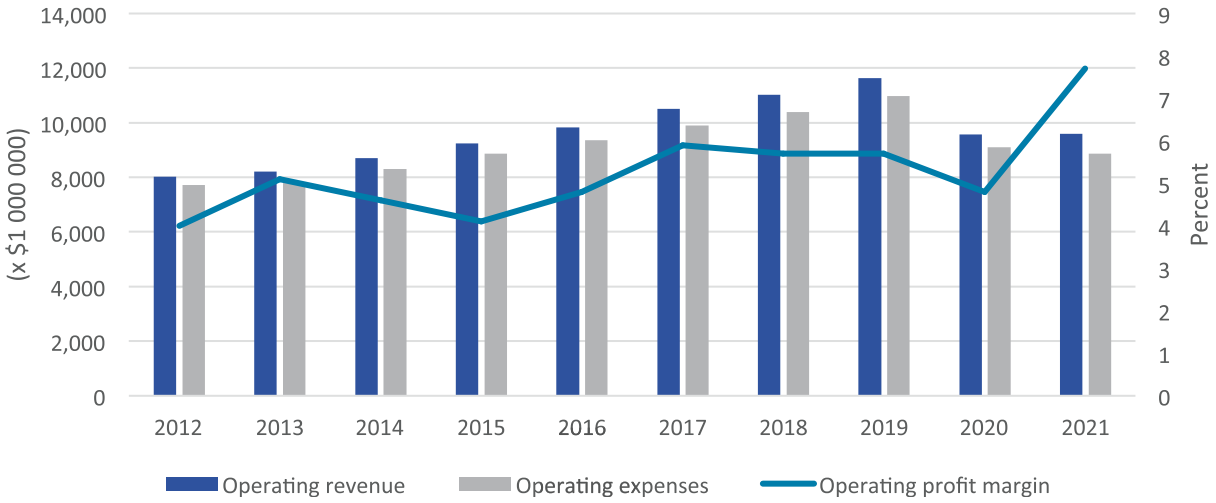
For the purposes of this project, economic summaries are presented for the industry group 7139 – "other amusement and recreation" industries, which is comprised of the following businesses: golf courses and country clubs, skiing facilities, marinas, fitness and recreational sport centres, bowling centres, and all other amusement and recreation industries (e.g., sports clubs). This category was selected as it best represents *active recreation.* NAICS has a classification for public administration (local, municipal and regional governments), however, does not provide any sub-classifications for parks, recreation and culture, and therefore was not included in this analyses. Provincial and territorial reporting (such as municipal financial statements) show that parks, recreation and culture are a significant employer for both full-time and part-time workers, and given that the national accounts were used, the employment values in this section may be an underestimate.

The economic impact of sport, physical activity and recreation was derived from the summation of values for gross domestic product (GDP) as it relates to sport, the amusement and recreation sector and by retail sales. **The economic value of sport, physical activity and recreation has been estimated at $37.2 billion in 2022 (i.e., $8.8 billion contributed from recreation and amusement, $6.9 billion from the sport sector and $21.5 billion in retail sales).**

Revenue, Expenditures, and Profit

Overall economic growth has supported the sport, physical activity and recreation industries to be profitable. The profitability of a business can be determined by comparing the operational revenues to the expenses (i.e., profit margin). In 2021, industries in the "other amusement and recreation" industry group reported $9.6 billion dollars in operational revenue and $8.9 billion in expenditures ($3.2 billion of which were for salaries, wages, commissions, and benefits) and a profit margin of 7.7%.[2] A profit in the amusement and recreation industry was observed for the last 10 years, with the highest profit margin observed in 2021 (see **Chart 1**).

Chart 1: Operating revenue and expenditures for the amusement and recreation industry, 2012-2021[2]



*Data for Prince Edward Island, Northwest Territories and Nunavut is limited

Revenue of industries within the "other amusement and recreation" sector – Businesses in the sport, physical activity and recreation industry were faced with operational challenges that arose during the COVID-19 pandemic, but there seems to be some recovery in 2021. In 2019, the operating revenue for industries in the "other amusement and recreation sector" was $11.6 billion; this estimate dropped to $9.57 billion in 2020, resulting in an 18% decrease compared to 2019. The good news is that the sector saw some growth in operational revenue, demonstrated by a slight increase in revenue of 0.32% in 2021, compared to the previous year.[2] Interestingly, in addition to the observed growth in operating revenue in 2021, operating expenditures decreased from $9.1 billion in 2020 to $8.9 billion in 2021 (a 2.8% decrease).

Overall economic growth has supported the sport, physical activity and recreation industries to be profitable.

Within the amusement and recreation sector, the golf and fitness industries are the greatest revenue generating businesses. In 2021, the amusement and recreation sector generated $9.6 billion in revenue, a third of which ($3.2 billion) came from the golf course and country club industry and $3.0 billion from fitness and recreational sports centres.[2] In previous years, the fitness industry reported the highest revenue, however, in 2021, golf courses and country clubs surpassed the fitness and recreational sport centres. Additional data is needed to determine if this change will persist. Revenue also increased for businesses in the "all other amusement and recreation" industry, which includes industries such as bowling, sport clubs, marinas, sport facilities, and all other amusement industries. This increase in revenue was relatively small, rising from $2.4 billion to $2.5 billion (1.4% increase).[2]

Profit and loss – Overall, the other amusement and recreation industry remained profitable amid pandemic-related challenges, yet this was not the case for all industries in the sector. The operational challenges faced by the sector during the pandemic were not unique, indeed other industries in Canada experienced similar hardships which resulted in decreases in profit during this time. What is important to note is that from an economic perspective, it appears that industries in the active recreation sector are bouncing back and are demonstrating profit margins comparable to, and in some cases better than, other industries in Canada. This positive trend was reflected by an increase in the profit margin for businesses in the "other amusement and recreation" industries from 4.8% in 2020 to 7.7% in 2021 (see **Table 2**).[2] The observed surplus was largely driven by the golf course and country club industry and the "all other amusement and recreation" group.

Table 2. Operating profit margin (surplus or deficit) for select industries by year[2-8]

	Operating profit margin surplus or deficit (%)				
	2017	**2018**	**2019**	**2020**	**2021**
Private nursing and residential care facilities	9.8	10.3	10	9.2	8.6
Accommodation services	13.7	14.2	14.2	4.6	11.5
Food services and drinking places	4.3	4.2	3.8	3.0	3.7
Spectator sports, event promoters, artists, related industries	2.4	-2.6	-1.1	-15.6	-11.3
Amusement parks and arcades	15.8	12.2	10.3	-23.5	0.4
Other amusement and recreation	**5.9**	**5.7**	**5.7**	**4.8**	**7.7**
Golf courses and country clubs	-0.2	0.7	0.9	10.3	14.1
Skiing facilities	13	12.3	11	11.2	8.5
Fitness and recreational sports	5.2	4.5	4.7	-1.7	-0.9
All other amusement and recreation industries	9.2	9.1	8.9	5.2	10.0

When considering the ratio between revenue and expenditures in 2021, the golf industry had the highest profit margin at 14.1%, followed by businesses in the "all other amusement and recreation" industry (e.g., outdoor adventure organizations or sports clubs) at 10.0%. Fitness and recreational sport centres, however, reported a deficit at -0.9%. Despite the lower operational revenue, the skiing industry saw an overall surplus in operations with a profit margin of 8.5% in 2021.[2]

Gross Domestic Product (GDP) and Employment

GDP is a mechanism used to measure the strength of an economy. For simplicity's sake, one can think of it as a country's economic report card.[9] The GDP value may be calculated in one of three ways, using either the expenditure, income or the value-added method.[9,10] In addition to calculating the national GDP, the calculation may be used to measure the value of goods and services produced within a specific industry. When added together, the GDP values of all industries may reflect the total GDP of the economy.[11] How well an economy is doing depends on whether the GDP value is growing or shrinking, which can be determined by looking at GDP values over time. It may also be of interest to look at global GDP estimates to determine how one's economy compares in respect to other nations. This project describes the GDP contribution of sport, physical activity and recreation to Canada's own economy.

GDP is a mechanism used to measure the strength of an economy. For simplicity's sake, one can think of it as a country's economic report card.[9]

Understanding the full scope of the economic impact of sport, physical activity and recreation in Canada also requires an understanding of how the recreation and sport sectors contribute to the economy. To this end, this section describes the contribution of the amusement and recreation sector to GDP and employment. Here the report will outline the *direct* and *indirect* contributions of the amusement and recreation industry on GDP.

As the contribution of the "other amusement and recreation" sector on GDP is not readily available, this had to be calculated through the following steps:

Step 1 – Determine the ratio of 2022 total GDP (in chained dollars) to 2019 total GDP (this ratio represents the variation in production without accounting for inflation).[2,12]

Step 2 – Estimate the 2022 operating revenue by multiplying the 2019 operating revenue by the ratio in Step 1 and the inflation rate (using the Consumer Price Index) between 2019 and 2022.[13]

Step 3 – Calculate the direct and indirect impact values in 2022 by multiplying the estimated 2022 operating revenue by a direct/indirect multiplier and add them for the total impact.[14]

Step 4 – repeat for each province/territory.

It is important to note that the NAICS 7139 ("other amusement and recreation" industry) is separate from the "sport" industry. As a result, this report will include both sport and amusement and recreation GDP in the overall computation. Sport GDP refers to the economic value added from the production of goods and services through sport-related activities, regardless of the producing industry. The four main sub-domains of sport that are included here are: (1) organized sport, (2) informal sport, (3) education and training, and (4) governance, funding and professional support.[15,16] Sport GDP did not require the step-by-step calculation that the "other amusement and recreation industry" did, as it was readily available. For the sport GDP, however, the indirect impact is not available, only the direct impact.

Impact of "other amusement and recreation" industry and "sport" industry on GDP – In 2022, Canada's amusement and recreation GDP was estimated at **$8.8 billion** ($5.4 billion direct impact and $3.4 billion indirect).[2,12-14] In 2022, sport GDP accounted for **$6.9 billion**, the highest contributors of which were education and training ($2.8 billion) and organized sport ($1.9 billion) (see **Table 3**).[15] It is important to note that the value of sport GDP was the highest in 2022 than it had been in over a decade but generally, the contribution of sport GDP has fluctuated slightly over time (except in 2020).[15]

Despite the impact of the pandemic on the sport industry, the sport economy is recovering. Public health measures such as lockdowns and restrictions proved challenging for sport-related activities, as observed by an 11% decrease in sport GDP in 2020 compared to the previous year.[15] When looking at sport sub-domains specifically, organized sport was the hardest hit, experiencing a 28% decrease in sport GDP in 2020 compared to 2019.[15] While most sub-domains of sport experienced a decline during this period, sport GDP as it relates to sport governance, funding and professional support grew by 1% in 2020 compared to 2019.[15] The magnitude of impact of the pandemic varied across the nation and was likely due to varying public health policies across jurisdictions. In 2022, however, sport GDP was on an upswing.[15]

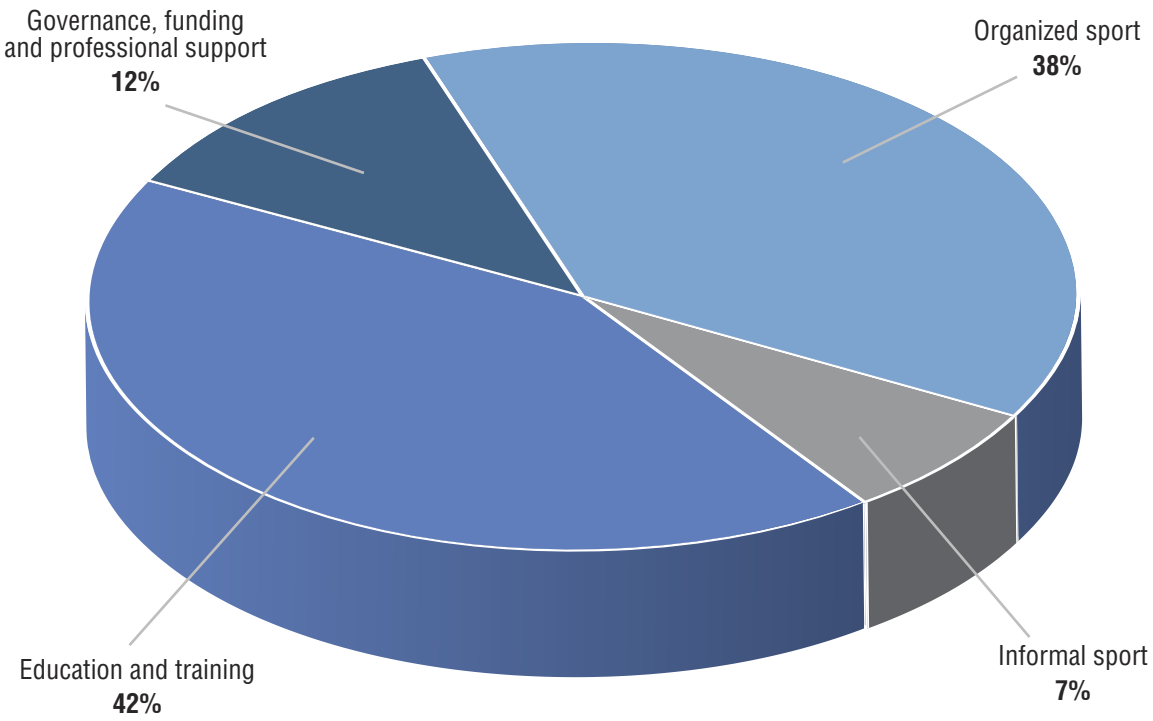
Table 3. Sport GDP by industry sub-domains, 2022[15]

	GDP in 2022 dollars (x1,000)
Sport Total	$6,895,569
Organized sport	$1,918,936
Informal sport	$391,687
Education and training	$2,843,875
Governance, funding and professional support	$1,741,068

Impact of "other amusement and recreation" industry and "sport" industry on employment – When looking at employment specifically, the sport and recreation sector produced 259,829 jobs in 2022;[15,18] the other amusement and recreation sector produced 159,374 jobs and sport resulted in 100,455 jobs.[15,18] Education and training held the largest share (42%) of sport-related employment in 2022 with 42,308 jobs, followed organized sport (38,319 jobs) (see **Chart 2**). As per the introduction of this section, the employment values may be an underestimate as the public service category of NAICS was not included in this analyses.[15,18]

Compared to 2021, there was a notable increase in employment related to the other amusement and recreation industry (31,067 more jobs in 2022) and for sport (11,661 more jobs in 2022), signaling a closer return to pre-pandemic levels of employment.[15,18]

Chart 2: Employment in sport, 2022[15]



Impact of sport and recreational activities contributing specifically to tourism

Tourism related to sport and recreation contributed significantly ($7.4 billion) to the Canadian economy in 2019. Of this amount, $4.1 billion resulted from spending by domestic visitors, so those who were travelling within the country. The remaining $3.3 billion was produced by spending from international visitors travelling to or through the country.[19] This almost equal distribution of spending does not, however, translate into almost equal numbers of *actual* visitors. For example, the domestic visitor spending of $4.1 billion represents 14.4 million domestic trips – 9.3 million trips that occurred on one day and 5.1 million that involved at least an overnight stay.[19] On the other hand, the international visitor spending of $3.3 billion was produced by only 1.4 million international visitors (roughly half from the U.S. and half from other international).[19] This translates into one-tenth of visitors accounting for 45% of all spending. Clearly, the economic contribution of the international travel for sport and recreation tourism cannot be overstated.[19] In terms of expenditures among all visitors, accommodations represented the highest spending. This is followed by food and beverages costs, vehicular expenses, recreational and entertainment costs, and commercial transportation expenses.[19]

Tourism related to sport and recreation contributed $7.4 billion to the Canadian economy in 2019.

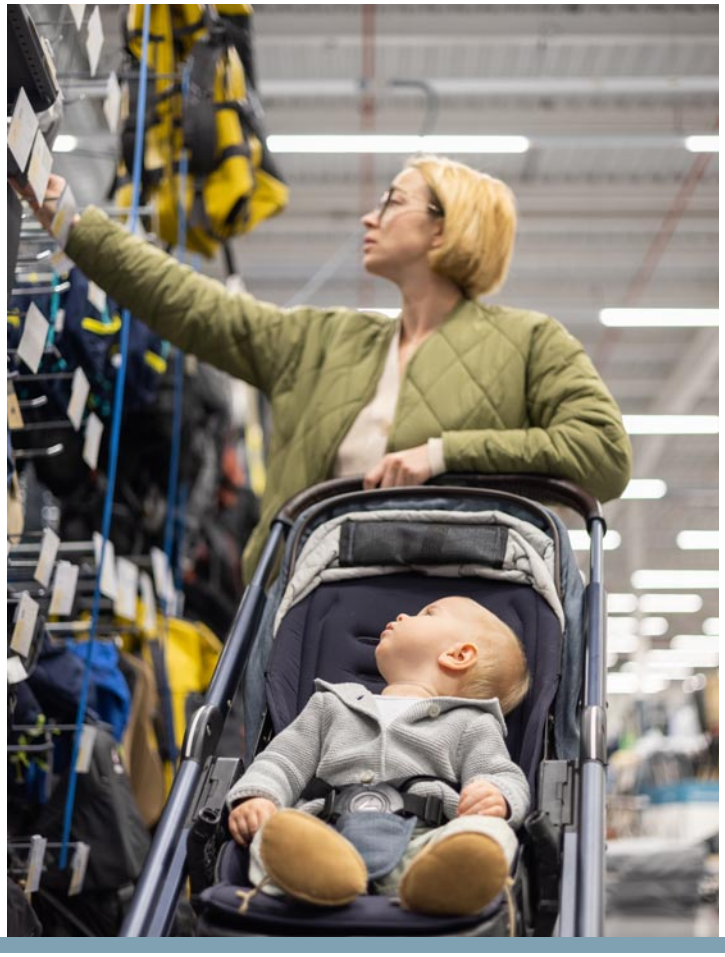
As described in the previous paragraph, it is also possible to look at the contribution of recreation and entertainment *while* visitors are travelling. Although "recreation and entertainment" may include some passive activities, examination of this category allows one to explore the relative contribution and value of this category in comparison to other essential categories of tourism, such as food and beverage or accommodations expenses. So, for example, recreation and entertainment represents 7.8% of total tourism activities in the country, whereas transportation represents 25.3%, accommodation is 23.2%, other industries is 22.2%, food and beverage is 15.2%, and travel services is 6.4%.[20] Over $3.4 billion of the recreation and entertainment GDP contribution within tourism was yielded in Canada in 2019, representing 7.8% of the country's tourism activities GDP.[20]

This section primarily presents 2019 data, however, the COVID-19 pandemic affected tourism considerably, including travel restrictions, requirements of proof of vaccination, and tracking apps.[21] Based on 2021 data, signs indicated that travel trips had resumed to about 95% compared to 2019, which is promising given the demonstrated contribution of tourism to the GDP.[22] More recent data (2022) shows that expenditures on recreation and entertainment increased over 2019 levels, and outdoor activities in 2022 such as hiking, backpacking, or visiting national, provincial, or territorial parks increased over the same period in 2019.[22] Despite these figures, we have not included tourism in the overall economic impact and value of sport, physical activity and recreation in this report because of the potential of duplication across industries.

Contribution of retail trade of sport, physical activity and recreation products

Retail trade of sport and recreation products is an important contributor to the economy. The retail trade sector is defined as "establishments primarily engaged in retailing merchandise...and rendering services incidental to the sale of merchandise."[23]

Import, export, and international trade of sport products – Import and export of sport products decreased during the pandemic. In 2020, imports of sport products (i.e., goods, services) totaled $1.2 billion, whereas exports were $0.8 billion, resulting in a decrease of more than 50% compared to the previous year.[24] The United States is Canada's largest international trade partner for sport products. The sub-domains contributing to the most import and export of sport products were: organized sport (imports $608 million, exports $277.5 million); education and training (imports $112.2 million, exports $348.5 million); governance, funding and professional support (imports $454.8 million, exports $158.1 million).[24]



The value of interprovincial trade of sports products was $1.4 billion in 2018. Unfortunately, the most current estimates for interprovincial trade are based on 2018 data. The largest contributors to interprovincial trade of sport products came from governance, funding and professional support and organized sport.[24] Additional research is needed to update these numbers to understand the current impact of interprovincial trade of sport products on the Canadian economy.

In 2022, retail trade of sport, physical activity and recreation products totaled $23.3 billion, $1.5 billion more than in the previous year.

Retail trade of sport, physical activity and recreation products – In 2022, retail trade of sport, physical activity and recreation products totaled $23.3 billion, $1.5 billion more than in the previous year (7% increase).[25] It is important to note that this total does not include all sport and recreation products. For example, this estimate does not include athletic clothing and therefore is likely an underestimate. The top three retail products contributing to sporting equipment sales were hunting, fishing and camping equipment ($2.4 billion), bicycles and biking equipment, and accessories ($1.9 billion), and other sporting equipment ($1.2 billion).[25] Retail sales of recreational vehicles (e.g., scooters and snowmobiles) account for $12.3 billion. Athletic gear, such as footwear, is instrumental in facilitating participation in sport and recreation. In 2022, athletic footwear totaled $2.7 billion in sales.[25] **Table 4** provides a more detailed breakdown of retail sales by commodity.

Table 4. Retail sales of sport, physical activity, and recreation products, 2022[25]

	Retail trade (Dollars x1,000)
Athletic footwear, at retail, Total	**$2,691,194**
Men's athletic footwear	$1,365,286
Women's athletic footwear	$858,310
Children's athletic footwear	$467,598
Sporting equipment, Total	**$8,273,134**
Bicycles and bicycle equipment and accessories	$1,890,099
Exercise equipment	$696,649
Golf equipment	$736,328
Skiing and snowboarding equipment	$139,901
Hunting, fishing and camping equipment	$2,407,250
Team sporting equipment	$947,165
Other sporting equipment	$1,165,212
Recreational vehicles at retail, Total	**$12,347,311**
New recreational vehicles	$9,994,237
Used recreational vehicles	$2,353,073

GDP is a measure of the economic activity of a defined area, based on the market value of goods and services produced in this specific area. Since only part of the products included in the retail sales values are produced in Canada, not all retail sales values contribute to GDP. Therefore, a simple multiplier to estimate the impact of the retail sales on GDP has been used in the estimated value to contribute to the overall economic impact value for this section ($37.2 billion). **As such the value attributed to retail sales as a contribution to GDP has been estimated at $21.5 billion**. Moreover, the retail sales were reflected in terms of GDP for the purposes of comparison with the GDP contribution of sport and amusement and recreation. The unit must be the same for all values included in the economic impact.

Government investment in infrastructure

Government investment in infrastructure is vital for the delivery of sport, physical activity, and recreation programs and services. Here, investment refers to the direct contribution of funds for the purposes of development or construction, purchasing of equipment, or for the maintenance or repair of existing structures.[26] In this section, we will explore how investments vary by the different levels of government (federal, provincial/territorial and municipal). The focus here will be on three types of infrastructure: sports facilities with spectator capacity, indoor recreation facilities and outdoor recreation facilities. As the category for these facilities are recreation, culture and religion there may be some overlap in uses such as multi-purpose use of facilities or some that are used for non-active purposes.

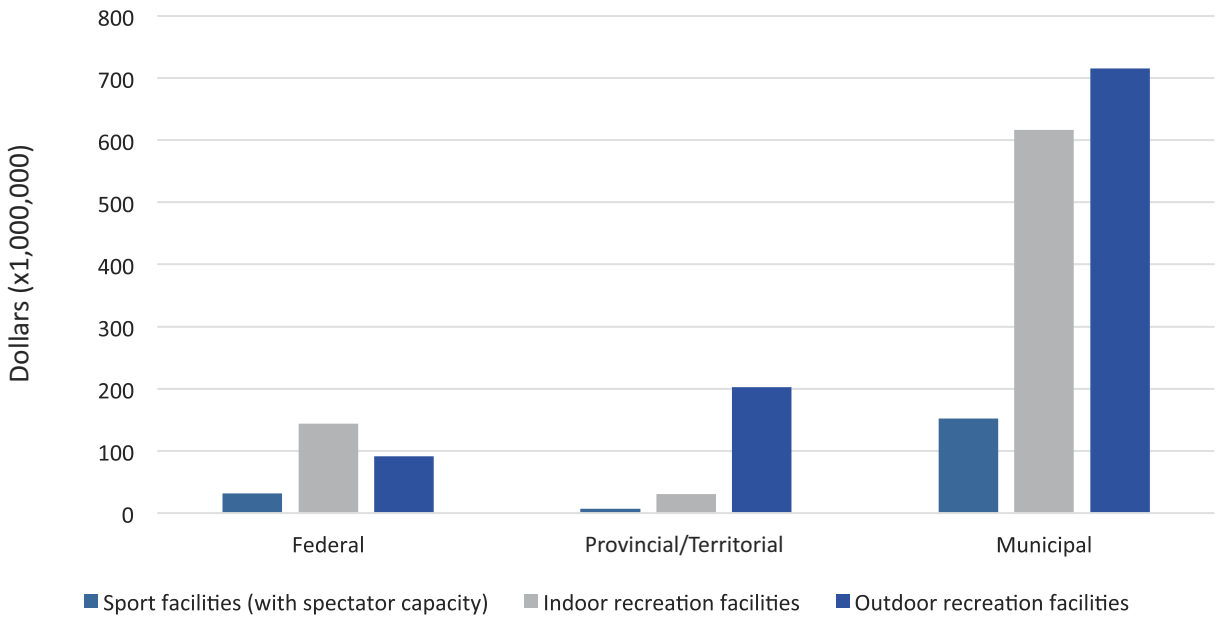
In 2022, the federal, provincial/territorial and municipal governments invested almost $2.0 billion in this type of infrastructure, more than half of which was directed toward outdoor recreation facilities.[26] Specifically:

- The federal government invested $32 million in sports facilities with spectator capacity, $144 million for indoor recreation facilities and $91 million towards outdoor recreation facilities.[26] In total, the federal government contributed $267 million towards the development, maintenance and/or repair of sport, physical activity and recreation infrastructure.
- The provincial and territorial governments made similar total contributions to sport, physical activity and recreation facilities; though they spent considerably less on sport facilities with spectator capacity compared to both the federal and municipal governments (at $7 million).[26] Investment for outdoor facilities was $203 million and $31 million was contributed towards indoor facilities.[26]
- Municipal governments invested $1.5 billion in sport, physical activity and recreational infrastructure in the same year, the bulk of which went towards indoor and outdoor facilities ($152 million for sports facilities with spectator capacity, $617 million for indoor facilities and $716 million for outdoor facilities) (see **Chart 3**).[26]

While municipal governments contributed the most to facilities compared to the provincial, territorial and federal governments,[26] it should be noted that some of the funds attributed to municipalities may come from federal or provincial/territorial governments grants. As a result, the federal, provincial or territorial contributions may be understated in the data.

Investment from all levels of government in spectator sport facilities decreased slightly in 2022 compared to the previous year, whereas funding for indoor and outdoor facilities increased during this time.[26] The decrease in funding of sport facilities may be attributed in part to the COVID-19 pandemic where public health restrictions limited access to these facilities.

Chart 3: Government investment in infrastructure, 2022[26]



Despite these investments, a majority of Canadian adults (61%) feel that the federal, provincial and territorial governments should increase funding *somewhat* (35%) or *substantially* (26%) for sport, physical activity and recreation. Less than one-quarter of adults (22%) feel that the funding should remain the same, whereas only 7% feel that funding should decrease. When asked about funding from municipal governments, 59% of adults feel that funding should increase to some extent; 34% feel that municipalities should *somewhat* increase funding and 25% say that funding should *substantially* increase. With 26% reporting that municipal governments should keep the funding at status quo, less than 10% are unsure or feel that the funding level should decrease.[27]

A majority of Canadian adults (61%) feel that the federal, provincial and territorial governments should increase funding *somewhat* (35%) or *substantially* (26%) for sport, physical activity and recreation.

References for Economic impact section

[1] Statistics Canada. (2021, Jul 30). Introduction to the North American Industry Classification System (NAICS) Canada 2022 Version 1.0. Available at (accessed July 26, 2023): www.statcan.gc.ca/en/subjects/standard/naics/2022/v1/introduction

[2] Statistics Canada. (2022, Nov 16). Amusement and Recreation, Summary Statistics. Table 21-10-0057-01. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=2110005701

[3] Statistics Canada. (2023, Mar 21). Public Nursing and Residential Care Facilities, Summary Statistics (x 1,000,000). Table 13-10-0101-01. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1310010101

[4] Statistics Canada. (2023, Mar 21). Private Nursing and Residential Care Facilities, Summary Statistics (x 1,000,000). Table 13-10-0102-01. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310010201

[5] Statistics Canada. (2023, Jan 18). Accommodation Services, Summary Statistics (x 1,000,000). Table 33-10-0102-01. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3310010201

[6] Statistics Canada. (2023, Feb 16). Food Services and Drinking Places, Summary Statistics (x 1,000,000). Table 21-10-0171-01. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2110017101

[7] Statistics Canada. (2023, Feb 16). Spectator Sports, Event Promoters, Artists, Related Industries, Summary Statistics (x 1,000,000). Table 21-10-0169-01. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2110016901

[8] Statistics Canada. (2022, Nov 16). Amusement and Recreation, Summary Statistics (x 1,000,000). Table 21-10-0057-01. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2110005701

[9] Statistics Canada. (2015, Sept). What is Gross Domestic Product (GDP)?. Catalogue Number: 11-629.-X, Issue Number 2015034. Available at (accessed July 26, 2023): https://www.statcan.gc.ca/en/sc/video/gdp

[10] Indeed Editorial Team. (2022, Nov 6). How to Calculate GDP in 3 Different Ways (with examples). Available at (accessed July 26, 2023): https://ca.indeed.com/career-advice/career-development/how-to-calculate-gdp?aceid=&gclid=CjwKCAjw9pGjBhB-EiwAa5jI3CZFyEoqCU6KzMMV7K-7jdIfcq1VI60uOfxrET6Ie3MRq2d19uruSBoCUWIQAvD_BwE&gclsrc=aw.ds

[11] Statistics Canada. (n.d.). Gross Domestic Product by Industry – National (Monthly) (GDP). Available at (accessed July 26, 2023): https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=1301

[12] Statistics Canada. (2022, Nov 8). Gross Domestic Product (GDP) at Basic Prices, by Sector and Industry, Provincial and Territorial (x 1,000,000). Table 36-10-0487-01 (formerly CANSIM 381-0030). Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610048701

[13] Statistics Canada. (2023, Jan 17). Consumer Price Index, Annual Average, Not Seasonally Adjusted. Table 18-10-0005-01 (formerly CANSIM 326-0021). Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810000501

[14] Statistics Canada (2022, Dec 13). Input-Output Multipliers, Detail Level. Table 36-10-0594-01. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610059401

[15] Statistics Canada. (2023, Aug 9). National Culture and Sport Indicators by Domain and Sub-Domain (x 1,000). Table 36-10-0652-01. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610065201

[16] Statistics Canada, (2023, Jun 26), Culture and Sport Indicators by Domain and Sub-domain, by Province and Territory, Product Perspective (x 1,000). Table: 36-10-0452-01 (formerly CANSIM 387-0012). Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610045201

[17] Statistics Canada. (2022, Nov 8). Gross Domestic Product, Expenditure Based, Provincial and Territorial, Annual. Tables: 36-10-0222-01 (formerly CANSIM 384-0038). Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610022201

[18] Statistics Canada. (2023, Mar 30). Employment by Industry, Annual. Table 14-10-0202-01. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1410020201

[19] Sport Tourism Canada. (2021, Sep 27). Value of Sport Tourism in 2019 Tops $7 Billion. Available at (accessed July 26, 2023): https://sporttourismcanada.com/value-of-sport-tourism-in-2019-tops-7-billion/

[20] Statistics Canada. (2023, Feb 24). Provincial and Territorial Gross Domestic Product (GDP) and Employment Generated by Tourism and Related Measures (x1,000,000). Table 24-10-0042-01. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=2410004201

[21] Liu, H. Statistics Canada. (2020, Oct 23). The Economic Impact of Travel Restrictions on the Canadian Economy due to the COVID-19 Pandemic. Economic Insights Article: 11-626-X No. 125. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/n1/pub/11-626-x/11-626-x2020023-eng.htm

[22] Statistics Canada. (2023, Feb 27). National Travel Survey, Third Quarter 2022. The Daily. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/n1/daily-quotidien/230227/dq230227c-eng.htm

[23] Statistics Canada. (2022). North American Industry Classification System (NAICS) Canada 2022, Version 1.0, 44-45 Retail Trade. Available at (accessed July 26, 2023): https://www23.statcan.gc.ca/imdb/p3VD.pl?CLV=1&CPV=44-45&CST=27012022&CVD=1369826&Function=getVD&MLV=5&TVD=1369825

[24] Statistics Canada. (2022, Oct 4). Trade of culture and sport products, 2022. The Daily. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/n1/daily-quotidien/221004/dq221004a-eng.htm

[25] Statistics Canada. (2023, Feb 28). Archived: Retail Trade Commodity Survey, Retail Sales, Inactive (x 1,000). Table 20-10-0016-01, 2023. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2010001601

[26] Statistics Canada. (2018, Oct 24, Updated 2023, June 14). Infrastructure Statistics Hub. Available at (accessed September 8, 2023): https://www150.statcan.gc.ca/n1/pub/71-607-x/2018013/ic2-eng.htm

[27] Canadian Fitness and Lifestyle Research Institute. (2023). Custom analysis, 2023 Social, Health, Economic, and Environmental Impact survey.

SOCIAL IMPACT

The social impact generated by sport, physical activity and recreation have been estimated at $13.6 billion on an average annual basis. Social impact reflected as the value of volunteering for sport-based activities.

SOCIAL IMPACT

Research shows that physical activity benefits individuals and the broader community. At the individual level, regular participation in sport and physical activity can improve academic achievement, employment status and life skills. Sport, physical activity and recreation also benefit the community by fostering community connections, community pride and cohesion. Here, the economic impact as it relates to social benefits is summarized as the sum of the financial contributions of volunteering.

Volunteering

Sport and recreation would not exist without volunteers, making volunteers essential to community health and well-being. According to the CFLRI 2020 Sport Monitor Survey, 27% of adults reported volunteering in an activity related to sport.[1] In terms of hours spent volunteering per year, this places sport and recreation (105 hours) as the third highest among organizations represented, following hospitals (111 hours) and religious organizations (110 hours).[2] **The value of volunteering in Canada has been estimated at $13.6 billion in 2020**.

Sport and recreation would not exist without volunteers, making volunteers essential to community health and well-being.

We can estimate the value of volunteering by multiplying the total number of volunteer hours by the average hourly wage of the amusement and recreation industry. Socio-demographic differences appear for volunteering. Higher percentages of volunteers in sport are observed among men, younger adults, those who are married or living with a partner, have a university degree, are living in higher income households, or are living in the western provinces. Men report spending more hours volunteering than women.[1]

In the CFLRI 2020 Sport Monitor, sport volunteers were asked about their attitudes towards, and experiences with, volunteering. In terms of a quality experience, 56% of volunteers reported that they felt "to a moderate or great extent" that they were adequately trained; 21% reported being trained to some extent.[1] Most volunteers feel that their time spent volunteering was appreciated; 88% of volunteers saw their volunteer contribution as valued and 91% felt that their volunteering provides a positive contribution to the organization or community to a moderate or great extent.[1] Similarly, 90% of volunteers said that their volunteer experiences had been generally positive, while 9% reported a neutral response.[1]

The CFLRI 2020 Sport Monitor asked volunteers and non-volunteers about the most important reasons for volunteering and non-volunteers about key barriers.[1] The most reported *reasons for volunteering* were for social networking, meeting people, or contributing to the community (26%), followed by development, mentorship, maintaining or promoting sport (20%).[1] Under 20% of adults cited the reasons as enjoyment or interest in the sport or organization (18%), because friends or family were involved (14%), for health or fitness (11%), because they have the time to volunteer (2%), or because it was required (2%).[1] As for perceived barriers to volunteering, the lack of time or busy schedule was reported by over half (58%) of non-volunteers, followed by a lack of motivation or interest (11%), a lack of access or awareness of opportunities (11%), a lack of confidence, self-esteem or skills (6%), or poor health, age or injury (6%).[1] Perceptions of a negative culture within the sport system, financial cost, and lack of transportation or child care was reported by 4% of non-volunteers.

The COVID-19 pandemic reduced or eliminated opportunities for volunteers in the sport sector. As such, participation rates of volunteers has decreased considerably since the pandemic. CFLRI will update this value when new data are available.

Social support, connectedness, cohesion and loneliness

The pandemic reminded us that social connections are vital for mental and physical health. Unfortunately, research has shown that these vital connections have declined over time, particularly during the COVID-19 pandemic. Social isolation can be influenced by many different factors, including retirement, strained relationships, or a passing of a friend or relative, as examples.[3] It is evident in the literature that social isolation and loneliness disproportionately affect certain populations more than others.[4] For example, older adults have a higher likelihood of experiencing loneliness and are also more likely to report poorer health outcomes. That said, the value of social connections is evident regardless of age. Given the relationship between social connections and population health, it is clear that as a society, we should explore efforts to strengthen social connectedness. Although not assigned a monetary value in this project, the benefits described in the literature are significant, and the recognition that physical activity is an effective method to help increase social cohesion, is increasing. Therefore, it is reasonable to conclude that investing in physical activity has the potential to yield considerable gains in social capital.[5]

According to the most recent census, 19% of the Canadian population is 65 years or older. The number of Canadians over 65 has increased from 5,154,937 in 2012 to 7,330,605 in 2022, or 42%, and is expected to increase to 10.4 million by 2037.[6,7] Research has shown that advanced age is associated with declines in physical and cognitive function and increased perceptions of loneliness.[3,8] Interestingly, loneliness or a lack of social connectedness have also been reported to be linked with decreases in physical and/or mental health.[4,8,9] As Canada's population ages, it will be key to gain insight into which factors contribute to healthy aging. Here, the aim will be to explore the link between physical activity, sport and recreation with social support and loneliness.

The pandemic reminded us that social connections are vital for mental and physical health.

Social support has been shown to be an important facilitator of participation in physical activity, particularly among older adults.[3] In 2017, a systematic review found that social support was moderately associated with increases in physical activity during leisure-time among older adults, particularly when the support came from family members.[3] When examining the effect of loneliness on physical activity levels, this study found some evidence that leisure-time physical activity was negatively associated with loneliness, however given the few number of studies (of moderate or good quality) included in the review, the authors acknowledge the need for further investigation.[3]

According to the CFLRI's 2019-2021 Physical Activity Monitor, over 80% of adults (18 years and older) reported that family or friends were at least somewhat supportive of their participation in physical activity, most frequently through motivation and encouragement (81% of family and 76% of friends).[10] This study showed, however, that fewer older adults indicated that they received this type of support from either family or friends compared to their younger peers.

Recently, a national study conducted among older adults examined the effects of a physical activity intervention on perceptions of loneliness; moreover, it identified factors that could reduce feelings of loneliness.[8] According to the authors, loneliness is a subjective construct that differs from social isolation/contact. Here, loneliness was described as "a perceived lack of quality or quantity of one's relationships," whereas social isolation is an objective construct which refers to reduced social networks or frequency of actual contacts.[8]

Older adults in the study participated in a six-month community-based physical activity intervention (i.e., Choose to Move).[8] The results showed a positive effect of physical activity on loneliness. Specifically, physical activity increased for both individuals who identified as lonely and non-lonely.[8] Physical activity reduced considerably among lonely adults at three to six months when the intervention diminished and access to the coach was limited.[8] When asked to identify which components of the study fostered social connectedness, participants cited access to an activity coach.[8] Participants identified key characteristics of the activity coach that reduced feelings of loneliness, such as being personable, motivating, accountable, positive, accommodating, accepting and observant.[8] Additionally, participants also found the motivational group meetings as important for creating and maintaining relationships.[8]

In response to the rising loneliness, authors in a recent study propose the promotion of walking, especially within one's own neighbourhood.

In a national study conducted by the CFLRI in 2023, 61% of Canadians agreed to a moderate or great extent that sport, physical activity, and recreation contributes to a reduction in feeling alone or loneliness, whereas an additional 19% agreed to some degree.[11] A further 12% agreed either a little or not at all that sport, physical activity and recreation contributes to reductions in these types of feelings, whereas 8% were unsure.[11]

Behaviours shifted during the COVID-19 pandemic as public health guidelines restricted access to key settings where individuals are frequently active; and the enforcement of strict measures for social distancing limited social contacts. As a result, to stay active, some people sought out activities that could be done in or around the home in order to remain a safe distance from others.[4,12] These adaptations helped minimize the effect of the pandemic on inactivity levels (at least among adults), however, research has shown that loneliness increased during this time. This was even more pronounced among certain subsets of the population, including women, older adults and those with chronic health conditions.[4]

In response to the rising loneliness, authors in a recent study propose the promotion of walking, especially within one's own neighbourhood, as a strategy to strengthen and build social relationships between neighbours.[4] Such walking, they suggest, could result in greater familiarity among neighbours as they interact with each other. This could, in turn, facilitate social cohesion, by developing a sense of safety, trust, belonging and inclusion among residents.[4]

In another study, Leavell and colleagues advocate for the use of social prescriptions as a way to combat rising cases of social isolation.[9] Similar to the aforementioned study about loneliness, the authors in this study acknowledged that loneliness is a growing problem, particularly among vulnerable populations such as new immigrants/refugees, older adults and youth from low-income communities.[9] The authors suggest that social prescribing could be an effective way to help support connectedness in the community. Social prescribing is when health care professionals or third-party organizations provide non-medical referrals with the purpose of connecting patients to community or nature-based programs (e.g., social services, recreation facilities, walking clubs, communal gardening).[9] Furthermore, given the wealth of knowledge in the literature on the mental health benefits of being in nature, the authors propose that nature-based social prescriptions, such as community gardens, could have the added benefit of having a positive impact on mental well-being.[9]

The physical and mental health benefits of participation in outdoor recreation are well understood.[13,14] There is growing recognition, however, that there exists a need to promote the use of outdoor interventions for improving physical activity levels and social connectedness. In another study, Wray et al. conducted a systematic review of the literature to examine the impact of outdoor settings on physical activity and social connectedness among children and youth.[15] The authors identified studies which showed evidence of increased social connectedness with nature-based or play-based interventions.[15] The interventions focus on naturalized environments, playgrounds, staffed activities and technological interventions.[15]

The physical and mental health benefits of participation in outdoor recreation are well understood.

Despite the evidence of using outdoor activities to improve social connectedness referenced above, some studies did not find evidence to support this link. According to a study by Rivera and colleagues, youth who were active outdoors did not demonstrate higher levels of social connectedness.[16] The authors provide some explanations for the lack of evidence showing that active pursuits of youth in the study may have involved little to no social interaction.[16] Explanations for the lack of evidence require more research.

These studies highlight the importance of walking for building relationships; however, walking offers important benefits beyond social connectedness and mental health promotion. While leisurely walking may not achieve the recommended intensity of moderate-to-vigorous activity in the 24-hour movement guidelines, there are health benefits that accrue from replacing sedentary behaviours with light physical activities, such as walking.[17]

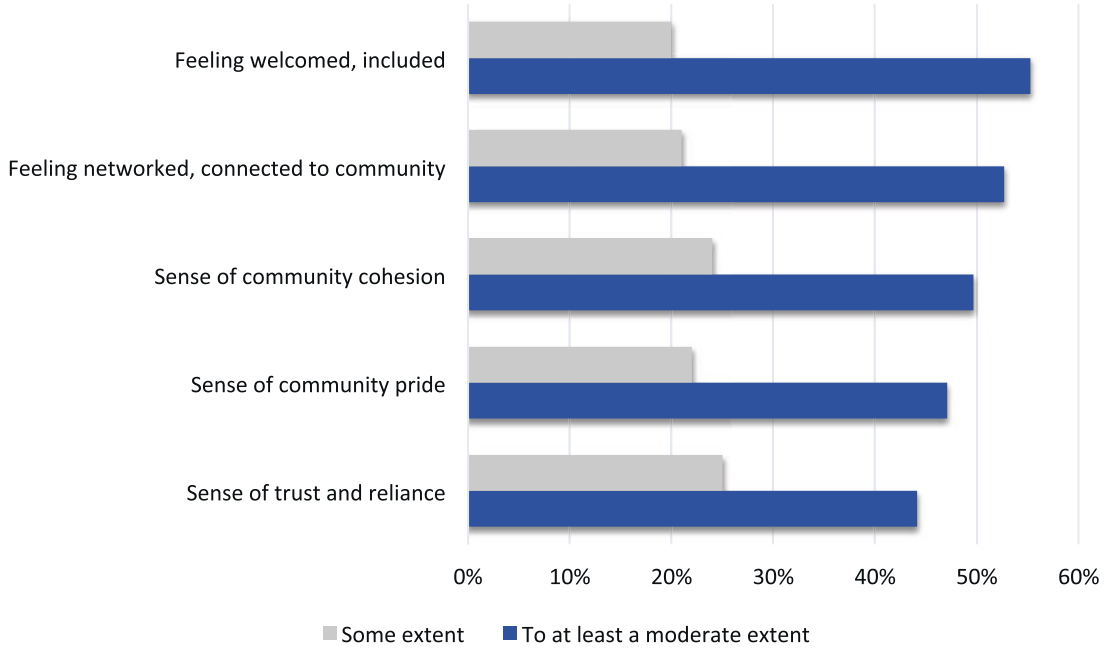
As previously described, there is some evidence in the literature supporting the positive impact that physical activity, recreation and/or sport has on improving social connectedness or cohesion. The relationship between neighbourhood walkability and social connectedness may be inter-related, as there is evidence to show that social connectedness and walkability impacts physical activity levels.[18] In another study, social cohesion at an individual and at a community level (e.g., strong community social bonding) was found to be positively associated with physical activity.[19] These authors suggest that combining high social cohesion with other factors like high walkability could produce higher physical activity levels.[19] According to a review by Eigenschenk and colleagues, participation in outdoor sport programs is an effective way to prevent loneliness and improve social connectedness by promoting active citizenship (e.g., social interaction, integration, volunteering, community identity and pride).[13]

CFLRI's research provides additional evidence for the importance of sport, physical activity and recreation in mitigating perceptions of loneliness. In 2023, and as previously mentioned, roughly 60% of respondents in the Social, Health, Economic, and Environmental Impact survey indicated that sport, physical activity and recreation contributed to a moderate or great extent to reductions in feeling alone or lonely.[11]

Based on the same CFLRI study, many Canadians strongly felt that sport, physical activity and recreation contributed positively to the community in ways related to ***social*** well-being. The previous section described in detail how sport, physical activity and recreation contributes to the economy in terms of employment or infrastructure, but there are many other ways that they contribute to a community's social well-being. An overwhelming number of adult volunteers felt that their time contributed to the community both socially and at an organizational level, but CFLRI also asked Canadians about other impacts of sport, physical activity and recreation within the community. In its 2023 survey, conducted for this project:

- 76% reported that sport, physical activity and recreation contributes to perceptions of *feeling welcomed and included* to at least some extent[11]
- 74% reported that sport, physical activity and recreation contributes to perceptions of *feeling networked or connected* to the community to at least some extent[11]
- 73% reported that sport, physical activity and recreation contributes to *community cohesion* to at least some extent[11]
- 69% said that sport, physical activity and recreation contributes to a sense of *community pride* to at least some extent[11]
- 69% stated that sport, physical activity and recreation contributes to a *sense of trust and reliance* in the community to at least some extent (see **Chart 4**).[11]

Chart 4: Percentage of adults reporting the contribution of sport, physical activity, and recreation to community-based outcomes[11]



Crime and risky behaviours

Perceptions of safety have been reported as barriers to physical activity participation in some studies, however, the evidence is not clear-cut. While some provide evidence that people are less likely to be active in their communities if they perceive them as being unsafe, whether it be due to crime or due to poor infrastructure, others do not demonstrate a clear link between perceived feelings of safety and physical activity.[20-23]

Participation in sport during the high school period may be important for preventing or reducing the use of illicit drugs (excluding cannabis).

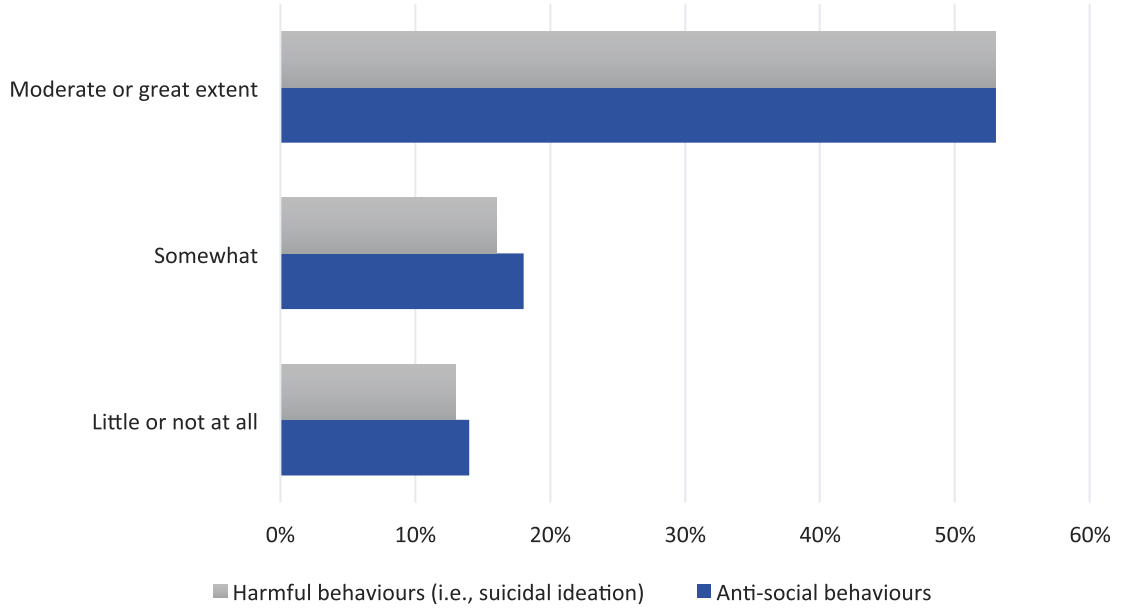
Antisocial and/or risky behaviours (e.g., substance abuse) may increase the risk of engaging in criminal activity. Of interest here is whether sport or physical activity participation could influence crime reduction by encouraging pro-social behaviours. Anti-social behavior in adulthood may be preceded by conduct disorder in childhood or adolescence.[24] Researchers in the United States conducted a study with the purpose of evaluating whether sport participation in high school lessens the association between conduct disorder in childhood and development of anti-social behaviours in young adulthood.[24] The authors found that those who participated in sports had fewer conduct disorders in childhood. Although not an overall protective factor, sport may be helpful for reducing risk of adolescent anti-social behaviour among those with childhood conduct disorders.[24] In addition, the researchers found an association between conduct disorder in childhood and anti-social behaviour in young adulthood was less among those who participated in sports during high school compared to those who did not.[24] Alternatively, researchers in another study did not find a significant association between juvenile delinquency and sport participation in adolescence.[25]

Additionally, participation in sport during the high school period may be important for preventing or reducing the use of illicit drugs (excluding cannabis).[26] According to one review, more than 80% of the studies that looked at the association between sport and illicit drug use (excluding marijuana) reported a significant inverse relationship.[26] The studies involving marijuana, however, were less clear. Sport participation is associated with greater alcohol use during adolescence and early adulthood,[26] with more than 80% of studies reviewed in a systematic review demonstrating a positive association between alcohol consumption and sport participation, this finding was supported by other literature as well.[27,28] Understanding factors that can affect these relationships is important.

Youth participating in sport in middle and high school had lower odds of suicide ideation in high school. Youth who ceased participating in sport after middle school had higher odds of attempting suicide during high school.[29] Participation in current sport activities or participating in sport at some point were also associated with decreased suicide risk.[30]

In the 2023 CFLRI study, Canadians were asked about the role that sport, physical activity and recreation has in terms of reductions in harmful behaviours; based on this data, 53% of adults indicated that they agreed to a moderate or great extent that sport, physical activity and recreation contributes to reductions in harmful behaviors such as suicide ideation, while 16% agreed to some extent. A further 13% agreed a little or not at all, and 18% were unsure.[11] Similar result were found for the contribution towards the reduction of anti-social, risky or deviant behaviours in the community; 53% agreed to a moderate or great extent, 18% agreed somewhat, 14% agreed a little or not at all, and 15% were unsure (see **Chart 5**).[1]

Chart 5: Percentage indicating that sport, physical activity, and recreation contributes to reductions in risky/harmful behaviours[11]



Academic achievement, employment and development of life skills

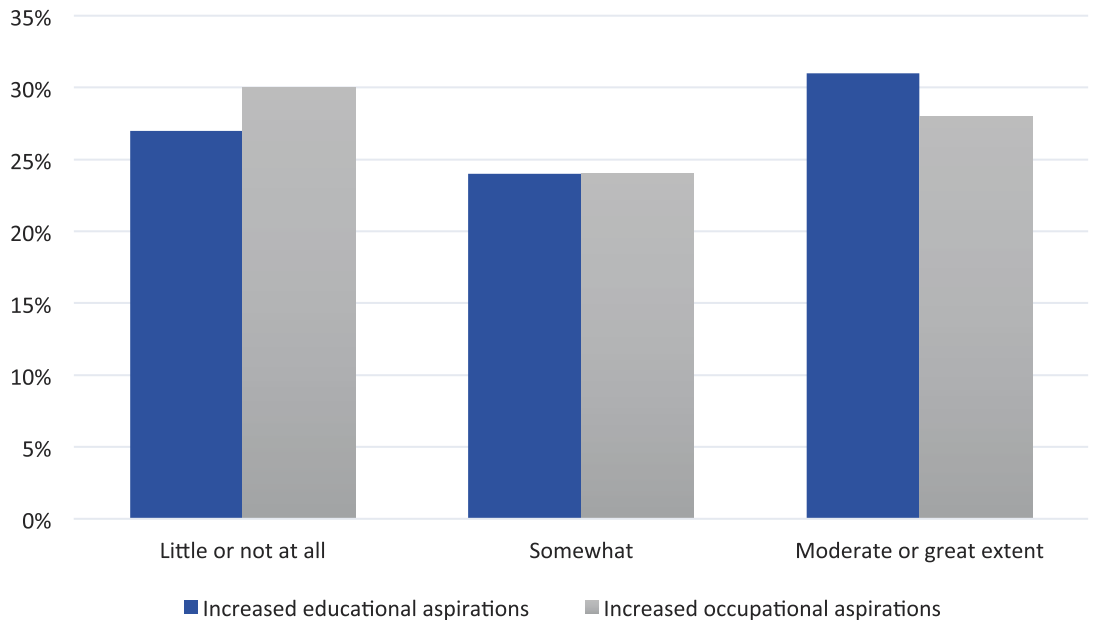
While there is a wealth of knowledge on the health benefits of participating in regular physical activity and sport, less is known about how physical activity contributes to academic achievement, employment or the development of life skills. This report will highlight some of the available evidence in this regard.

Schools represent a key setting for facilitating physical activity participation among children and youth. Schools may be faced with challenges of time constraints and limited resources which could make the provision of physical activity opportunities a challenge. Incorporating physical activity in the classroom, however, has been shown to have an impact on academic-related outcomes.[31] The results of a meta-analysis showed a short-term improvement on on-task behaviour and selective attention, however the evidence for improvements in cognitive abilities was inconclusive.[31] Other research indicates that outdoor sport is associated with: increased self-motivation, inner strength, education achievements, greater sense of purpose for learning, better engagement, attention, memory, brain structure, problem solving and increased communication, cooperation, relationships, trust, and cohesion.[13] Additional research is needed to draw more definitive conclusions about the impact of physical activity on academic-related outcome, especially in the long-term.

Workplace physical activity interventions have been used as a strategy to improve health and to boost productivity and reduce absenteeism.[32] Beyond the noted health benefits to the employee and subsequent benefits to employer, there appears to be some limited evidence in support of additional income-related benefits for the employee while being physically active. According to a study by Kosteas et al., regular participation in physical activity resulted in a 6% to 10% increase in earnings and that a higher frequency of participation leads to even greater increases.[33]

In addition to this, the CFLRI 2023 Social, Health, Economic, and Environmental Impact study found that about three out of ten Canadians reported that sport, physical activity, and recreation contributed to occupational or educational aspirations to a moderate or great extent (see **Chart 6**).[11]

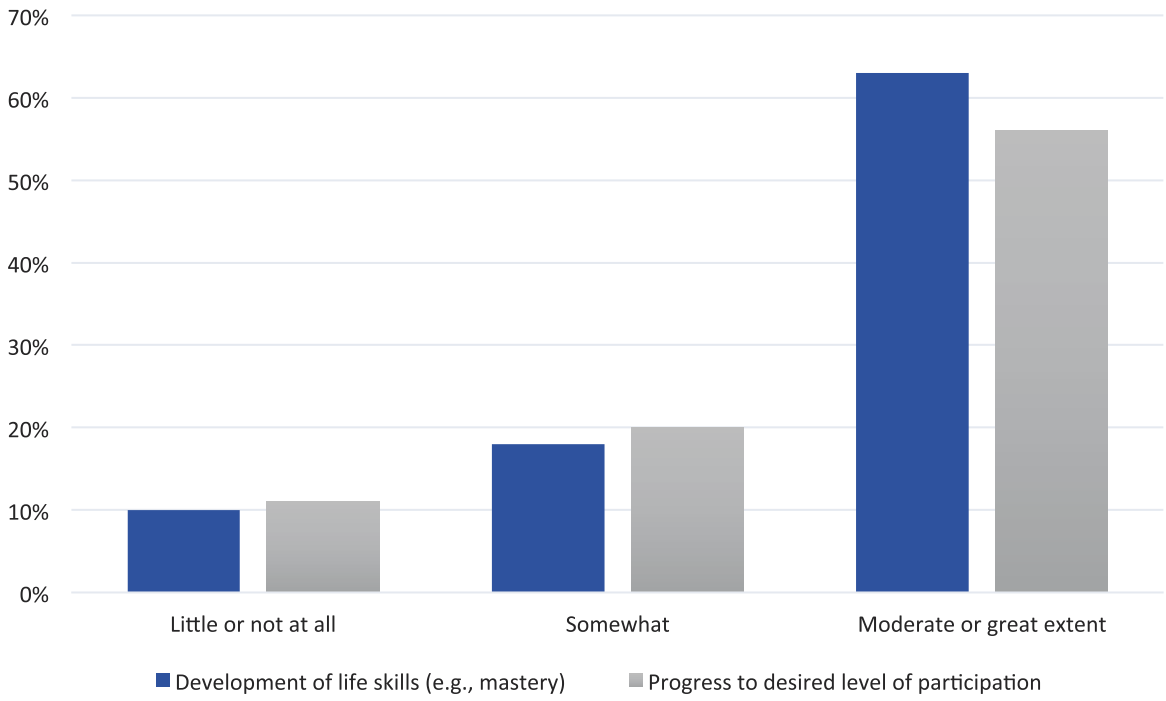
Chart 6: Percentage reporting that sport, physical activity, and recreation contributes to increased educational and occupational aspirations[11]



The CFLRI survey also explored the influence of sport, physical activity and recreation on the development of life skills such as mastery, confidence, empowerment, working individually or as a team, as well as perceptions of opportunities for growth. Specifically, more than half of respondents indicated that sport, physical activity and recreation contributed, to a moderate or great extent, to the development of life skills.[11] Similarly, about half (56%) indicated that sport, physical activity and recreation provided the ability to progress to their desired level of participation, skill or competition (see **Chart 7**).[11]

More than half of respondents indicated that sport, physical activity and recreation contributed, to a moderate or great extent, to the development of life skills.

Chart 7: Percentage indicating that sport, physical activity, and recreation allows for development of life skills and participation at desired level[11]



References for Social impact section

[1] Canadian Fitness and Lifestyle Research Institute. 2020 Sport Monitor. Monitoring and Tracking the Field: Available at (accessed July 26, 2023): https://cflri.ca/sites/default/files/2022-03/CFLRI-TrackingTheField-Sport%20Monitor-Volunteering-EN-Final.pdf

[2] Hahmann T, du Plessis V, Fournier-Savard P. (2020, June 26). Volunteering in Canada: Challenges and opportunities during the COVID-19 pandemic. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00037-eng.htm

[3] Smith GL, Banting L, Eime R, O'Sullivan G, van Uffelen JG. (2017). The Association between Social Support and Physical Activity in Older Adults: A Systematic Review. *Int J Behav Nutr Phys Act*; 14:56.

[4] Glover TD, Todd J, Moyer L. (2022). Neighborhood Walking and Social Connectedness. *Front Sports Act Living*; 4; 825224.

[5] Bailey R, Hilllman C, Arent S, Petitpas A. (2012). Physical Activity as an Investment in Personal and Social Change: The Human Capital Model. *J Phys Act Health*; 9: 1053-1055.

[6] Statistics Canada (2022). Population Estimates on July 1st, by Age and Sex. Table 17-10-0005-01. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1710000501

[7] Canadian Institute for Health Information. (n.d.). Infographic: Canada's Seniors Population Outlook: Uncharted territory. Available at (accessed July 26, 2023): https://www.cihi.ca/en/infographic-canadas-seniors-population-outlook-uncharted-territory

[8] Franke T, Sims-Gould J, Nettlefold L, Ottoni C, McKay HA. (2021). "It makes me feel not so alone": Features of the Choose to Move Physical Activity Intervention that Reduce Loneliness in Older Adults. *BMC Public Healt*h; 21:312.

[9] Leavell MA, Leiferman JA, Gascon M, Braddick F, Gonzalez JC, Litt JS. (2019). Nature-Based Social Prescribing in Urban Settings to Improve Social Connectedness and Mental Well-being: A Review. *Curr Environ Health Rep*; 6:297-308.

[10] Canadian Fitness and Lifestyle Research Institute. (2023). Social Support for Physical Activity and Sport. Custom analysis, 2019-2021 Physical Activity Monitor.

[11] Canadian Fitness and Lifestyle Research Institute. (2023). Custom analysis, 2023 Social, Health, Economic, and Environmental Impact survey.

[12] Canadian Fitness and Lifestyle Research Institute. (2022). Impact of Pandemic on Physical Activity in Key Settings. Monitoring and Tracking Field. Available at (accessed July 26, 2023): https://cflri.ca/sites/default/files/2022-04/B2.%20CFLRI-TTF-Impact-KeySettings-EN-FINAL.pdf

[13] Eigenschenk B, Thomann A, McClure M, Davies L, Gregory M, Dettweiler U, Inglés, E. (2019). Benefits of Outdoor Sports for Society. A Systematic Literature Review and Reflections on Evidence. *Int J Environ Res Public Health*; 16: 937.

[14] Wicks C, Barton J, Orbell S, Andrews L. (2022). Psychological Benefits of Outdoor Physical Activity in Natural versus Urban Environments: A Systematic Review and Meta-analysis of Experimental Studies. *App Psychol Health Well-Being*; 14:1037-1061.

[15] Wray A, Martin G, Ostermeier E, Medeiros P, Little M, Reilly K, Gilliland J. (2020). Physical Activity and Social Connectedness Interventions in Outdoor Spaces among Children and Youth: A Rapid Review. *Health Promot Chronic Dis Prev Can*; 40(4).

[16] Rivera E, Veitch J, Loh VH, Salmon J, Cerin E, Mavoa S, Villaneuva K, Timperio A. (2022). Outdoor Public Recreation Spaces and Social Connectedness among Adolescents. *BMC Public Health*; 22(165).

[17] Füzéki E, Engeroff T, Banzer W. (2017). Health Benefits of Light-Intensity Physical Activity: A Systematic Review of Accelerometer Data of the National Health and Nutrition Examination Survey (NHANES). *Sports Med*; 47(9):1769-1793.

[18] Kaczynski AT, Glover TD. (2012). Talking the Talk, Walking the Walk: Examining the Effectiveness of Neighbourhood Walkability and Social Connectedness on Physical Activity. *J Public Health*; 34(3): 382-389.

[19] Yip C, Sarma S, Wilk P. (2016). The Association between Social Cohesion and Physical Activity in Canada: A Multilevel Analysis. *SSM-Popul Health*; 2:718-723.

[20] Harrison RA, Gemmell I, Heller RF. (2007). The Population Effect of Crime and Neighbourhood on Physical Activity: An Analysis of 15461 adults. *J Epidemiol Comm Healt*h; 61:34-39.

[21] Perez L, Conway TL, Bauman A, Kerr J, Elder JP, Arredondo EM, Sallis JF. (2018). Sociodemographic Moderators of Environment-Physical Activity Associations: Results from the International Prevalence study. *J Phys Act Health*; 15(1): 22-29.

[22] Rees-Punia E, Hathaway E, Gay J. (2018, June). Crime, Perceived Safety and Physical Activity: A Meta-analysis. *Prev Med*; 111: 307-313.

[23] Ruijsbroek A, Droomers M, Groenewegen P, Hardyns W, Stronks K. (2015). Social Safety, Self-rated General Health and Physical Activity: Changes in Area Crime, Area Safety Feelings and the Role of Social Cohesion. *Health Place*; 31; 39-45.

[24] Samek DR, Elkins IJ, Keyes MA, Iacono WG, McGue M. (2015, July). High School Sports Involvement Diminishes the Association Between Childhood Conduct Disorder and Adult Antisocial Behavior. *J Adolesc Health*; 57(1):107-112.

[25] Spruit A, van Vugt E, van der Put C, van der Stouwe T, Stams G-J. (2016). Sports Participation and Juvenile Deliquency: A Meta-analytic Review. *J Youth Adolescence*; 45:655-671.

[26] Kwan M, Bobko S, Faulkner G, Donnelly P, Cairney J. (2014). Sport Participation and Alcohol and Illicit Drug Use in Adolescents and Young Adults: A Systematic Review of Longitudinal Studies. *Addict Behav*; 39.

[27] Fagan MJ, Duncan MJ, Bedi RP, Puterman E, Leatherdale ST, Faulkner G. (2022). Physical Activity and Substance Abuse among Canadian Adolescents: Examining the Moderating Role of School Connectedness. *Front Public Health*; 10:889987.

[28] Walczak B, Walczak A, Tricas-Sauras S, Kolodziejczyk J. (2023). Does Sport Participation Protect Adolescents from Alcohol Consumption? A Scoping Review. *Int J of Environ Res Public Health*; 20:5417.

[29] Taliaferro LA, Eisenberg ME, Johnson KE, Nelson TF, Neumark-Sztainer D. (2011). Sport Participation during Adolescence and Suicide Ideation and Attempts. *Int J Adolesc Med Health*; 23(1):3-10

[30] Müller B, Georgi K, Schnabel A, Schneider B. (2009). Does Sport have a Protective Effect against Suicide? *Epidemiol Psichiatr Soc*; 18(4):331-5.

[31] Watson A, Timperio A, Brown H, Best K, Hesketh KD. (2017). Effect of Classroom-based Physical Activity Interventions on Academic and Physical Activity Outcomes: A Systematic Review and Meta-analysis. *Int J Behav Nutr Phys Act*; 14(114).

[32] White MI, Dionne CE, Wärje O, Koehoorn M, Wagner SL, Schultz IZ, Koehn C, Williams-Whitt K, Harer HG, Pasca R, Hsu V, McGuire L, Schultz W, Kube D, Wright MD. (2016). Physical Activity and Exercise Interventions in the Workplace Impacting Work Outcomes: A Stakeholder-Centered Best Evidence Synthesis of Systematic *Reviews. Int J Occup Environ Med*; 7(2):61-74.

[33] Kosteas VD. (2012). The Effect of Exercise on Earnings: Evidence from NLSY. *J Labor Res*; 33.

ENVIRONMENTAL IMPACTS

The environmental impacts generated by sport, physical activity and recreation have been estimated at $42.5 billion. This value reflects the replacement value of sport and recreation facilities and active transportation infrastructure in very poor, poor and fair condition.

ENVIRONMENTAL IMPACT

The physical and built environment (i.e., the surrounding conditions where individuals live, work and play) have been recognized as an important determinant of health.[1] For example, parks, forests and other green spaces have been shown to have a positive impact on mental health and have been linked to increased physical activity. Conversely, air pollution, exposure to contaminants and effects of climate change have the potential to negatively affect overall health, as well as participation in sport and physical activity. This report describes the environmental impacts on sport, physical activity and recreation specifically by looking at air pollution, increasing active transportation, public transit, parks, and green spaces, and the state of infrastructure and facilities. **The environmental impact of sport, physical activity and recreation has been estimated at $42.5 billion in 2020, based on replacement costs for sport and recreation facilities and active transportation infrastructure in very poor, poor, and fair condition.**

Climate change and air pollution

> **The environmental impact of sport, physical activity and recreation has been estimated at $42.5 billion in 2020.**

Globally, the World Health Organization (WHO) names outdoor air pollution as one of the most significant environmental risks to health, including risks of premature mortality, stroke, heart disease, lung cancer, and respiratory diseases.[2] Worldwide, the WHO estimates that outdoor air pollution has caused 4.2 million premature deaths in 2019, with most occurring in low-to-middle income countries.[2] Indeed, the WHO has established air quality guidelines that provide thresholds for air pollutants that can impact health.[3] Air pollution can result from human activities such as transport and industries including oil and gas or electricity production. It can also evolve from natural sources such as volatile organic compounds, dust, volcanoes and forest fires.[4]

Canada has also developed standards for health and environmental outdoor air quality called the Canadian Ambient Air Quality Standards.[5] The standards test for four types of pollutants (fine particulate matter [$PM_{2.5}$], ground level ozone [O_3], nitrogen dioxide [NO_2], and sulphur dioxide [SO_2]), but seven standards were included based on these four pollutants (so for example, it may include a derivative of hourly plus annual); all seven must be met for air quality to be determined as achieving the standards.[5] Based on these standards and the most current reporting (which is 2017-2019), 29% of Canadians lived in areas where the outdoor air pollutant concentrations were beyond the standards; yet this percentage has decreased over time from 37% in 2005-2007 to 32% in 2016-2018.[5]

As mentioned, air pollutants can have an impact on health, the environment and on the economy. In terms of the influence on the environment, nitrogen and sulphur oxides can have a bearing on the development of acid rain which can damage, destroy or affect rock formations, soil, water sources, vegetation and wildlife.[4] When combined with other pollutants, it can also affect the acidity of water bodies impacting fish and wildlife.[4] Fine particulate matter can contribute to haze and reduced visibility, or can impact plants, vegetation and soils by hindering photosynthesis.[4] Ground-level ozone can affect the ecosystem, including a decrease in forested areas.[4] The environmental impacts will ultimately result in significant economic costs related to renovation and maintenance of infrastructure, in addition to the impact on the wildlife, fisheries, agriculture, and forestry sectors, among others.[4]

Air pollution also has a significant impact on health. In terms of specific pollutants, nitrogen and sulfur oxides affect the lungs, reducing function and also increasing asthmatic symptoms.[4] $PM_{2.5}$ and ground-level ozone act as an irritant on the eyes, nose and throat; negatively affect breathing, exacerbate respiratory conditions such as chronic obstructive pulmonary disease and asthma, increase the risk of developing cardiovascular disease, and may cause premature death.[4] Carbon monoxide enters the blood stream through lungs and can affect exercise capacity, perception and learning functions.[4] In essence, $PM_{2.5}$, NO_2, and O_3 are the pollutants that yield most of the health impacts.[6] Within Canada, air pollutant exposure is associated with increased heart and respiratory conditions leading to increased direct and indirect impact on the health care system, such as hospital and emergency room visits, hospitalization, reduced productivity or premature death.[6]

Canada is among the countries with the lowest levels of $PM_{2.5}$ but despite this, air pollution is the eleventh risk factor for premature death and disability and is cited as the top environmental risk.[6] Based on 2016 population data, and concentrations of air pollutants between the period of 2014 to 2017, it resulted in an estimated 15,300 premature deaths annually, with the health care cost attributable to air pollution being about $120 billion per year.[6] Based on 2016 dollars, provincial and territorial estimates of premature death attributable to certain air pollutants are described in Table 5 and totals approximately $114 billion.[6] In addition to mortality, morbidity was estimated as $5.6 billion in 2016 dollars, for a total of $120 billion.[6] This set of estimates includes air pollutants from human production, as well as natural contributions, including forest fires.[6] Pre-pandemic, the trend in percentage of deaths attributed to short-term exposure to O_3 and $PM_{2.5}$ was decreasing over time, whereas the risk of hospitalizations due to O_3 was increasing, but had not significantly changed for $PM_{2.5}$.[7]

Table 5: Premature deaths attributed to certain air pollutants by province and territory, 2016[6]

	Total cases/ 100,000	NO_2	$PM_{2.5}$	Ozone	2016 Value (in millions)
Canada	42	1,300	10,000	4,100	$114,000
Newfoundland and Labrador	18	10	35	46	$690
Prince Edward Island	0	3	10	16	$220
Nova Scotia	29	20	150	98	$2,000
New Brunswick	5	14	110	66	$1,400
Quebec	48	330	2,800	920	$30,200
Ontario	47	570	4,200	1,780	$49,200
Manitoba	33	35	300	100	$3,300
Saskatchewan	36	29	280	97	$3,000
Alberta	33	120	850	430	$10,400
British Columbia	40	170	1,200	470	$13,900
Yukon	11	0	3	1	$31
Northwest Territories	9	0	3	1	$32
Nunavut	3	0	0	1	$6

Although, in general, most of the air pollutant emissions cited in this report have declined since 1990, more recent environmental changes have the potential to impact health care costs.[7] For example, the Canadian Climate Institute estimates that the forest fires raging across the country in 2023 will have a significant effect on health care costs. Indeed, wildfire-related health care costs are estimated at $1.28 billion in Ontario between June 4 and 8, 2023.[8] These costs were calculated using the fine particulate matter and other pollutants during that time period that produced air quality results by a population factor. In addition, the Canadian Climate Institute's "The Health Costs of Climate Change" report estimates that by 2050 the cost of extreme heat-related deaths and reduced quality of life would range from $3 to $4 billion per year, and heat-related labour-productivity losses between $3.9 to $5.4 billion per year.[9] These estimates do not account for the environmental and ecological impact costs of the wildfires or the economic and social costs for limiting and/or cancelling sport and recreational opportunities at school or in communities, provincially, territorially, or nationally that are also associated with these events. With the health implications of these extreme values, the extent and number of wildfires across the country, and the impact on the already burdened health care system, the implications of these and other environmental catastrophic events will need to be monitored very closely over time to assess potential long-term impacts.

In 2015, the WHO member states signed off on a resolution and plan of action to address the health impact of air pollution.[2] As examples of promising policies, the WHO suggested prioritizing public transit, improving active transportation networks, rail and passenger travel systems, transitioning to low-emission vehicles, improving energy efficiency of facilities, or greening of cities.[2] These types of policies direct the indicators that this report will examine in the next few sections.

In addition, on June 27, 2023, the Ministry of Environment and Climate Change Canada released Canada's first National Adaptation Strategy, which estimates that "every $1 invested in adaptation measures now will save up to $15 in costs across the economy".[10] The goal of the strategy is to increase resilience to the consequences of climate change, such as flooding, wildfires or extreme heat and to have resilience planning at the municipal level.[10] This will involve funding from Environment and Climate Change Canada and other departments such as Infrastructure Canada that have committed funding to projects that protect the natural environment, support communities and assist with the economy.[10] The indicators for progress for Canada's National Adaptation Strategy are aligned to those identified for measurement in this report, namely the percentage of households with park or green space close to home, and the percentage of tree canopy cover in urban areas (urban greenness), as examples.[11]

Active travel and public transit

Active transportation – Active transportation involves movement by human activity or human-powered aids (such as bicycles, e-bikes, scooters, wheelchairs, rollerblades, skates).[12] From a governmental policy perspective, climate change and air pollution have been gaining interest, including a focus on the potential role that active transportation can play in curbing air pollution. This is apparent through international mechanisms such as the WHO's Global Action Plan on Physical Activity (GAPPA)[13] and the Sustainable Development Goals[14] and at a national level through the development of the National Active Transportation Strategy[12] and Canada's 2030 Agenda National Strategy.[15]

> **Climate change and air pollution have been gaining interest, including a focus on the potential role that active transportation can play in curbing air pollution.**

The GAPPA describes several relevant policy actions such as the support of cohesive urban and transport planning policies, improved walking and cycling networks, and implementation of policies and actions for road safety.[13] Being a pedestrian or a bicyclist involves some risks, as fatalities and serious injuries are too common. Internationally, there were roughly 1.4 million road fatalities in 2016, of which 25% were pedestrians and cyclists in the Americas.[16] Looking at Canada more specifically, there were 1,768 motor vehicle fatalities, 8,185 serious injuries, and 108,018 total injuries in Canada in 2021.[17] Among the fatalities, 15.8% involved pedestrians and 2.5% involved bicyclists.[17] **Table 6** shows the trends in fatalities involving pedestrians and bicyclists between the periods of 2019-2021 in Canada. Among serious injuries, 14% are among pedestrians and 4.7% are among bicyclists in 2021.[17] In 2018, the costs of transport incidents among pedestrians and bicyclists were in the hundreds of millions (see **Table 7**).[18]

Table 6: Number and percentage of traffic fatalities overall and involving pedestrian and bicyclists[17]

		2019	2020	2021
Total fatalities	Number	1,756	1,746	1,768
	Percentage	100%	100%	100%
Pedestrians	Number	301	286	280
	Percentage	17.1%	16.4%	15.8%
Bicyclists	Number	39	51	44
	Percentage	2.2%	2.9%	2.5%

Table 7: Transportation incidents by injury outcome, cost in millions, 2018[18]

2018	Deaths	Hospitalizations	Emergency visits	Disability	Total
Total incidents	$1042	$731	$1,079	$765	$3,617
Pedestrians	$156	$125	$81	$76	$438
Bicyclists	$33	$72	$143	$129	$377

Despite these negative implications and costs, the benefits of active transportation are compelling. It has the potential to curb air pollution and greenhouse gas emissions as it is essentially "non-polluting and among the most environmentally friendly forms of transportation."[19] As emissions are highest while a vehicle combustion engine is warming, the replacement of short trips with alternative options have the potential to reduce emissions considerably.[19] Given that an individual who uses a bicycle for commuting over a car is about one-tenth of the "ecological footprint," the use of cycling or walking as a replacement is an obvious choice.[19]

If you often drive in a major urban centre, at some point you have probably experienced the frustration of being stuck in rush hour traffic. That congestion contributes to air and noise pollution as well as greenhouse gas emissions, and the associated excessive cost required for construction and maintenance to support the wear-and-tear on our roadways and highways, and has driven the need to find alternative solutions to vehicle use. Indeed, it is estimated that traffic congestion and a lack of transit alternatives costs $15 billion in lost productivity annually.[20] As such, this has become an important priority in public policy for governments at all levels, and up-to-date evidence on influencing factors are both required and are essential for properly conducting these assessments; this could include the effects of the pandemic on commuting and the shift from working at an office to telecommuting, public fears about using public transit during the pandemic, the climate change effects on road access and serviceability (e.g., flooding causing the inability to use major arterial highways for extended periods or the effect of excessive heat on asphalt), or the substantial increase of owning and operating a private vehicle. For example, pandemic-related supply chain issues and inflation have pushed up the price of new or used cars by roughly 19-20%, and inflation and tax increases have driven up interest rates and fuel costs, resulting in an average annual cost of owning and operating a vehicle at about $13,000 per year.[21]

Researchers have attempted to calculate the cost-benefit ratio for bicycle infrastructure investment in three Canadian cities using three scenarios: no change, a moderate 2% increase in bicycling infrastructure, and a major 5% increase in infrastructure, between the periods of 2016 to 2020. The outputs in their calculation looked at reductions in premature death and carbon emissions and the investments ranged from $28 to $69 million.[22] Using the moderate 2% increase in infrastructure scenario, the benefit-to-cost ratio ranged from 1.7:1 to 2.1:1, and the outcomes ranged from 9-18 prevented premature deaths and a range of 87,000-142,000 tonnes less carbon over 10 years.[22] For the major 5% increase, the benefit-to-cost ratio ranged from 3.9:1 to 4.9:1 to produce outputs with a range of 19-43 premature deaths prevented and 209,000-349,000 tonnes less carbon.[22]

Given that an individual who uses a bicycle for commuting over a car is about one-tenth of the "ecological footprint," the use of cycling or walking as a replacement is an obvious choice.

Although only representing three cities, it is interesting to recognize the potential benefit that exceeds investment to assist governments to justify investment in bicycling infrastructure. In New Zealand, the estimated benefit-to-cost ratio for a comprehensive program that went beyond investment in active transportation infrastructure to include shared spaces, training, and media campaigns and events yielded an 11:1 ratio with a discounted rate of 3.5%.[23] Also not to be lost is the impact of e-bike use on modes of transportation. In one Switzerland study, researchers simulated various modes of commuting for work including cars, electric vehicles, e-bikes, and e-bike and electric vehicles; they found that the latter combination of e-bikes and electric vehicles produced the most greenhouse gas reduction (17.5%), followed by the e-bike mode (10%), although the findings fluctuated based on seasons and weather.[24]

The COVID-19 pandemic impacted transportation dynamics with a shift to working at home, public health restrictions reducing access to workplaces, business closures and job losses.[25] In comparison to 2016, the May 2021 passenger vehicle commuting number dropped by 1.7 million in Canada.[25] Car commuting then rebounded from 11 million in May 2021 to 12.8 million in May 2022.[25] During the same periods, the number of individuals taking public transit dropped from almost 2 million in 2016 to 1 million in May 2021, although the public transit ridership only rebounded slightly to roughly 1.2 million in May 2022.[25] It will be important to see if public transit use returns to pre-pandemic rates, given that governments are investing considerably in lower-carbon alternatives, including public transportation, in order to meet international commitments.[25]

There was also a drop in active commuters (e.g., walking and cycling) by almost 300,000 between May 2016 (1,100,000) and May 2021 (811,000).[25] Between May 2021 and May 2022, there was a slight increase in walkers (roughly 75,000) and bicyclists (approximately 78,000). With the federal investment of $400 million for active transit in support of the National Active Transportation Strategy, it will be important to monitor the changes in active commuting behaviour over time with modernized, improved or better maintained infrastructure resulting from this considerable investment.[25] As the broader *Investing in Canada Plan*, over $236 million has been invested in approximately 300 active transportation projects, and almost $15 billion in public transit projects.[12]

Although calculating the cost of modifying behaviour from a private vehicle-dominated culture to that of commuting actively is very complex, we have used a simplistic model in this report to attempt to determine an approximate value associated with the reduction of greenhouse gas emissions related to the reduction of car use.

First, the percentages of the main three emissions (carbon dioxide, methane, and nitrous oxide) were determined based on estimates per tonne for private vehicles.[26] The cost per each of these types of pollutants were derived using U.S. dollars and converted into Canadian dollars based on the year of accessible data.[27] These values were then multiplied by the average tonnes of greenhouse gas emissions per vehicle per year (estimated at 4.6 tonnes), which yielded the cost in greenhouse gas emissions per private vehicle.[28] During this same time period, there were approximately 23,472,111 private vehicles under 4,500 kilograms,[29] and so the economic value produced was multiplied by this number to yield the total emissions of all of these private vehicles and was estimated at about $56.4 billion in 2019/2020. Using this very rudimentary approach, several incremental goals can be adopted to change the behaviours and convert approximately:

- **1% of private car use to active transportation, the greenhouse gas emission savings would be approximately $564 million in savings per year**
- **5% conversion would be approximately $2.82 billion in savings per year**
- **10% conversion would be approximately $5.64 billion in savings per year.**

Public transit – Public transit systems are an important investment in communities. There are considerable benefits of public transit that have been assessed a monetary value.[30] According to the Canadian Urban Transit Association, and based on 2018 data, public transit:

- produces an economic benefit of roughly $19 billion/year;
- employs 59,600 individuals;
- reduces household vehicle operating costs by about $12.6 billion/year;
- reduces the cost of traffic collisions by roughly $3.2 billion/year;
- reduces annual greenhouse gas emissions by 4.7 million tonnes (est. $207 million);
- produces about $137 million in annual health care savings specific to respiratory conditions.[30]

Clearly, the economic benefits of public transit systems include the development of employment, from construction and operations to other types of supplemental industries. Public transit also benefits municipalities through land development, facilitating movement, and reducing the hospitalizations, injuries, and emissions and air quality such as greenhouse gas emissions and air pollutants associated with traffic and congestion. Households can benefit from reduced transportation costs.[30] The federal government, however, has proposed the Canadian Net-Zero Emissions Accountability Act to establish targets towards net-zero emissions by 2050; this will yield accountability for various sectors including public transportation and governmental buildings.[20] In part, the strategy includes electrifying the public transit systems, purchasing 5,000 zero-emission public transit and school buses, and involving the National Active Transportation Strategy to encourage more active modes of commuting.[20]

Based on 2017 data, it is estimated that public transit systems are available to about 23 million Canadian residents, and that the ridership was about 2.1 billion trips. But as mentioned previously, these ridership numbers decreased considerably during the pandemic and the rebound has been slower than expected at an estimated 1.2 million as of May 2022.[30] According to CFLRI's 2023 Social, Health, Economic, and Environment Impact survey, 78% of Canadians have a public transit system available in their community, but only 14% use it frequently, 13% use it sometimes, and 25% rarely do; the remaining 48% never use public transit.[31]

Public transit typically involves some active transportation/physical activity to get to and from stops or stations, which can be of value and can potentially contribute to the percentage of people achieving physical activity guidelines. The contribution of active transportation to transit, however, is complicated to measure given that in many self-reported assessments, the typical mode of transportation is probed, yet not the supporting amount of physical activity (so for example, an individual may state that they typically take public transit, yet the assessment may not ask how much active commuting is involved using that typical mode).[32] Further, there are potential confounding impacts on walking for public transit given that public transit is more readily available in denser and higher mixed area uses, which are also associated with more walking.[33]

Some research, however, shows that the energy expenditure level is significantly higher for public transit users over car users, with their time spent walking ranging from 8 to 33 minutes per day.[32] Models within other countries have estimated that even if the amount walking for transportation was on the lower end of this range, it would lead to considerable increases in physical activity and improvements to population health.[32] Based on American transit use, it is estimated that about one-third of transit users reached activity guidelines just based on the walking associated with using public transit.[33] In some research, transit users achieved more daily physical activity overall and through walking overall and walking specifically for transit use than non-transit users, but these rates varied based on the frequency of transit use; those with the highest level of transit use generally had higher level of physical activity, walking overall, and transit-related walking.[33] Furthermore, transit use also increases walking to other destinations near home or work.[34] Based on regional data from Montreal, it is estimated that a transit trip involves 1,250 steps one-way (included in this value would be accessing and leaving the transit system and also for connections), yielding about 2,500 steps for a return trip; this value is estimated to represent about 25% of the recommended level of physical activity per day.[35]

Promoting public transit use would benefit not only the environment and household expenses (e.g., households can save roughly $10,000 per year by using public transit),[36] but would also improve activity levels and therefore potential savings to public health and health care costs, more generally. Additional benefits include the reduced health impact of less air pollution for those living in high density, high traffic volume areas (about one-third of the population) and fewer traffic fatalities, as the rates are lower for public transit.[36]

There is added economic value for the conversion of car usage to active transportation. A typical travel lane on a typical road can accommodate approximately 600-1,600 private vehicles per hour, whereas a two-way bike lane can provide for 7,500 bicycles per hour and a sidewalk can accommodate 9,000 individuals per hour.[12] Based on 2020 Infrastructure data, however, estimated replacement value for sidewalks in the country that are in poor or very poor condition sits at about $2.9 billion, and add on another $4 billion to replace those in fair condition.[37] For other core assets like footbridges, paved pathways, and non-paved trails, the estimated replacement value is $562 million for those in poor or very poor condition, and another $1.5 billion for those in fair condition **(all told, the replacement value for active transportation-related infrastructure in fair, poor, or very poor condition is $9 billion)**.[37] Although these are substantial numbers, it does not compare to the replacement value of $127 billion for roadway repair of road systems that are in very poor or poor condition.[37] Indeed, pedestrian and bicycling infrastructure creates roughly 46% more jobs than road-only projects, whereby bicycle projects create 11.4 jobs, pedestrian project create 10 jobs, multi-use trail projects create 9.6 jobs, and road projects create 7.8 jobs.[12]

Role of municipalities in active transportation – Municipalities and communities across Canada play a huge role in the movement of Canadians, from the funding to the development and planning of infrastructure and by-laws. CFLRI has surveyed municipalities over time (e.g., roughly every five to seven years since 1999) to assess infrastructure access and needs regarding active transportation. In the most recent iteration of the CFLRI municipal survey in 2020, the scenario related to active transportation is as follows in the country (among municipalities with at least 1,000 residents):

- 17% of municipalities have a formal plan involving active transportation. This is in comparison to 42% who have a formal plan for parks and recreation
- 36% of municipalities have designated bicycle lanes on roads
- 82% have multi-use trails that can be used for active transportation with no motorized vehicles
- 39% have multi-use trails that can be used for active commuting that are also used by motorized vehicles.[38]

In addition, municipalities and communities also have infrastructure that can support physical activity, including:

- bicycle carriers on public transit (19% of municipalities with at least 1,000 residents)
- bicycle parking at transit park and ride lots (21%)
- school safety zones with reduced speed limits (73%)
- walkable or pedestrian-friendly downtown core (56%)
- crossing guards at designated intersections (45%)
- walking school bus programs (7%)
- pedestrian friendly elements located at box store development location and retail parking lots (9%).[38]

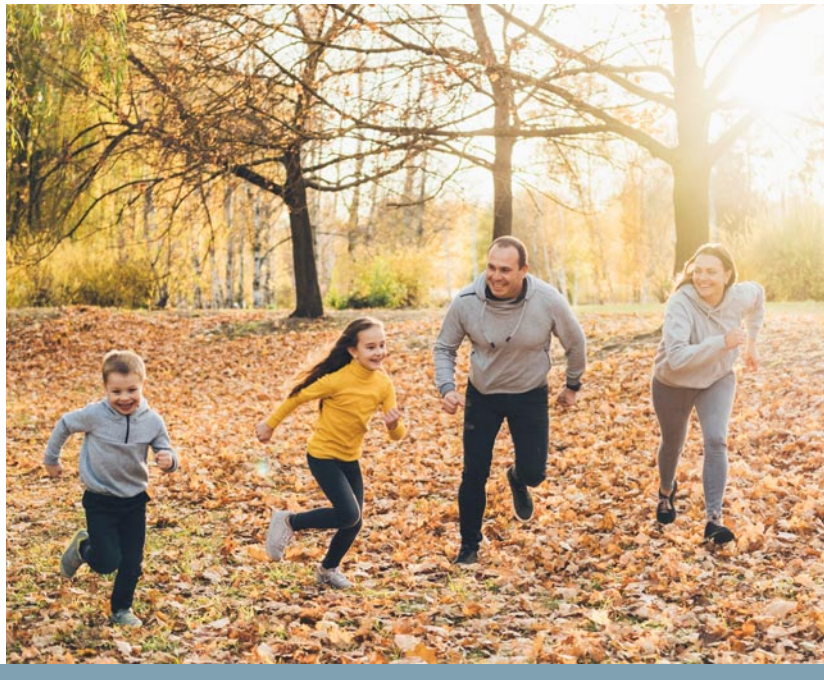
Sport and recreational facilities, green spaces and natural environments

The Global Action Plan on Physical Activity extended its policy actions to include the strengthening of facilities and infrastructure to support physical activity. This includes improved access to quality public and green open spaces and ensuring that policy, regulations and design promote facilities that are designed to ensure individuals of varying abilities can be active.[13]

Canada has many and diverse natural environments: it has 28% of the world's boreal forest; 24% of the world's wetlands, and 20% of the world's freshwater resources and its longest coastline.[20] Nature-based alternatives for reducing emissions include the planting of trees, maintaining of grassland and wetlands, and improved agricultural techniques.[20] Parks and green spaces are important for the cooling of urban heat island effects.[39,40] Some research has calculated that a single square kilometre of green space per 1,000 people could possibly prevent up to 7.4 deaths caused by heat, and parks have a cooling effect of 0.94 °C.[40,41] Beyond these outdoor spaces, it is important to establish emission standards for buildings and ensure that facilities meet such standards. Information about other types of recreational facilities is less available than it is for parks, although infrastructures that have considerable heating or cooling requirements typically have a greater negative impact on climate through higher energy consumption per square metre.[40]

The federal government intends to invest over $3 billion to plant two billion trees and roughly $630 million to restore wetlands, peatlands, grasslands and agricultural lands.[20] Through the *Investing in Canada Infrastructure Program*, the federal government is committing in excess $33 billion to public infrastructure projects across the country. This includes a stream for Community Culture and Recreation Infrastructure with an aim to invest in upgrades to recreational facilities, like arenas, and both indoor and outdoor recreational spaces; with this funding, there will be a climate focus to ensure climate-considered infrastructure and those projects that will reduce energy costs.[42]

Availability, satisfaction, and usage of parks, green space, natural environments, trails and pathways – The 2023 CFLRI survey asked Canadians about the availability of, distance to, satisfaction with, and usage of various types of green and natural environments for physical activity. Based on this data, 94% of adults indicated the availability of parks, green spaces, natural environments or waterways in their community.[31] Most adults (76%) indicated that parks, green spaces, natural environments or waterways are less than one kilometre from their household, 12% reported between one to two kilometres, 8% stated between two to five kilometres, 4% report over five kilometres.[31] The survey also asked about the availability of trails and pathways; 91% of adults indicated that these are available in their community. Two-thirds of adults (66%) reported that trails or pathways were less than one kilometre from their household, 15% indicated between one to two kilometres, 11% cited between two to five kilometres, and 8% report over five kilometres away.[31]

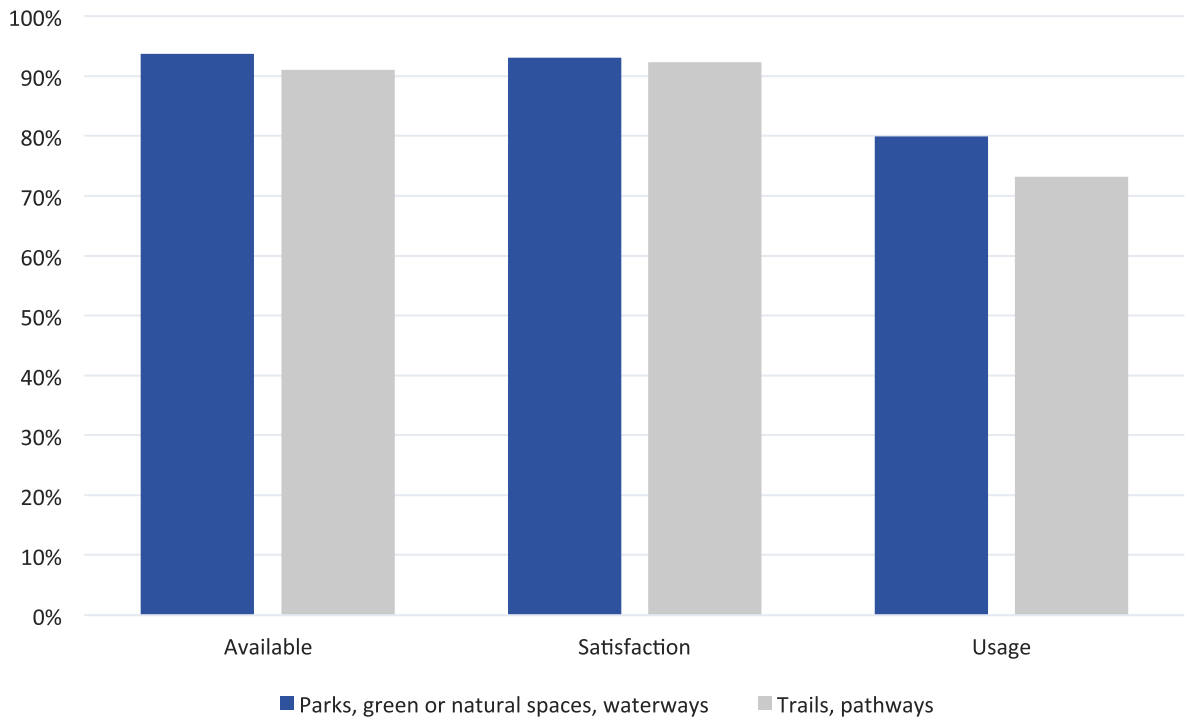


In addition to availability, the survey asked about satisfaction with these facilities in terms of quality, accessibility and usage. Regarding *parks, green spaces, natural environments or waterways*, 68% of adults indicated that they were very satisfied with the *quality* of these types of facilities, 25% were somewhat satisfied, 2% were not at all satisfied, and 5% were unsure.[31] Very similar findings were reported for the *accessibility* of these spaces; 67% were very satisfied, 25% somewhat satisfied, 3% not at all satisfied, and 6% unsure.[31] Relative few (20%) never or rarely used parks, green spaces, natural environments and waterways in their communities, while 80% at least sometimes have.[31]

For *trails, walking or bicycling pathways,* 67% of individuals stated that they were very satisfied with the *quality* of these facilities, 25% were somewhat satisfied, whereas 3% were not at all satisfied with the quality, and 4% were unsure.[31] Once again, similar findings exist for the satisfaction with *accessibility* of trails, walking or bicycling pathways; 66% indicated that they were very satisfied, 25% reported that they were somewhat satisfied, 4% were not at all satisfied, and 6% were unsure. Roughly one-quarter of adults (27%) never or rarely used trails or pathways whereas 73% at least sometimes have.[31]

Based on this most recent CFLRI data, parks, green spaces, natural environments and waterways, trails and pathways are readily available in most communities, and there are high ratings of satisfaction with the facilities.[31] In addition, the majority of adults (73% and higher) used these natural environments and green spaces at least sometimes.[31]

Chart 8: Availability, Satisfaction, and Usage of Parks, Green Space, Natural Environments, Trails and Pathways[31]

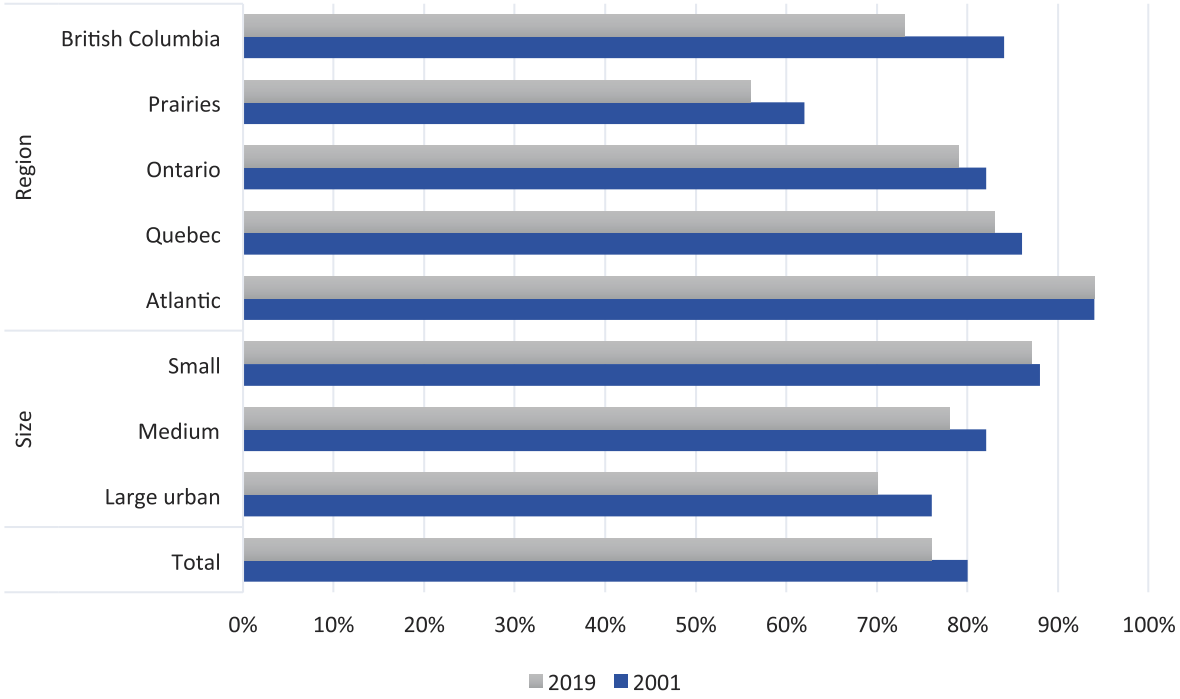


The facilities and ecosystems that support trees cannot be overstated in terms of their role on air pollution reduction, cooling, and aesthetics.[43] In the United States, it is estimated that the pollution removed by urban trees was 651,000 tonnes per year.[43,44]

Nowak et al. conducted a study in 2010 to investigate the removal of key air pollutants by urban trees by estimating the amount of air pollution removed within 86 cities in Canada and also estimating the monetary value on health.[43] The findings of the study indicated that about 16,500 tonnes of air pollution was removed in the 86 cities with an estimated health value of $227.2 million. If that same estimate was inflated to today's monetary value, it would be approximately $295 million in 2022. Beyond air quality improvement, trees also moderate air temperatures and urban heat islands, and affect building energy use.[43] In terms of urban planning, adding trees to areas of high population density could help to reduce pollution while providing other benefits including reduced temperatures, natural environment connections, and aesthetics.[43]

Despite these benefits, urban greenness, which indicates the vegetation in urban areas including parks and publicly and privately owned green spaces, declined in Canada between 2001 and 2019, although the majority (76%) of land in cities, towns and suburbs in southern Canada were green in 2019.[45] Changes in urban greenness can occur with urban expansion and growth, or through natural factors such as climate conditions, and insects.[45] Decreases in urban greenness occurred mainly in medium and large population centres; 77% of large population centres and 71% of medium population centres had seen their urban greenness decrease between 2001 and 2019.[45] Small population centres had the highest average urban greenness and roughly one-third (35%) were considered entirely green; on average medium (78%) and small population centres (87%) were greener than large urban areas (70%).[45]

Chart 9: Urban greenness by population size and region, 2001-2019[45]



The pandemic provided somewhat of a catalyst for cities and governments to reconsider urban design; municipalities nimbly acted on opportunities to increase physical activity opportunities in outdoor spaces and places while the public health regulations restricted access to indoor facilities. Cities around the world began to progressively re-think urban design to address sprawl, car dependency, air pollution, and green spaces.[39] Various designs and formats have been proposed globally and are briefly described here:

The pandemic provided somewhat of a catalyst for cities and governments to reconsider urban design; municipalities nimbly acted on opportunities to increase physical activity opportunities in outdoor spaces and places.

- *Compact cities:* promote higher density and diversity, increases land use, reduces travel requirements and increases alternative modes of transportation;
- *Superblocks:* reduce the access of motorized traffic to a block of nine areas within a grid of streets. Less car use helps to reduce premature death, pollution, heat, and increase green space;
- *Low traffic neighbourhood:* limit car access with planters or barriers of some sort, increase safe walking and cycling, aesthetics, increase greening, reduce car ownership, street crime, and injuries, yet increase social connections;
- *15-minute city:* incorporate work, school, shops, entertainment, and recreation within 15-minute active transit commutes. The goal is to reduce air and noise pollution and traffic while promoting active communities and increasing social connections;
- *Car-free city:* establish car-free zones yielding pedestrian-friendly centres, shopping, restaurants, workplaces, and schools. This type of design contributes to reduced air and noise pollution, increased physical activity, and green spaces.[39]

These various models help to ensure the greening of communities and have the potential to considerably impact the physical and mental health of the population, contribute to healthier ecology, reduce air pollution, and assist in achieving the country's goals to combat climate change.[39] With considerable population growth expected and the need for urban growth and continued expansion to accommodate, it will be important to monitor the impact that development has on the greenness and availability of parks, as ultimately, this will impact human health. Developing environmental-friendly design in urban development is a critical piece. In addition, the federal commitment to plant two billion trees and restore wetlands, peatlands, grasslands, and agricultural lands could support this.[20] In a similar way, the continued measurement and surveillance within the Canada's National Adaptation Strategy of the percentage of households with park or green space close to home, and the percentage of tree canopy cover in urban areas (urban greenness), will also help to determine if these population shifts will impact these important environmental indicators.[11]

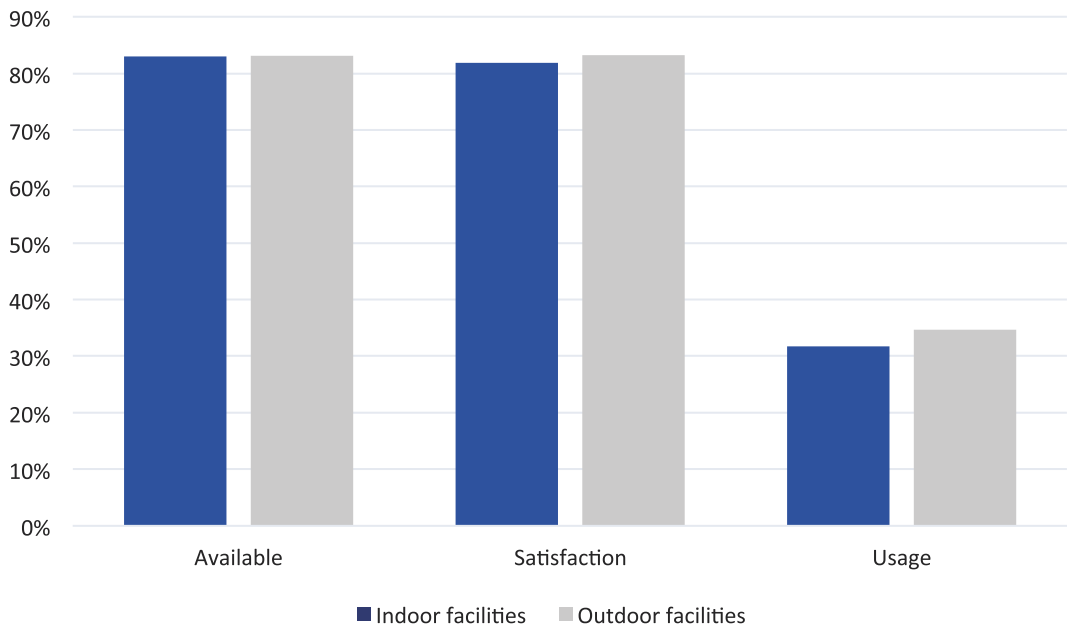
Availability, satisfaction, and usage of sport and recreational facilities – The recent CFLRI 2023 survey asked Canadians about the availability of, distance to, satisfaction with, and usage of, various types of sport and recreation facilities, as well as multi-purpose facilities. Based on this data, 83% of Canadians reported having indoor sport and recreation facilities in their community.[31] In terms of distance to these types of facilities, 28% of adults indicated that there are *indoor sport and recreation facilities* less than one kilometre from their household, 21% stated between one to two kilometres, 27% indicated between two to five kilometres; and 24% report over five kilometres.[31]

Similarly, 83% of Canadians reported available *outdoor sport and recreation facilities* in their community, with 46% indicating that outdoor sport and recreation facilities were less than one kilometre from the household, 20% between one to two kilometres, 18% between two to five kilometres, and 16% over five kilometres away.[31]

The survey also asked about satisfaction with these facilities in terms of quality and accessibility and about the usage of these facilities. For *indoor sport and recreation facilities*, 52% of Canadians reported being very satisfied with the *quality* of facilities, 30% were somewhat satisfied, 4% were not at all satisfied, and 14% were unsure.[31] Similar results appeared for *accessibility*: 49% of adults were very satisfied, 31% somewhat satisfied, 6% not at all satisfied, and 15% unsure with the accessibility of *indoor sport and recreation facilities*.[31] Despite this satisfaction, 68% never or rarely use *indoor sport and recreation facilities*, whereas 32% at least sometimes do.[31]

In terms of the outdoor facilities, 51% of Canadians reported that they were very satisfied with the *quality* of *outdoor sport and recreation facilities*, 32% were somewhat satisfied and 2% were only a little satisfied or not at all, while 14% were unsure.[31] In terms of satisfaction with the *accessibility* of *outdoor sport and recreation facilities*, 52% reported being very satisfied, 30% somewhat satisfied, 4% not at all satisfied, and 15% unsure. As with indoor, 65% never or rarely used *outdoor sport and recreation facilities*, while 35% at least sometimes do.[31]

Chart 10: Availability, Satisfaction and use of indoor and outdoor sport and recreation facilities[31]



Replacement value

There are clear disconnects between the availability, satisfaction and usage of the sport and recreation facilities in Canadian communities, yet less so for the natural environments and the green spaces. Although indoor and outdoor sport and recreation facilities are available, relatively few adults use them to at least some degree. Conversely, outdoor parks, green spaces, environments, and trails and pathways are both available and fairly well used to at least some degree.

To understand this relationship, it is important to understand perceptions of some key barriers associated with the environment. A considerable percentage of Canadians (83%) felt that sport, physical activity and recreation facilities are safe (e.g., free from crime and harassment, well-lit).[31] Yet 74% of adults stated that they find sport, physical activity and recreation opportunities not affordable at all to only somewhat affordable. Just 15% of individuals reported that they find the opportunities very affordable, with 11% being unsure.[31] It is plausible that Canadians use parks, green spaces, natural environments and waterways, and walking and bicycling pathways for sport, physical activity and recreation more than sport and recreation facilities because they are relatively inexpensive to use, convenient and accessible. Sport and recreation facilities may be, in part, more costly to access due to the very nature of the upkeep of the facilities themselves. The 2019 Canadian Infrastructure Report Card indicates that between 30% and 35% of recreation facilities are in fair, poor or very poor condition, and among certain categories, more than 60% are at least 20 years old.[46] Those in the worst condition include single-pad ice arenas, outdoor pools, wading pools, indoor 25-metre pools, indoor curling rinks, and tennis courts.[46] The additional maintenance costs for the upkeep of these facilities must be addressed, and some costs may be passed to the users.

Statistics Canada's 2020 Core Public Infrastructure survey indicate that there are roughly 7,569 ice facilities, 5,060 aquatic facilities, 8,146 other indoor recreational facilities, 55,148 other outdoor recreational facilities, and 34,346 trails and pathways in kilometers, under the jurisdiction of provincial and territorial, local and regional governments.[47] Almost all of the publicly owned recreation and sport facilities, however, were the property of municipalities.[48] Based on this data, about one-fifth of recreational and sport facilities were owned by rural municipalities with fewer than 5,000 residents, with about 32% being newer assets (since 2010) (see the Economic section for more discussion on the financial investment per level of government to sport and recreation infrastructure). The replacement costs have been identified by Statistics Canada in their Canada's 2020 Core Public Infrastructure survey. **Table 8** outlines the replacement value estimates for replacing the very poor, poor and fair infrastructure related to sport, physical activity and recreation.[37]

Table 8: Estimated replacement value of core public infrastructure assets related to sport, physical activity and recreation by physical condition rating (in $1,000,000)[37]

	Very Poor	Poor	Fair	Row total
Indoor ice arenas with performance/ spectator (1,000 plus seats)	$348	$644	$1,245	$2,237
Indoor ice arenas, without performance/ spectator (1,000 plus seats)	$1,325	$2,713	$5,865	$9,903
Curling facility	$45	$305	$1,119	$1,469
Indoor pools	$705	$1,141	$2,411	$4,257
Multi-purpose sports centres	$345	$1,494	$1,351	$3,190
Community centres (senior, youth centres)	$1,379	$2,190	$3,466	$7,035
Parks (sports fields, playparks, nature parks)	$76	$668	$818	$1,562
Other outdoor sports facilities	$758	$833	$2,086	$3,677
Outdoor specialty areas	$13	$36	$129	$178
Column Total	$4,994	$10,024	$18,490	$33,508

As such, the total estimated replacement values of core public infrastructure assets related to sport physical activity and recreation facilities that are either in very poor, poor or fair condition would be approximately $33.5 billion.[37] This does not include the infrastructure costs pertaining to active transportation, which were described previously.

To be considered in these replacement costs would be adaptive measures to address climate change, such as thermal heat, storms, flooding, drought, or seasonal length and impact, or other disasters.[49] For example, climate change can impact sport facilities in numerous ways: damage to playing surfaces from heat, drought, flooding or pests; damage to infrastructure; warmer winters impact snow and ice coverage; algae blooms in water systems; carbon emissions in building with poor energy efficiency standards.[50] National, provincial/territorial sport organizations, sport federations, community sport organizations, and municipalities will look to evidence-based frameworks and practices for developing more sustainable, greener, efficient and adaptive facilities and equipment when being replaced.[50] It is estimated that developing climate-resilient building codes in Canada has a benefit-cost ratio of 12:1, which would represent a 1,100% return on investment.[11]

Conceptual models have been developed to help mitigate the risks associated with climate change for sport organizations.[51] Within these models, technical measures for dealing with increased heat stress include modern insulation and glazing, reduction of heat-storing building materials, green roofs, natural and artificial shading.[51] For extreme weather, technical measures including lightning shelters, flood and backwater protection.[51] For increased ultraviolet light exposure, it would include natural environments, trees and shading, roofing structures for break areas, spectating areas, and referee areas.[51]

For air pollution, technical measures would include conversion mechanisms to support electric vehicles, or limiting exhaust-producing machinery.[51] For increased allergen exposure, technical measures would include hypoallergenic greening.[51] For reducing infectious disease, technical measures would include the reduction of standing water, improved ventilation, and improved cooling for catering, improved water access and testing.[51] There are other policy, organizational and individual level measures that sport organizations can employ, like regulations for interrupting play, postponement of events, changing to evening competitions, adjustment to rules and regulations for shortening games, or additional breaks,[51] however, these are not covered in this report as the focus is on sport and recreation facilities.

For such sport tourism and mass sport events, strategies are required to reduce the emissions through innovative ways to reduce the carbon cost related to the transportation of athletes, support staff and spectators.

Competitive sport and mass sporting events – Interestingly, some researchers have looked at the impact of sport-related emissions and carbon footprints through specific sports, venues and facilities, equipment, countries and events.[52] This type of analysis is important, as it allows one to understand where and how to take action to reduce emissions. For example, in terms of particular sports, it was found that the nature-based individual sports of diving, climbing and golf yielded the highest carbon footprint, due mainly to training, competitions and travel.[52] In Canada, research has been conducted for several specific sports and also for the difference between elite teams. One study looked at the University of British Columbia's sport teams in 2011/2012; among those athletes that traveled almost exclusively by plane, their footprint for the team was 630 tonnes of carbon for one season, whereas at another University (Montreal), whereby the team mostly travelled by bus, the footprint was 0.5 tonnes.[24] Using this same type of analysis, it is clear that mass sporting events have a tremendous carbon footprint. Among the soccer teams of the English leagues, for example, 2,100 metric tonnes of carbon equivalent from waste was produced in landfills in one season alone (2012/2013), whereas 56,200 tonnes of carbon equivalent was generated by spectator travel to and from games.[52,54,55] In comparison, the footprint of the 2008 Beijing Olympic Games was estimated at 0.77 to 2.1 million tonnes of carbon equivalent, generated through flights, venues, construction of facilities, and transportation.[52] For such sport tourism and mass sport events, strategies are required to reduce the emissions through innovative ways to reduce the carbon cost related to the transportation of athletes, support staff and spectators, and to improve the efficiency of venues and equipment (e.g., Formula 1 creating more efficient engines or ensuring efficiencies of heating, ventilation, air conditioning and alternative cooling systems, and lighting at venues).[52] This could include retrofits and shading, insulation, ventilation, and alternative modes of energy such as solar panels or use of wind.[52] These types of strategies are being addressed more globally through the United Nations Sport for Climate Action Framework, as one example.[50] In addition, many organizations and municipalities are adhering to standards such as the Leadership in Energy and Environmental Design (LEED) standards for sustainability and green building to yield lower carbon emissions, conservation and reducing operating costs; indeed Canada is advanced in LEED certification more generally (not specifically to sport).[49,56]

References for Environmental impact section

[1] Government of Canada. (2013). What Makes Canadians Healthy or Unhealthy? Available at (accessed July 26, 2023): www.canada.ca/en/public-health/services/health-promotion/population-health/what-determines-health/what-makes-canadians-healthy-unhealthy.html

[2] World Health Organization (WHO). (2022, Dec 19). WHO Response in Ambient (Outdoor) Air Pollution Available at (accessed July 26, 2023): https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health

[3] World Health Organization (WHO). (2021, Sept 22). WHO Global Air Quality Guidelines: Particulate Matter (PM2.5 and PM10), Ozone, Nitrogen Dioxide, Sulfur Dioxide and Carbon Monoxide. Available at (accessed July 26, 2023): https://www.who.int/publications/i/item/9789240034228

[4] Government of Canada. (2022, Nov 24). Air Pollution: Drivers and Impacts. Available at (accessed July 26, 2023): www.canada.ca/en/environment-climate-change/services/environmental-indicators/air-pollution-drivers-impacts.html

[5] Environment and Climate Change Canada (2023). Canadian Environmental Sustainability Indicators: Population Exposure to Outdoor Air Pollutants. Available at (accessed July 26, 2023): www.canada.ca/en/environment-climate-change/services/environmental-indicators/population-exposure-outdoor-air-pollutants.html

[6] Health Canada. (2021). Health Impacts of Air Pollution in Canada - 2021 Report. Available at (accessed July 26, 2023): www.canada.ca/en/health-canada/services/publications/healthy-living/health-impacts-air-pollution-2021.html

[7] Environment and Climate Change Canada. (2022). Canadian Environmental Sustainability Indicators: Air Health Trends. Available at (accessed July 26, 2023): www.canada.ca/en/environment-climate-change/services/environmental-indicators/air-health-trends.html

[8] Sawyer D, Stiebert S, Welburn C. (2023, June 26). Blog: With the Forest Ablaze, the Health Costs Hit Home. Available at (accessed July 26, 2023): https://climateinstitute.ca/with-the-forest-ablaze-the-health-costs-hit-home/

[9] Canadian Institute for Climate Choices. (2021, June). The Health Costs of Climate Change. Available at (accessed July 26, 2023): https://climatechoices.ca/wp-content/uploads/2021/06/ClimateChoices_Health-report_Final_June2021.pdf

[10] Environment and Climate Change Canada (2023). Funding Climate Change Adaptation. Available at (accessed July 26, 2023): www.canada.ca/en/environment-climate-change/news/2023/06/funding-climate-change-adaptation.html

[11] Environment and Climate Change Canada. (2023). Canada's National Adaptation Strategy: Building Resilient Communities and a Strong Economy. Cat no. En4-544/2023E-pdf, ISBN: 978-0-660-49133-2, EC23062 Available at (accessed July 26, 2023): https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/national-adaptation-strategy/full-strategy.html

[12] Infrastructure Canada. (2021). National Active Transportation Strategy: 2021-2026. Catalogue No: T94-27/2021E-Pdf, ISBN: 978-0-660-39815-0. Available at (accessed July 26, 2023): https://www.infrastructure.gc.ca/trans/nats-strat-snta-eng.html

[13] World Health Organization. (2018). Global Action Plan on Physical Activity 2018-2030: More Active People for a Healthier World. Geneva. ISBN: 9789241565684. Available at (accessed July 26, 2023): https://apps.who.int/iris/bitstream/handle/10665/272722/9789241514187-eng.pdf

[14] United Nations (2015). Sustainable Development Goals. Available at (accessed July 26, 2023): https://sdgs.un.org/goals

[15] Sustainable Development Goals Unit, Employment and Social Development Canada (2019). Towards Canada's 2030 Agenda National Strategy. Available at (accessed July 26, 2023): https://www.canada.ca/content/dam/esdc-edsc/documents/programs/agenda-2030/7781_EmploymentSocialDevelopment_2030-ENv5.pdf

[16] World Health Organization. (2018). Global Status Report on Road Safety, 2018. Available at (accessed July 26, 2023): https://www.who.int/publications/i/item/9789241565684

[17] Transport Canada. (2021). Canadian Motor Vehicle Traffic Collision Statistics: 2021. Available at (accessed July 26, 2023): https://tc.canada.ca/en/road-transportation/statistics-data/canadian-motor-vehicle-traffic-collision-statistics-2021

[18] Parachute Canada. (2022, July 19, last reviewed). Cost of Injury in Canada: The Highest Costs: Falls and transport. Available at (accessed July 26, 2023): https://www.parachute.ca/en/professional-resource/cost-of-injury-in-canada/the-highest-costs-falls-and-transport/

[19] Transport Canada. (2011). Active Transportation in Canada: A Resource and Planning Guide. TP 15149E, Catalogue No. T22-201/2011E-PDF; ISBN 978-1-100-18789-1. Available at (accessed July 26, 2023): https://publications.gc.ca/collections/collection_2011/tc/T22-201-2011-eng.pdf

[20] Environment and Climate Change Canada. (2020). A Healthy Environment and A Healthy Economy: Canada's Strengthened Climate Plan to Create Jobs and Support People, Communities and the Planet. Her Majesty the Queen in Right of Canada, represented by the Minister of Environment and Climate Change, Government of Canada. Available at (accessed July 26, 2023): https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/healthy-environment-healthy-economy.html

[21] CTV News. (January 17, 2023, 6:34 pm EST). Toronto, Owning a New Car is Getting More Expensive. Here's Why. Available at (accessed July 26, 2023): https://toronto.ctvnews.ca/owning-a-new-car-is-getting-more-expensive-here-s-why-1.6234773

[22] Whitehurst DGT, DeVries DN, Fuller D, Winters M. (2021). An Economic Analysis of the Health-related Benefits Associated with Bicycle Infrastructure Investment in Three Canadian Cities. *PLoS ON*;16(2):e0246419.

[23] Chapman R, Keall M, Howden-Chapman P, Grams M, Witten K, Randal E, Woodward A. (2018). A Cost Benefit Analysis of an Active Travel Intervention with Health and Carbon Emission Reduction Benefits. *Int J Environ Res Public Health*; 15; 962.

[24] Bernard P, Chevance G, Kingsbury C, Baillot A, Romain A-J, Molinier V, Gadais T, Dancause KN. (2021). Climate Change, Physical Activity and Sport: A Systematic Review. *Sports Med*; 51; 1041-1059.

[25] Statistics Canada. (2022, Nov 30). Has the COVID-19 Pandemic Changed Commuting Patterns for Good? The Daily. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/n1/daily-quotidien/221130/dq221130c-eng.htm

[26] Statistics Canada, Environment Accounts and Statistics Division (2009). Special Tabulation; Table 1: Greenhouse Gas Emissions from Private Vehicle Operation by Type of Gas, Canada. Catalogue no. 16-201-X20060009515. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/n1/pub/16-001-m/2010012/t001-eng.htm

[27] Clifford C. (2021, March). Here's What You Need to Know About 'The Social Cost of Greenhouse Gases'– A Key Climate Metric. Available at (accessed July 26, 2023): https://www.cnbc.com/2021/03/09/heres-everything-you-need-to-know-about-the-social-cost-of-greenhouse-gases.html#:~:text=There%20are%20estimates%20for%20the,according%20to%20the%20SCC%20measure

[28] Canadian Geographic. (n.d.) Challenge 1: Commuting. Available at (accessed July 26, 2023): https://canadiangeographic.ca/live-net-zero/commuting/

[29] Statistics Canada. (2020, Sept 10). Archived - Vehicle Registrations, by Type of Vehicle, Inactive. Table: 23-10-0067-01 (formerly CANSIM 405-0004) Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=2310006701

[30] Canadian Urban Transit Association. (2019). The Economic Impact of Transit Investment in Canada, Urban Mobility Issue paper 50. Available at (accessed July 26, 2023): https://cutaactu.ca/wp-content/uploads/2021/01/final_issue_paper_50_cuta_v2.pdf

[31] CFLRI, custom tabulation from 2023 Social, Health, Economic, and Environment Study. CFLRI, Ottawa, Ontario, Canada.

[32] Rissel C, Curac N, Greenaway M, Bauman A. (2012 Jul). Physical Activity Associated with Public Transport Use – A Review and Modelling of Potential Benefits. *Int J Environ Res Public Health*; 9(7):2454-2478.

[33] Saelens BE, Moudon AV, Kang B, Hurvitz PM, Zhou C. (2014). Relation between Higher Physical Activity and Public Transit Use. *Am J Pub Health*; 104, 5.

[34] Lachapelle U, Pinto DG. (2015, June). Longer or More Frequent Walks: Examining the Relationship between Transit Use and Active Transportation in Canada. *JTH*; 3(2); 173-180.

[35] Morency C, Trépanier M, Demers M. (2011). Walking to Transit: An Unexpected Source of Physical Activity. *Transport Policy*; 18; 800-806.

[36] Canadian Public Health Association, Ontario Public Health Association, Canadian Heath Association for Sustainability & Equity. (2021, Feb). Invest in Public Transit to Create Healthy, Green and Just Communities; Public Transit Fact Sheet 1. Available at (accessed July 26, 2023): https://www.cpha.ca/public-transit-factsheet#:~:text=In%20Canada%2C%20it%20typically%20costs,year%20by%20using%20public%20transit

[37] Statistics Canada. (2023). Estimated Replacement Value of Core Public Infrastructure Assets, by Physical Condition Rating (x1,000,000) Table 34-10-0284-01. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=3410028401

[38] CFLRI, 2020 Physical Activity Opportunities for Physical Activity in Canadian Communities. CFLRI, Ottawa, Ontario, Canada.

[39] Nieuwenhuijsen MJ. (2021). New Urban Models for More Sustainable, Livable and Healthier Cities Post-Covid19; Reducing Air Pollution, Noise and Health Island Effects and Increasing Green Space and Physical Activity. *Environ Int*; 157.

[40] Abu-Omar K, Gelius P, Messing S. (2020). Physical Activity Promotion in the Age of Climate Change. *F1000Research*; 9:349.

[41] Bowler DE, Buyung-Ali L, Knight TM, Pullin AS. (2010). Urban Greening to Cool Towns and Cities: A Systematic Review of the Empirical Evidence. *Landsc Urban Plan*; 97(3); 147-155.

[42] Government of Canada. (2023). Investing in Canada Infrastructure Program. Available at (accessed July 26, 2023): https://www.infrastructure.gc.ca/plan/icp-pic-INFC-eng.html

[43] Nowak DJ, Hirabayashi S, Doyle M, McGovern M, Pasher J. (2018). Air Pollution Removal by Urban Forests in Canada and its Effect on Air Quality and Human Health. *Urban For Urban Green*; 29;40-48.

[44] Nowak DJ, Hirabayashi S, Ellis E, Greenfield EJ. (2014). Tree and Forest Effects on Air Quality and Human Health in the United States. *Environ Pollut*; 193;119-129.

[45] Lantz N, Grenier M, Wang J. (2021, Aug 17). Urban Greenness, 2001, 2011, and 2019. *EnviroStats*. Catalogue no. 16-002-X, ISSN 1913-4320. Statistics Canada. Government of Canada.

[46] Federation of Canadian Municipalities, Consulting Engineering Companies Canada, the Canadian Construction Association, the Canadian Parks and Recreation Association, the Canadian Public Works Association, the Canadian Society for Civil Engineering, the Canadian Urban Transit Association. (2019). Canadian Infrastructure Report Card 2019. Available at (accessed July 26, 2023): http://canadianinfrastructure.ca/downloads/canadian-infrastructure-report-card-2019.pdf

[47] Statistics Canada. (2022, Sept 27). Canada's Core Public Infrastructure Survey: Culture, Recreations and Sports Facilities, and Public Social and Affordable Housing, 2020. *The Daily.* Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/n1/daily-quotidien/220927/dq220927a-eng.htm

[48] Statistics Canada. (2020, Dec 18). New Construction of Culture, Recreation and Sport Infrastructure Doubles in Rural Municipalities in 2017 and 2018. *The Daily*. Available at (accessed July 26, 2023): https://www150.statcan.gc.ca/n1/daily-quotidien/201218/dq201218b-eng.htm

[49] Orr M, Inoue Y, Seymour R, Dingle G. (2022). Impacts of Climate Change on Organized Sport: A Scoping Review. *WIREs Clim Change*; 13;e760.

[50] United Nations Climate Change Panel. (n.d.). Global climate Action. Sports for Climate Action Framework. Version 02.0. Available at (accessed July 26, 2023): https://unfccc.int/climate-action/sectoral-engagement/sports-for-climate-action

[51] Schneider S, von Winning A, Grüger F, Anderer S, Hoffner R, Anderson L. (2022). Physical Activity, Climate Change and Health – A Conceptual Model for Planning Public Health Action at the Organizational Level. *Int J Environ Res Public Health*; 19: 4664.

[52] Wilby RL, Orr M, Depledge D, Giulianotti r, Havenith G, Kenyon JA, Matthews TKR, Mears SA, Mullan DJ, Taylor L. (2023). The Impacts of Sport Emissions on Climate: Measurement, Mitigation and Making a Difference. *Ann NY Acad Sci*; 1519:20-33.

[53] Wicker P. (2019). The Carbon Footprint of Active Sport Participants. *Sport Manag Rev*; 222:513-526.

[54] Dosumu A, Colbeck I, Bragg R. (2014). Greenhouse Gas Emissions: Contributions Made by Football Clubs in England. *NPJ Clim Atmos Sci*; 4:642-652.

[55] Dosumu A, Colbeck I, Bragg R. (2019). Greenhouse Gas Emissions as a Result of Spectators Travelling to Football in England. *Sci Rep*; 7:6986.

[56] Canada Green Building Council. (n.d.). LEED The Global Standard in Green Building. Available at (accessed July 26, 2023): https://www.cagbc.org/our-work/certification/leed/

HEALTH IMPACTS

The health impacts generated by sport, physical activity and recreation have been estimated at $3.9 billion on an average annual basis. This value reflects the annual contribution of direct health care costs and indirect costs associated with premature mortality for select health conditions related to physical inactivity.

HEALTH IMPACT

As the findings of most of the earlier sections touch on the subject, we will wrap up the report with a section summarizing the implications of sport, physical activity and recreation on health. Economic disparities, social influences and the environment can influence all aspects of health. Regular physical activity offers many benefits; for example, there is considerable evidence in the literature demonstrating its role in preventing and/or managing morbidity and mortality from various non-communicable diseases.[1] Being physically active offers many additional health benefits such as improved cognition and overall mental health. Research has shown that regular physical activity can help with depression and anxiety. Yet despite this evidence it continues to be a global public health concern as rates of inactivity have remained high both in Canada and in many parts of the world. Physical inactivity is a modifiable risk factor linked to various non-communicable diseases and mental health disorders such as cardiovascular disease, hypertension, breast and colon cancer, diabetes (type 2) and depression.[2] Keeping this in mind, **the health costs associated with physical inactivity has been estimated at $3.9 billion in 2022**.

Physical inactivity is a modifiable risk factor linked to various non-communicable diseases and mental health disorders.

As in the previous sections, the relationship between sport, physical activity and recreation with health is bi-directional. Although poor health can affect participation in sport, physical activity and recreation, our focus in this report is on the impact that sport, physical activity and recreation has on health – and the health care system, in particular.

About chronic diseases and conditions

Chronic diseases refer to a set of long-term conditions (those that typically persist for a year or more) that often require treatment, and which may considerably impair an individual's quality of life.[3] Health expenditures (e.g., related to the treatment/management of chronic conditions) have a significant impact on the health care system – indeed it has been estimated that total health spending in Canada was $331 billion in 2022, amounting to 12.2% of Canada's GDP.[4] The cost per capita is $8,563; the highest cost per capita is for infants (<1 year) at $14,541 followed by older adults 65 years and older at $12,521.[4,5] There are several chronic conditions which may contribute to morbidity or mortality in the population. This report will focus on those conditions for which there is empirical evidence supporting their connection to physical inactivity, namely heart diseases (e.g., cardiovascular disease), stroke, hypertension, type 2 diabetes, certain cancers (e.g., breast and colon), osteoporosis, and depression. The following provides a brief description of some of these conditions and their associated risk factors.

Heart diseases – arise from physiological conditions that affect the structure and functioning of the heart and/or related organs (i.e., blood vessels, arteries).[6,7] Several factors may increase one's risk to developing heart disease including: family history, unhealthy diet, physical inactivity, smoking, drugs, alcohol, and environmental factors, including air pollution.

Stroke – a restriction of blood supply to the brain that can result in brain damage.[7] Similar to heart disease, many lifestyle factors increase the risk of developing stroke including physical inactivity, unhealthy diet, stress, alcohol, drugs and smoking.[7]

Type 2 diabetes – a chronic disease that can result from the body's inability to produce enough or to adequately use insulin, a hormone with the important role of regulating the amount of sugar in the blood.[8] A number of factors may increase one's risk of developing type 2 diabetes, some which are modifiable, such as high blood pressure, diet, smoking, a high body mass index, or physical inactivity and others less so, such as family history or ethnicity. If poorly managed, type 2 diabetes could result in serious complications such as kidney disease, diabetic retinopathy, heart disease and stroke.[8]

Breast cancer – refers to changes in breast cells that may result in damage to surrounding tissue.[9] Breast cancer predominantly affects females, although males can also develop breast cancer.[9] The risk of developing breast cancer increases with age, with the majority of cases occurring between 50-69 years of age.[9] Other factors which could increase one's risk of developing breast cancer include physical inactivity, obesity and family history.[9]

Depression – a type of mood disorder and is one of the more common forms of mental health disorders.[10] Depression can affect more than just the psyche. A person with depression may also experience physical symptoms such as fatigue and muscle/joint pain.[10] Depression may be associated with family history, socio-economic factors and with chronic conditions such as stroke, heart disease and obesity.[10]

A considerable proportion of Canadians have at least one chronic condition. According to the 2017-2018 Canadian Community Health Survey, 38% of Canadian adults reported having at least one underlying chronic condition, 13% at least two health conditions, 4% at least three, and 1% having at least four.[11] In 2020/2021, the most prevalent chronic condition was hypertension, affecting a quarter (26%) of the Canadian adult population.[13] Although not the most prevalent, ischemic heart disease affects 8% of the population and is the second leading cause of death among adults in Canada (see **Table 9**).[13] Similar results were reported in another national study in 2018,[14] whereby cardiovascular disease (i.e., heart disease, high cholesterol, stroke or hypertension) was the most prevalent condition at 22% followed by arthritis (17%).[14]

Table 9: Age-standardized prevalence of the most common chronic diseases among adults ≥20 years*, 2020-2021[13]

	Total
Hypertension	26%
Osteoarthritis	14%
Asthma	12%
Osteoporosis (40 years and older)	12%
Chronic Obstructive Pulmonary Disease	10%
Diabetes	9%
Ischemic heart disease	8%
Dementia	6%
Stroke	3%

*Northwest Territories data not included; prevalence estimates for each condition vary by age.

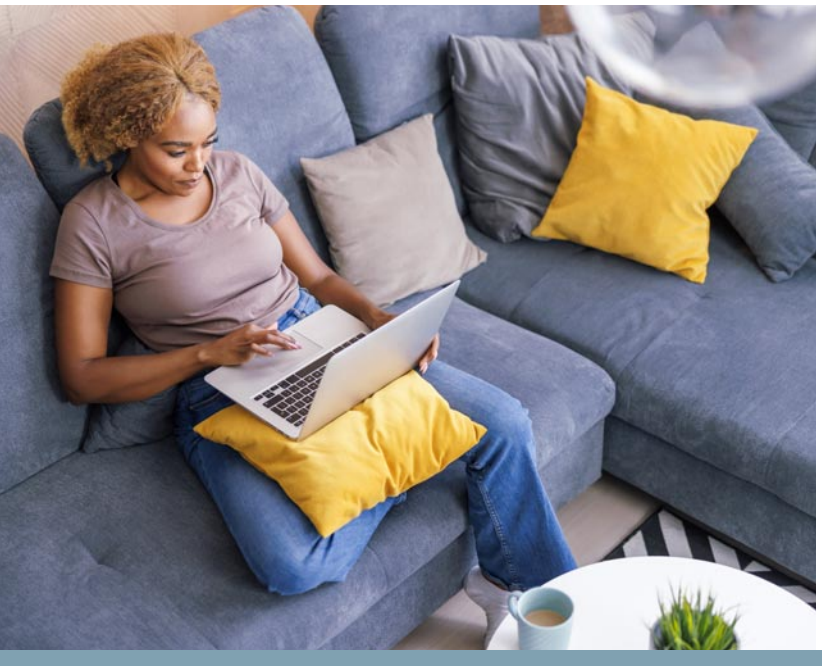
Economic burden of physical inactivity

Given the breadth of knowledge we now have regarding the link between physical inactivity and chronic diseases and the steep health care costs required to treat them, an important question to ask is "how much of these health care costs could be averted by reducing physical inactivity?". To answer that question, we first need to determine how much of the health care expenditures are directly and indirectly attributed to physical inactivity. To date, there is limited data available looking at the economic burden of physical inactivity, both globally, and in Canada. As such, this project will aim to add to this growing body of literature to provide a more current estimate.

International research

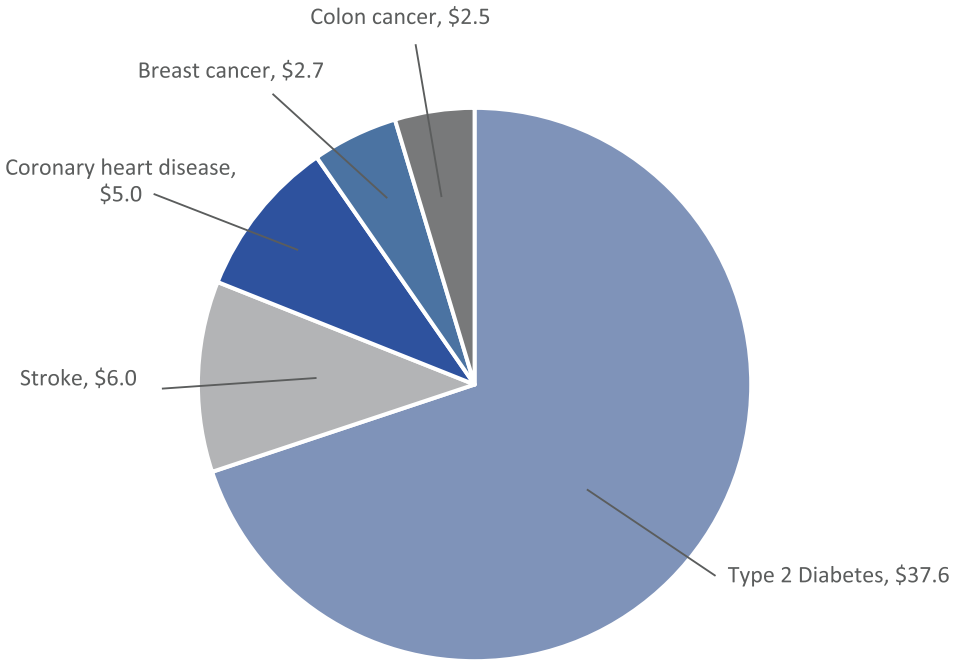
Physical inactivity is a global phenomenon and while considerable headway has been made to raise awareness of the importance of reducing inactivity to improve health outcomes of the global population, the focus has traditionally been on acquiring health and social benefits from a well-being perspective. Few studies have attempted to quantify the global burden of illness due to inactivity. One example of this is an international study conducted by Ding and colleagues.[15]

Researchers in this study collected and examined economic (productivity losses, health care costs) and health (disability adjusted life years from chronic conditions) data from 142 countries with the purpose of estimating the global cost of physical inactivity.[15] The first step in the process of determining the costs was to determine the relative risks (RRs) of a set of chronic conditions (five) for which physical inactivity is a risk factor.[15] Next, population attributable fractions (PAFs) were calculated using the RRs and prevalence estimates of physical inactivity (country-specific).[15] Furthermore, researchers estimated the average annual cost for each disease in each country, which together with the PAF provided disease-specific health care costs attributable to physical inactivity. In addition to direct costs, researchers estimated indirect costs which included productivity loss as resulting from morbidity and mortality.[15] Based on these calculations, the global median adjusted population attributable risk fractions of the conditions related to physical inactivity were between 4% to 7%.[15] It was estimated that physical inactivity cost global health care systems $67.5 billion INT in 2013, of which $53.8 billion was in direct health costs while $13.7 billion was in indirect costs.[15] When considering direct costs specifically, $37.6 billion was spent on type 2 diabetes (see **Chart 11**).[15] Researchers were also able to estimate health care costs of inactivity for each country specifically. According to the findings, physical inactivity cost Canadians $1.1 billion INT dollars in health care-related costs (direct and indirect) in 2013.[15]



The results from this study demonstrate that physical inactivity is a significant contributor of health care costs on a global scale. Experts state that if inactivity rates remain high, we could expect to see an additional 500 million new cases of non-communicable diseases between 2020 and 2030. This would translate into $524 billion INT (cumulative), or $48 billion INT (per year) in health care costs globally.[1]

Chart 11: Global direct health care costs due to physical inactivity ($ in billions), 2013[15]



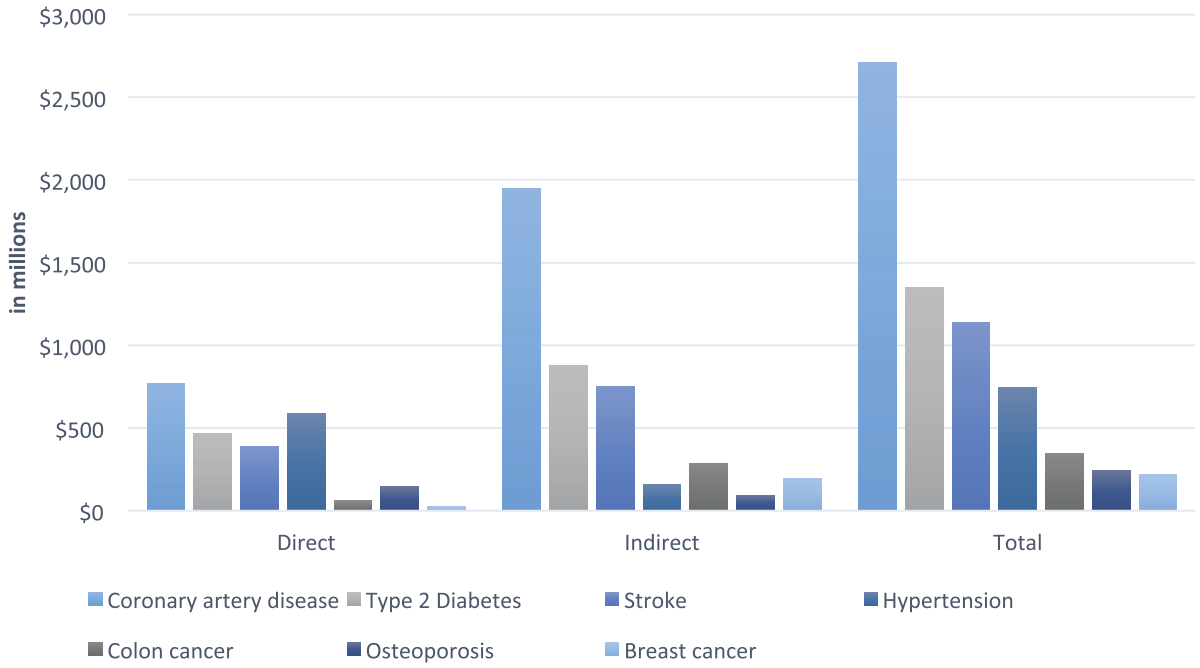
Canadian research

Efforts to explain the economic impact of physical inactivity on the Canadian health care system span over 20 years, though the literature has been sparse. In an early study (2000), Katzmarzyk et al. explored how physical inactivity contributed to direct health care expenditures in Canada.[16] According to this study, physical inactivity was prevalent in about 62% of the adult population at the time.[16] This study used a prevalence-based approach whereby the population-attributable fraction (PAF) for each chronic illness related to physical inactivity was calculated. This was computed by using the prevalence estimate for physical inactivity (62%) and relative risk (RR) estimates for each disease (the RR was calculated from prospective studies).[16] The resulting PAF estimate was then combined with health care expenditures for each disease to determine health care costs directly attributable to physical inactivity. The results showed that physical inactivity resulted in $2.1 billion in health expenditures (2.5% of direct health care costs in 1999).[16] Furthermore, researchers in this study determined that the total cost of physical inactivity represented approximately 26% of the cost of treating conditions which are known to be linked with physical inactivity such as cardiovascular disease, stroke, hypertension, type 2 diabetes, breast and colon cancers, and osteoporosis.[16] The researchers in this study also determined that a 10% reduction in the prevalence of physical inactivity could result in a savings of $150 million annually in direct health care costs.[16]

Researchers in this study determined that the total cost of physical inactivity represented approximately 26% of the cost of treating conditions which are known to be linked with physical inactivity.

About a decade later, a similar study provided updated estimates for the health care costs attributable to physical inactivity.[17] Health care costs were determined using the following information: a) relative risks of conditions known to be linked to physical inactivity; b) direct and indirect health care costs of these conditions; and c) prevalence of physical inactivity.[17] As a first step, Janssen conducted a meta-analysis of data from studies examining risk of seven chronic conditions among physically inactive compared to active individuals. Summary relative risks were then calculated for each of the chronic conditions, and took into consideration potential confounders for example age, race and socio-economic status.[17] Next, population attributable risk (PAR%) estimates were calculated by combining the relative risks for each condition and the prevalence of physical inactivity, to determine the extent to which the seven chronic conditions were attributable to inactivity.[17] Furthermore, the direct (e.g., costs from treatment/care, including hospital care, physician and drug expenditures) and indirect costs (e.g., loss in revenue from disability, illness or premature death) of each chronic condition (in Canadian dollars) were gleaned from the Economic Burden of Illness in Canada (2000), a government system which allows users to access cost estimates for all major illnesses in Canada.[18] The costs for each disease were combined with the PAR% to determine the health care costs directly attributable to physical inactivity.[21] Lastly, given that these values were based on costs in 2000, an adjustment factor was applied to account for inflation and changes in population size.[17] This study found that between 15% and 39% of chronic illnesses were directly attributable to physical inactivity.[17] Moreover, the estimated direct, indirect and total health care costs due to physical inactivity were $2.4 billion, $4.3 billion and $6.8 billion, respectively (see **Chart 12**).[17] According to these findings, the total costs of physical inactivity represented 3.7% of the overall health care costs in Canada. The total health care cost of physical inactivity was higher in 2009 compared to previous estimates of $2.1 billion in 1999 and $5.3 billion in 2001.[16-17,19] It should be noted, however, that there were slight differences between the studies which could partially explain the difference in costs between the studies. For example, the study conducted in 1999 did not consider the indirect costs, and both studies relied on self-reported rather than objective measures for physical activity.[16,19] Based on the results from 2009, coronary artery disease was the most expensive disease resulting from physical inactivity at $2.7 billion, followed by type 2 diabetes at $1.4 billion and stroke at $1.1 billion.[17]

Chart 12: Health care costs of physical inactivity for specific diseases in millions, 2009[17]



Since 2009, additional studies have been conducted in Canada looking at the health care expenditures of factors related to physical inactivity, such as cardiorespiratory fitness and sedentary behaviour.[20,21] Cardiorespiratory fitness (CRF) refers to the ability of the circulatory and respiratory system to supply oxygen during physical activity.[20] There is evidence in the literature that rates of CRF among adults are waning.[20] Similar to the economic studies previously described, this study estimated the cost associated with low CRF.[20] To estimate health care costs, researchers determined the PAR% using: pooled RR estimates for specific conditions known to be associated with low CRF in adults; prevalence estimates of low CRF; and, the 2010 EBIC data tool to determine the direct and indirect costs associated with each condition.[18,20] In a similar way, these values were multiplied by the PAR% for each condition to determine the cost attributable to low CRF.[20] In addition to applying correction factors to account for inflation and population growth, researchers in this study made a few adjustments to account for differences in how diseases were defined.[20] This study found that the total health care cost of low CRF was $3.6 billion, which represents 2.7% of the overall costs in 2021.[20] Similar to previous studies, the most expensive diseases were type 2 diabetes, heart disease and depression/anxiety.[20] Researchers in the study concluded that a 10-percentage point decrease (from 46% to 36%) of low CRF would result in a savings of $644 million per year.[20]

This study found that the total health care cost of low CRF was $3.6 billion, which represents 2.7% of the overall costs in 2021.

In another recent study, researchers aimed to quantify the economic burden of excessive sedentary time.[21] In this study, excessive sedentary time was characterized as energy expenditure of ≤1.5 metabolic equivalents while in a sitting or reclining position.[21] A similar method, as outlined in the previous paragraph, was used to determine the cost of excessive sedentary behaviour. The first step involved extraction of pooled RR estimates from the literature for eight chronic conditions known to associated with excessive sedentary behaviour, these included cardiovascular disease, Type 2 diabetes, dementia, depression and certain cancers.[21] Again, the RR together with the prevalence of excessive sedentary behaviour (88% for >8 hours/day and 70% for >9 hours/day) were used to derive the PAR% for each condition. The PAR% was multiplied by direct and indirect costs for each of the eight health outcomes. Health care costs for each these diseases were obtained from the 2010 EBIC online tool.[21] Adjustments were made to account for discrepancies with definitions and to account for changes due to inflation and population growth.[21] The results indicated that between 8% (type 2 diabetes among women) and 21% (colorectal cancer and dementia among women) of the eight conditions were directly attributed to either criterion of excessive sedentary behaviour (at either the 8h or 9h per day cut-off). The total health care costs (direct and indirect) of excessive sedentary behaviour were estimated between $1.8 to $2.2 billion, which represents 1.5% to 1.6% of the overall burden of illness cost in 2021.[21] Similar to previous studies, the two most costly conditions attributed to excessive sedentary time were cardiovascular disease and type 2 diabetes.[21] Researchers noted that a 10% reduction in sedentary behaviour could save Canadians $219 million a year.[21]

Current assessment

In this report, we provide an update on the health care costs of physical inactivity in Canada. To achieve this requires estimating the cost of chronic conditions and disability which are attributable to physical inactivity. The methods adopted in this report are similar to those reported in previous studies (described earlier), whereby a prevalence-based approach is taken. Three key pieces of information were required 1) relative risk (RR) of chronic diseases associated with inactivity 2) prevalence of physical inactivity among Canadians and, 3) the costs of these conditions. The following describes the step-by-step approach used to calculate cost estimates:

Step 1 – We reviewed the available literature to identify estimates for the relative risks of chronic diseases which are most linked to physical inactivity. We identified several studies, both nationally and internationally, which examined the relationship between physical activity and chronic diseases. Researchers in these studies extracted pooled estimates from meta-analyses from prospective cohort studies.[15,17,19-22] It should be noted that there was general agreement across studies about which chronic conditions have a strong link to inactivity. As such, we decided to use the RR estimates presented in the articles by Janssen and Warburton.[17,22] It is important to note here that the study conducted by Janssen et al. provided the RR for coronary artery disease, which is one aspect of heart disease.[17] It seemed reasonable in this case to include the cost of additional cardiovascular conditions related to physical inactivity, as such the RR estimate for cardiovascular disease was obtained from the systematic review published in 2010.[22] In addition, the RR estimate for breast cancer in Janssen's article excluded men, and given that the health care costs in the EBIC tool includes costs for men, the RR estimate from the study by Warburton et al. was used instead.[22] The RR estimate for depression was obtained from a recent systematic review and meta-analysis of literature examining the link between physical activity and incident depression.[23] **Table 10** outlines the relative risks for the eight chronic conditions related to physical inactivity that were extracted from the above publications.

Table 10: Summary relative risk estimates of chronic conditions related to physical inactivity[17,22,23]

	Summary relative risk
Type 2 Diabetes	1.74
Osteoporosis	1.57
Cardiovascular disease (excluding stroke)	1.45
Stroke	1.40
Colon cancer	1.37
Hypertension	1.36
Breast cancer	1.31
Depression	1.33

Step 2 – Next, we determined the proportion of these eight chronic conditions directly attributable to physical inactivity; this is known as the population attributable risk (PAR%). The formula for PAR% requires information about the RR of each chronic disease as well as the prevalence of physical inactivity. For this calculation, the prevalence of physical inactivity was based on results from the 2018-2019 Canadian Health Measures Survey (CHMS). The 2018-2019 CHMS uses objective measures to determine physical activity levels of Canadian adults (aged 18 to 79). In this study, accelerometers were used to collect data on participants' movements during waking hours. Participants classified as "physically active" if they accumulated at least 150 minutes of moderate-to-vigorous physical activity (MVPA) per week. By contrast, to be classified as inactive participants had to record <150 minutes of MVPA/week.[24] Based on the results of this study, 51% of Canadian adults (48% of men and 54% of women) did not meet the recommended physical activity target of 150 minutes of MVPA per week.[25] The prevalence of inactivity was combined with the relative risk estimates to determine the PAR % for each condition using the following equation:

$$PAR\% = [P(RR-1)]/[1+P(RR-1)]$$

where P=prevalence of physical inactivity; RR is relative risk of conditions.

Table 11: Percentage of chronic conditions attributable to physical inactivity among adults (18+ years)

	Men	Women	Total
Cardiovascular disease (excluding stroke)	17.8%	19.4%	18.6%
Stroke	16.1%	17.7%	16.9%
Type 2 Diabetes	26.2%	28.4%	27.3%
Breast cancer	13.0%	14.2%	13.6%
Colon Cancer	15.1%	16.5%	15.8%
Hypertension	14.7%	16.2%	15.5%
Osteoporosis	21.5%	23.4%	22.5%
Depression	13.7%	15.0%	14.4%

Source: CFLRI, custom analysis

Step 3 – Direct and mortality costs for each disease were obtained from the 2010 Economic Burden of Illness in Canada (EBIC) online tool.[18] According to EBIC, direct costs refer to the cost of treatment or care related to illness or injury – for example, expenditures for hospital care, physician care and drug treatment.[18] Mortality costs refer to lost earnings resulting from premature mortality.[22] Unfortunately, the 2010 EBIC tool available online does not provide other indirect costs (i.e., loss of wages resulting from disability and/or morbidity) and, as a result, was not included in our analysis. We recognize that this is a significant limitation and that the overall health costs reported here are, therefore, significantly underestimate the true costs associated with physical inactivity. The direct and mortality costs were then applied to the PAR% to determine what proportion of the overall cost (for men and women separately) were attributable to physical inactivity in 2010. These overall cost estimates were adjusted to account for inflation and population growth from 2010 to 2022. The direct costs were multiplied by 16.3% to reflect an increase in health care costs as per the Consumer Price Index from 2010 to 2022,[26] and by 15.8% to reflect the increase in the adult population (≥15 years).[27] Indirect costs were multiplied by 5.8% to reflect increases in wages, salaries and commissions and population growth.[28] **Table 12** provides the estimated direct and indirect costs of physical inactivity in Canadian dollars.

Table 12: Direct, indirect and total health care costs attributable to physical inactivity (in millions)

	Health care cost attributable to inactivity		
	Direct	Indirect	Total
Cardiovascular disease (excluding stroke)	$1,136.2	$20.6	$1,156.8
Stroke	$209.3	$2.8	$212.1
Type 2 Diabetes	$1,633.4	$5.0	$1,638.3
Breast cancer	$48.4	$3.3	$51.8
Colon Cancer	$103.0	$4.5	$107.5
Hypertension	$164.6	$0.8	$165.4
Osteoporosis	$162.6	$0.0	$162.6
Depression	$409.3	$0.02	$409.3

The results indicate that the direct and indirect (relating to mortality only) health care costs of physical inactivity in Canada in 2022 were **$3.87** billion (CAD) and **$36.9** million (CAD) respectively, for a total of at least **$3.9** billion. The most expensive diseases in this study were Type 2 diabetes at $1.6 billion, cardiovascular disease at $1.2 billion followed by depression at $409 million (CAD). While these estimates are in line with what has been reported previously, they are, as mentioned, likely considerably lower than the actual costs as these estimates do not factor in the cost of lost wages due to morbidity. These findings demonstrate the significance of physical inactivity to the economic burden of illness in Canada. In fact, a 10-percentage point decrease in physical inactivity levels among Canadian adults could result in an annual savings of $629 million annually in health care costs from chronic conditions. More specifically, decreasing the physical inactivity rate among adults by 10 percentage points could support the Canadian economy as follows:

- 16.0% reduction in costs due to the seven chronic conditions (from $3.5 billion to $2.9 billion)
- 17.3% reduction in costs related to depression (from $409 million to $338 million).

References for Health impact section

[1] World Health Organization (WHO). (2022). Global Status Report on Physical Activity 2022. Geneva: World Health Organization. Available at (accessed July 25, 2023): https://www.who.int/teams/health-promotion/physical-activity/global-status-report-on-physical-activity-2022

[2] Warburton D, Nicol W, Bredin S. (2006). Health Benefits of Physical Activity: The Evidence. CMAJ; 174(6). Available at (accessed August 4, 2023): https://pubmed.ncbi.nlm.nih.gov/16534088/

[3] Centre for Disease Control Disease and Prevention (CDC). (2022). About Chronic Diseases. National Center for Chronic Disease Prevention and Health Promotion. Available at (accessed July 25, 2023): https://www.cdc.gov/chronicdisease/about/index.htm

[4] Canadian Institute for Health Information. (2022). National Health Expenditure Trends [release summary]. Available at (accessed July 25, 2023): https://www.cihi.ca/en/national-health-expenditure-trends

[5] Canadian Institute for Health Information. (2022, Nov). Health Expenditure Data in Brief. Available at (accessed July 25, 2023): https://www.cihi.ca/sites/default/files/document/health-expenditure-data-in-brief-2022-en.pdf

[6] Public Health Agency of Canada (PHAC). (2017).About Heart Disease and Conditions. Available at (accessed July 25, 2023): https://www.canada.ca/en/public-health/services/diseases/heart-health/heart-diseases-conditions/about-heart-diseases-conditions.html

[7] Heart and Stroke. (n.d.). What is Heart Disease? Available at (accessed July 25, 2023): https://www.heartandstroke.ca/heart-disease/what-is-heart-disease

[8] Diabetes Canada (n.d.). Understanding Type 2 Diabetes. Available at (accessed July 25, 2023): https://www.diabetes.ca/about-diabetes/type-2

[9] Canadian Cancer Society. (n.d.). What is Breast Cancer? Available at (accessed July 25, 2023): https://cancer.ca/en/cancer-information/cancer-types/breast/what-is-breast-cancer

[10] Government of Canada. (2016). What is Depression? Available at (accessed July 25, 2023): https://www.canada.ca/en/public-health/services/chronic-diseases/mental-illness/what-depression.html

[11] Statistics Canada. (2020-07-03). Number and Percentage of Adults (aged 18 years and older) in the Household Population with Underlying Health Conditions, by Age and Sex (two-year period). Canadian Community Health Survey 2017 and 2018. Table 13-10-0777-01. Available at (accessed July 25, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310077701

[12] Government of Canada. (2021). Canadian Chronic Disease Surveillance System 2017-2020. *Public Health Infobase*. Available at (accessed July 25, 2023): https://health-infobase.canada.ca/ccdss/data-tool/

[13] Government of Canada. (2021). Canadian Chronic Disease Surveillance System 2019-2020. *Public Health Infobase*. Available at (accessed July 25, 2023): https://health-infobase.canada.ca/ccdss/data-tool/Index

[14] Montague T, Nemis-White J, Aylen J, Torr E, Martin L, MacPherson N, Gogovor A. (2019). Chronic Diseases in Canada: Contemporary Burden and Management. Health Care in Canada Survey (HCIC). Available at (accessed July 25, 2023): https://www.mcgill.ca/hcic-sssc/files/hcic-sssc/hcic_chronic_disease_in_canada_burden_and_management_2019.pdf

[15] Ding D, Lawson KD, Kolbe-Alexander TL. Finkelstein EA, Katzmarzyk P, van Mechelen N, Pratt M for the Lancet Physical Activity Series 2 Executive Committee. (2016). The Economic Burden of Physical Inactivity: A Global Analysis of Major Non-Communicable Diseases. *The Lancet*; 388:1311-24

[16] Katzmarzyk PT, Gledhill N, Shephard RG. (2000). The Economic Burden of Physical Inactivity in Canada. *CMAJ*; 163(11):1435-40. Available at (accessed August 4, 2023): https://pubmed.ncbi.nlm.nih.gov/11192648/

[17] Janssen, I. (2012). Health Care Costs of Physical Inactivity in Canadian Adults. *Appl Physiol Nutr Metab*; 37: 803-806

[18] Public Health Agency of Canada (PHAC). (n.d.). Economic Burden of Illness in Canada 2010. Available at (accessed August 4, 2023): https://cost-illness.canada.ca/index.php#:~:text=Welcome%20to%20the%20Economic%20Burden,all%20major%20diseases%20and%20injuries.

[19] Katzmarzyk P, Janssen I. (2004). The Economic Costs Associated with Physical Inactivity and Obesity in Canada: An Update. *Can J Appl Physio*; 1: 90-111. Available at (accessed August 4, 2023): https://pubmed.ncbi.nlm.nih.gov/15001807/

[20] Chaput JP, Janssen I, Sampasa-Kanyinga H, Tomkinson G, Lang J. (2023). Economic Burden of Low Cardiorespiratory Fitness in Canada. *Prev Med*; 168:107424.

[21] Chaput JP, Janssen I, Lang J, Sampasa-Kanyinga H. (2023). Economic Burden of Excessive Sedentary Behaviour in Canada. *CJPH*. Vol. 114: 165-175

[22] Warburton DER, Charlesworth S, Ivey A, Nettlefold L, Bredin SSD. (2010). A Systematic Review of the Evidence for Canada's Physical Activity Guidelines for Adults. *Int J Behav Nutr Phys Act*; 7:39

[23] Pearce M, Garcia L, Abbas A, Strain T, Schuch FB, Golubic R, Kelly P, Khan S, Chukuri M, Laird Y, Mok A, Smith A, Tainio M, Brage S, Woodcock J. (2022). Association between Physical Activity and Risk of Depression: A Systematic Review and Meta-analysis. JAMA Psychiatry; 79(6): 550-559. Available at (accessed August 4, 2023): https://jamanetwork.com/journals/jamapsychiatry/fullarticle/2790780

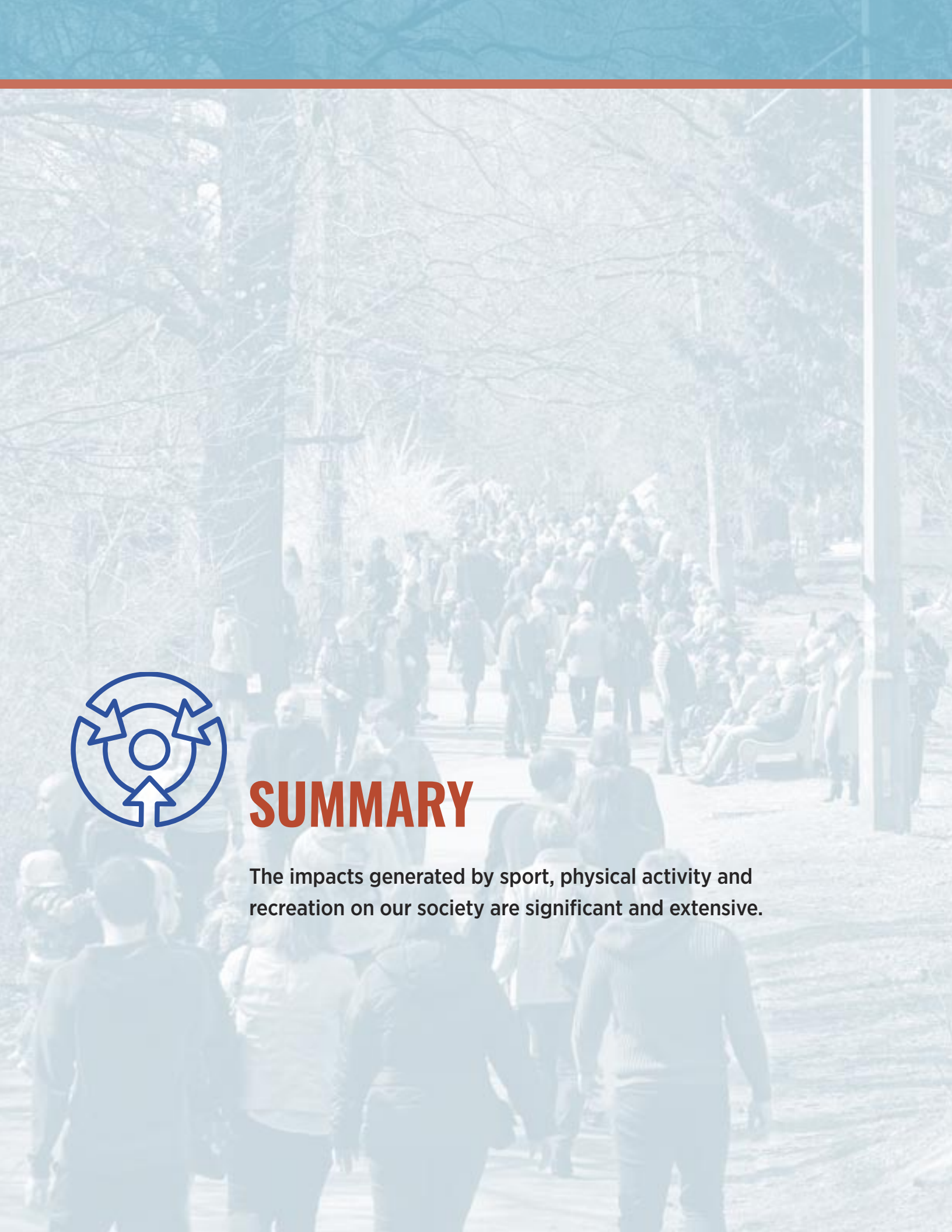
[24] Statistics Canada. (2021). Canadian Health Measures Survey: Activity Monitor Data, 2018-2019. *The Daily*. Available at (accessed August 4, 2023): https://www150.statcan.gc.ca/n1/daily-quotidien/210901/dq210901c-eng.htm

[25] Statistics Canada. (2021). Household Population Meeting /Not Meeting the 2020 Canadian Physical Activity Guidelines. Table: 13-10-0821-01. Available at (accessed August 4, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1310082101

[26] Statistics Canada. (2022). Population Estimates on July 1st, by Age and Sex. Table 17-10-0005-01. Available at (accessed August 4, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000501

[27] Statistics Canada. (2023). Consumer Price Index, Annual Average, Not Seasonally Adjusted. Table 18-10-0005-01. Available at (accessed August 4, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810000501

[28] Statistics Canada. (2023). Income of Individuals by Age Group, Sex and Income Source, Canada, Provinces and Selected Census Metropolitan Areas. Table 11-10-0239-01. Available at (accessed August 4, 2023): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1110023901



SUMMARY

The impacts generated by sport, physical activity and recreation on our society are significant and extensive.

SUMMARY

This report amassed a sizable amount of economic, health, social, and environmental data with the purpose of demonstrating the importance of sport, physical activity, and recreation to these four respective areas. **Given these numbers assess different constructs or concepts, these amounts cannot be added together**. The results showed that investments in sport, physical activity, and recreation have the potential for significant economic, health, social, and environmental gains. The findings in this report also make clear that the relationship between sport, physical activity, and recreation and these various sectors is bi-directional. For example, increasing rates of physical activity results in clear health and economic benefits, while in other circumstances changes in the environment such as a reducing the number of motorized vehicles on the road could result in increased activity through the adoption of more active means of transportation. There are important limitations identified in this report, the first being gaps in data particularly with respect to health care and environmental costs. In some instances, estimation techniques had to be applied, where possible, to provide a more accurate reflection of the current context as data may have been dated. The authors acknowledge the need for continued monitoring/surveillance to be able to better inform governments regarding the impact of sport, physical activity, and recreation to Canadians.

Given these numbers assess different constructs or concepts, these amounts cannot be added together.