Abstract

Background: In recent years, a number of initiatives aimed at promoting healthy lifestyles in health-friendly environments have been implemented. The purpose of this review is to synthesize initiatives conducted in Canada and documented in publications for the period 1995–2015 in order to gain a better understanding of their objectives and impacts.

Methods: A systematic review of Canadian initiatives published over the past 20 years was conducted from multiple databases (i.e., Scopus, SPORTDiscus, PubMed, Academic search complete, Renseausante.com, Cairn, and Erudit). In total, 264 publications were identified and retained for the final analysis based on 5 criteria: (1) publication between 1995 and 2015, (2) online availability, (3) research conducted in Canada, (4) main topic related to environments favorable to healthy lifestyles (EFHL), and (5) publication in French or English.

Results: A sharp increase in the number of studies on EFHL was observed between 2010 and 2015 (57%). Two major lifestyle components—physical activity and nutrition—and 2 environmental aspects—neighborhood and built environment—were the elements most frequently examined regarding adults (48%), young people (34%), and seniors (9%), using quantitative (60%) and qualitative (18%) methods. Furthermore, the analysis reveals a greater focus on the municipal (53%) than the national or provincial levels (31%).

Conclusion: This work is a first map of Canadian studies related to EFHL. It clarifies the definition of EFHL and classifies its components. As well, it documents the issues raised, the research methods employed, and the role of stakeholders, while outlining a new research agenda that includes dimensions of EFHL formerly neglected by researchers, namely, political and sociocultural spheres of action.

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Keywords: Built environment; Canada; Favorable environment; Healthy lifestyle; Initiatives; Neighborhood; Nutrition; Physical activity

1. Introduction

Healthy food choices and regular physical activity are 2 key behaviors that help prevent the premature development of chronic diseases, obesity, and their complications. Findings in recent years have identified environments (physical, sociocultural, economic, and political) as an important factor in promoting healthy lifestyles. Studies on healthy lifestyles have also led to numerous initiatives (e.g., intervention strategies; programs; national campaigns; action plans; policies and government legislation; and financial support from foundations and official organizations) to encourage the adoption of healthy habits. More specifically, the concept of environments favorable to healthy lifestyles (EFHL) has emerged in public health and the related literature during the past 3 decades. This concept is difficult to implement, however, owing to its vague definition and the multiple forms of action it includes. A health-friendly environment does not necessarily prevent sedentary lifestyles or poor food choices. As a result, more studies on EFHL are needed to develop improved initiatives to promote healthy living.

The Ottawa Charter was a call for action on health promotion. It initiated a five-fold solution to combat sedentary behavior and unhealthy lifestyles by (1) building healthy public policy, (2) strengthening community action, (3) developing personal skills, (4) creating supportive environments, and (5) reorienting health services. The third point was the main focus of this study. A number of initiatives were subsequently developed...
in Canada through governmental action plans, which lead to the creation of organizations such as Pace Canada, ParticipACTION, Health Nexus, or the Healthy Living Unit of Health Canada. There have been various types of projects including promotion programs (e.g., Grand défi Pierre Lavoie, World Day for Physical Activity) or more complex intervention strategies (e.g., school or community programs); and although some have been well documented, the influence of environment has received little attention. There are few literature reviews of studies on environmental perspectives despite the many actions implemented in this regard. It appears a clearer portrait of the Canadian literature on EFHL is needed to better understand the EFHL concept in Canada, studies and findings relative to EFHL, and impacts and future research locations.

The literature shows that a number of models have been employed to organize and understand EFHL-related work. They include the ecological model, which classifies applied health promotion initiatives based on 5 core principles of health behavior (individual, microsystem, mesosystem, exosystem, and macrosystem), and the built environment model, which organizes environment in terms of 3 dimensions (transport system, patterns of land use, and urban design). We decided, however, on a different and promising guide for our investigation: a Canadian model based on the 2006–2012 action plan of the ministère de la Santé et des Services sociaux du Québec (MSSS). Quebec has been proactive in the field of EFHL, and in 2006 the MSSS targeted environmental influences (“For a common vision of favorable environments”) with the goal of involving stakeholders from many sectors of intervention. In its action plan, the MSSS defined EFHL as “all the physical, sociocultural, political, and economic elements that have a positive influence on diet, physical activity, and body image.”

### 1.1. Physical dimension and built environment

There is a broad consensus in the literature that the built environment includes all elements of the physical environment produced by human labor. Examples are public spaces, parks, physical structures (e.g., homes, schools, shops, etc.) and transport infrastructures (e.g., cycling paths, streets). A number of operational applications are discussed regarding the contributions of different scientific disciplines (e.g., geography, public health, education, urban planning, and transportation).

In addition, the physical environment can be divided into 2 categories: natural elements (e.g., water, river, forest, mountain, or desert) and artificial elements (e.g., building, road, technology, and urban design), often referred to in the literature as the built environment. Frank et al. explained that the built environment involves 3 dimensions (land use patterns, urban design characteristics, and transportation systems), which influence the physical activity of the community and can potentially improve its health status (Table 1). In their discussion of land use patterns, Bergeron et al. mentioned neighborhood; urban design, proximity and types of restaurants; food options; and sports infrastructures. Urban design characteristics influence people’s perception of their environment. For example, a walk in a well-maintained park is more enjoyable than a walk along a traffic-dense road or in an industrial neighborhood. The authors explained that the built environment is a major motivation to become active and adopt healthy lifestyles on an everyday basis. The last dimension, the transportation systems, includes safe cycling and walking routes, use of stairs instead of elevators, etc. Two studies demonstrate that the better the quality of infrastructure (e.g., lighting, pavement, security), the greater the probability the community will be active and develop positive perceptions of active transportation. This could lead to less driving and an improvement in air quality. Heath et al. concluded that the built environment can easily facilitate or restrict physical activity. They strongly recommended involving various authorities such as the health system and the school, community, or municipal governments in the implementation of key modifications to facilitate accessibility and improve environmental safety and aesthetics. Booth et al. divided environments into 5 levels: international, national or provincial, regional, municipal, and local. Generally speaking, the physical environment appears to be the most thoroughly investigated dimension in the EFHL literature.

### 1.2. Sociocultural environment

The sociocultural environment is a set of beliefs, customs, practices, and behaviors that exists within a certain population. According to the MSSS, it may be a combination of 3 elements: (1) social connections, (2) norms, and (3) conventions expressed by systems, culture, and traditions. The sociocultural environment can have a strong impact on nutrition, physical activity, and the motivation to adopt healthy lifestyles. To illustrate, Belon et al. studied how the community environment shapes physical activity through perceptions revealed through photovoice. Furthermore, family is crucial because it

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| Dimension | Element |
|-----------|---------|
| Land use patterns | Mixed |
| Density | Number of persons |
| Urban design characteristics | Width and pavement surfaces |
| Urban design (street) | Lighting, street vegetation |
| Urban design (site) | Traffic calming measures |
| Transportation systems | Parking |
| Transportation systems | Pedestrian crossings |
| Transportation systems | Width and height of buildings, architecture |
| Non-motorized transport infrastructures | Cycling paths |
| Non-motorized transport infrastructures | Pavement |
| Non-motorized transport infrastructures | Tracks |
| Public transport infrastructures | Bus stops |
| Public transport infrastructures | Train stations |

Adapted from Bergeron, et al.
exercises a special influence on young people’s lives with respect to health. Family interaction may lead to a strong sense of family identity and subsequently facilitate or limit the adoption of healthy lifestyles.5

1.3. Political environment

The political sphere relates to all systems involving decision making and involves the examination of political and cultural systems along with elements such as laws, public policies, national or regional action plans, regulatory systems, rules, rights, and relations to authority.7 Studies in this area investigate, for example, the tax system as it relates to promoting physical activity,25 the Comprehensive School Health approach,26 or barriers and supports for healthy eating and physical activity for First Nation youths in northern Canada.27 Surprisingly, however, it appears that the political aspect receives little attention whereas it should be essential for supporting EFHL-related actions.

1.4. Economic environment

The final dimension of environment involves structures and production systems. It includes the production, consumption, and use of wealth and resources, all of which can modify economic decisions and priorities.7 As an example, changes in food prices can influence the accessibility of food services and products.28

To the authors’ knowledge, EFHL seems to be ill-defined in Canada, and yet numbers of initiatives have been implemented with this concept in mind. Furthermore, researches on EFHL focus on a variety of themes that include urban design, accident prevention, refugee integration, physical activity promotion, and food distribution. These reasons alone point to the importance of a more thorough investigation of the EFHL concepts and initiatives examined in the Canadian scientific literature. Our aim is twofold: first, to explore the development, objectives, functions, and actions of EFHL in Canada in order to gain an improved understanding of this concept and its applications and second, to guide EFHL stakeholders in their particular fields of action.

The purpose of the present study was to conduct an extensive review and analysis of the Canadian scientific research on EFHL published during the past 20 years. Our review was guided by 4 key questions as follows: (1) What research has been published in Canada on EFHL initiatives? (a) When did they start? (b) What is the volume of research? (c) What are their publication metrics? (d) In which refereed journals have they been published? (2) How was the concept of EFHL defined? (a) Which components of EFHL have been studied? (3) What methodologies were used? (a) Which data collection methods were used? (b) Who were the research participants? and (4) What are the findings of these studies?

2. Methods

2.1. Protocol and design

This study used a research design based on the 2 common types of information summaries described by Silverman and Skonie.30 They distinguished a published research analysis from a literature review by stating that analyses “are different from literature reviews in that they categorize research instead of synthesizing the results” (p. 300). Our objective in exploring the literature was not to systematically review or quantify all evidence, but to create a profile of the multiple potential benefits, as well as the negative effects, of each environmental feature as a tool for policymaking and a guide for future research. The initial intention was to analyze the published research in order to identify and categorize all Canadian scientific literature on EFHL. Because of the substantial number of articles identified, the data extraction was divided into 5 phases of analysis, based on the work of various authors.26,31,32 Both the scientific and gray literature were researched. The latter was included because we expected that studies of many subject areas would have been done by government agencies and policy groups rather than scholars. Fig. 1 presents the flow chart depicting the 5 steps of the article selection process: identification, screening, eligibility, inclusion, and data extraction.33

2.2. Phase 1: identification of the studies

In the first phase, an exhaustive research through computerized databases was performed to locate all scientific publications on the topic of EFHL. The initial goal was to be inclusive in locating relevant sources of information. Owing to the extent of the overall search and the differences across topics, however, we developed search protocols specific to each topic area and explored specialized search engines in the various fields. Relevant articles were identified by means of a computerized search through multiple bibliographic databases (i.e., Scopus, SPORTDiscus, PubMed, Academic search complete, Reseausante.com, Cairn, and Erudit) with different combinations of MeSH-terms and keywords (Appendix A). The first author performed the initial selection in the literature search based on the abstract and title (n = 425).

2.3. Phase 2: screening

In the second phase, 6 duplicates were eliminated and 419 papers were considered. Regarding the scientific literature, we began by looking for systematic and non-systematic reviews and prioritized peer-reviewed articles. The gray literature (Reseausante.com) was also taken into account to ensure no important papers were overlooked. To this end, we targeted reports from credible organizations, that is, groups like government agencies, academic centers, and selected advocacy groups. Newspapers, magazines, and blogs were not searched, except to identify citations from credible reports. The third and fourth authors also identified additional studies on the subject.

2.4. Phase 3: eligibility

The first 2 authors performed a double-blind selection of the abstracts based on inclusion criteria. To remove any doubt, the third and the last authors were consulted. Five inclusion criteria were applied for article eligibility: (a) published between January 1995 and December 2015, (b) conducted in Canada, (c) main subject related to EFHL, (d) available online, and (e)
written in French or English. In total, 155 full texts were excluded for many reasons (did not meet criteria a, b, c, d, or e) and 264 full papers were included for the qualitative and quantitative synthesis and data extraction.

2.5. Phase 4: inclusion

This phase corresponds to the validation of the inclusions. A $2 \times 2$ table was used to calculate an odds ratio and 95% confidence intervals for dichotomous or categorical measures $(131 + 271)/451 = 0.8914$ and Cohen’s $d$ value $(\kappa = 0.839)$ (0.2 ≤ $d$ < 0.5: small difference; 0.5 ≤ $d$ < 0.8: medium difference; $d$ ≥ 0.8: large difference). The fourth phase of the literature search was to obtain copies of the articles identified in the previous phase. Finally, 264 (62%) publications met our inclusion criteria: (Scopus: 186 (70.5%); SPORTDiscus: 8 (3.0%); PubMed: 9 (3.4%); Academic search complete: 6 (2.3%); Reseausante.com: 50 (18.9%); Cairn 3 (1.1%); Erudit 2 (0.8%)) (Appendix B).

2.6. Phase 5: data extraction

A data form was used to extract information concerning the date of study; level of intervention (international, national or provincial, regional, municipal, and local); EFHL dimensions (physical, political, sociocultural, and economic); general methodology (quantitative, qualitative, mixed, situation review, and literature review); data collection (e.g., survey, document, interview, observation, and focus group); research participants (adults, youth, seniors, and women or girls); theoretical framework used; problem or variables studied; definition of EFHL based on subject studied and results or findings. The first and second authors performed the data extraction and the third and fourth authors verified all extracted data. To remove any doubt, data were discussed until agreement was reached. Once Phase 5 was completed, the analysis and review of the 264 identified articles was begun. The analysis process was structured using the research questions presented in the “Introduction” section above and summarized in the section “Synthesizing the results” below.

2.7. Data analysis

Data analysis was conducted in 2 steps. The first step was to code basic information on the EFHL papers into specific tables for each category. For example, general methodology was coded “QT” if the methods used in the paper were quantitative. We employed the same procedure for levels of intervention, EFHL dimensions, data collection, and research participants. However, the theoretical framework used, problem or variables studied, definition of EFHL based on subject studied and results or findings were coded based on the main idea of the selected text. The second step was to produce descriptive statistics and percentages for each element in the different categories.

2.8. Synthesizing the results

Results are presented in 2 parts. First, we categorize the Canadian articles published. Our aim was to identify and classify the time period of publication, number of publications, refereed journals, research locations, general methodologies, data collection, and characteristics of research participants. Second, we synthesize the results of the published Canadian research. More specifically, we present and summarize the results as follows: (a) EFHL intervention dimensions, (b) EFHL types based on the MSSS classification, (c) theoretical framework, (d) problems addressed and variables studied, and (e) conceptualization of research subject and findings regarding EFHL topic.
3. Results

3.1. Part 1: categorizing publications

The articles analyzed in this review were published in 88 different refereed journals according to the time period and location (Table 2). Most articles appeared in the following: (a) Canadian Journal of Public Health (n = 26), (b) BMC Public Health (n = 16), (c) International Journal of Behavioral Nutrition and Physical Activity (n = 12), (d) Health Places (n = 11), and (e) Journal of Physical Activity and Health (n = 7). We also noted that various subjects were associated with EFHL publications (Accident Analysis and Prevention, Aménagement, Environment and Planning B: Planning and Design, Injury Prevention, Leisure Sciences, Journal of Community Health, Social Market Quarterly, Recherche en soins infirmiers). Most research pertained to 3 Canadian provinces—Quebec, Ontario, and British Columbia—and to Canada as a whole. The number of publications rose sharply during 2010–2014 (n = 161; 61.0%), and the same trend was evident during the following period with 53 publications representing 20.1% of the total only for the year 2015.

Table 2
Articles published per period of 5 years and locations of studies.

| Time period | n (%) | Location |
|-------------|-------|----------|
| 1995–1999   | 2 (0.8) | QC (2)   |
| 2000–2004   | 3 (1.1) | CA (1), QC (1), AL (1) |
| 2005–2009   | 45 (17.0) | CA (17), AL (4), BC (5), NS (1), ON (10), QC (9) |
| 2010–2014   | 161 (61.0) | CA (37), AL (10), BC (17), NS (3), ON (43), QC (51) |
| 2015        | 53 (20.1) | CA (6), AL (1), BC (17), ON (13), QC (27) |
| Total       | 264   | 276 locations cited |

Table 3
General methodology (n (%)).

| Time period | QT (n) | QL (n) | Mixed (QT and QL) (n) | Literature review (n) | Situation review (n) | Total (n) |
|-------------|--------|--------|-----------------------|-----------------------|----------------------|-----------|
| 1995–1999   | 1 (0.47) | 0 (0)  | 0 (0)                 | 0 (0)                | 0 (0)               | 1 (0.47)  |
| 2000–2004   | 2 (0.95) | 0 (0)  | 0 (0)                 | 0 (0)                | 0 (0)               | 2 (0.95)  |
| 2005–2009   | 22 (10.43) | 7 (3.32) | 2 (0.95)            | 0 (0)                | 3 (1.42)            | 34 (16.12) |
| 2010–2014   | 81 (38.39) | 27 (12.80) | 12 (5.69)          | 4 (1.90)             | 17 (8.06)           | 141 (66.82) |
| 2015        | 20 (9.48) | 5 (2.37) | 2 (0.95)            | 2 (0.95)             | 4 (1.90)            | 33 (15.64) |
| Total       | 126 (59.72) | 39 (18.49) | 16 (7.58)         | 6 (2.84)             | 24 (11.37)          | 211 (100) |

Table 4
Data collection methods (n (%)).

| Time period | Survey (n) | Document (n) | Interview (n) | Focus group (n) | Observation (n) | Total (n) |
|-------------|------------|--------------|---------------|----------------|----------------|----------|
| 1995–1999   | 0 (0)      | 1 (0.50)     | 0 (0)         | 0 (0)          | 0 (0)          | 1 (0.50)  |
| 2000–2004   | 1 (0.50)   | 1 (0.50)     | 0 (0)         | 0 (0)          | 0 (0)          | 2 (1.01)  |
| 2005–2009   | 15 (7.54)  | 12 (6.03)    | 2 (1.01)      | 1 (0.50)       | 2 (1.01)       | 32 (16.08) |
| 2010–2014   | 58 (29.15) | 48 (24.12)   | 17 (8.54)     | 8 (4.02)       | 1 (0.50)       | 132 (66.33) |
| 2015        | 15 (7.54)  | 12 (6.03)    | 5 (2.51)      | 0 (0)          | 0 (0)          | 32 (16.08) |
| Total       | 89 (44.72) | 74 (37.19)   | 24 (12.06)    | 9 (4.52)       | 3 (1.51)       | 199 (100) |

As Table 3 indicates, 4 methodologies were identified: quantitative (n = 126), qualitative (n = 39), situation review (n = 24), and mixed (n = 16). Only a few literature reviews were found (n = 6). To our knowledge, only 1 study offered a theoretical framework on the topic. The methodology most widely used in the studies is the quantitative (59.7%) followed by the qualitative (18.5%) and the situation review (11.4%).

The research articles analyzed used different methods to collect data (Table 4). It should be noted that authors often relied on more than 1 method, while a few neglected to mention it. The most popular data collection methods were surveys (n = 89; 44.7%) and documents (n = 74; 37.2%). Examples of the latter include an accelerometer report, a report on number of accidents, or a map of a specific area. Other data collection methods include interviews (n = 24; 12.1%), focus groups (n = 9; 4.5%), and observation (n = 3; 1.5%). Additional methods were used in only a few studies and are not included in Table 4. These have to do with equipment such as an accelerometer (n = 8), geographic information system (n = 5), pedometer (n = 4), or procedures like the motivational journal (n = 4), photovoice (n = 4), blood samples (n = 2), and various measurements of body composition (n = 7).

Table 5 lists the categories of participants in the Canadian studies analyzed. Those studied most often for the 5 periods were adults (n = 101; 48.3%) and young people (n = 71; 34.0%). Seniors (n = 19; 9.1%) were most often studied for their walking habits in relation to the environment. Few studies focus on girls or women as regards EFHL (n = 2; 1.0%). Finally, the “other” category (n = 16; 7.7%) includes various subjects such as injuries, food products, observations, geographic area, etc.

3.2. Part 2: synthesizing the results of the published research

3.2.1. Intervention levels of EFHL

Table 6 shows the intervention levels of the studies analyzed. Most Canadian research initiatives surrounding EFHL were
conducted at the municipal (n = 125; 53.4%) or national or provincial level (n = 73; 31.2%). Local (n = 23; 9.8%), international (n = 7; 3.0%), and regional (n = 6; 2.6%) levels were also indicated.

3.2.2. EFHL dimensions

Each study has been classified based on 1 or more of the 4 EFHL dimensions (physical, sociocultural, economic, and political) indicated in Table 7. Many articles investigated the physical dimension of environment only (n = 217; 75.1%). The political (n = 19; 6.6%), sociocultural (n = 33; 11.4%), and economic (n = 20; 6.9%) aspects, however, are more often associated with the physical dimension.

3.2.3. Theoretical framework

The EFHL literature published in Canada can be divided into research with or without a theoretical framework. The choice of theoretical framework depends, for the most part, on the EFHL topic covered in the study; as a result, frameworks are very different. Physical activity programs for young people are based on concepts such as SHAPES,41 PLAY-ON,42 or REAL Kids Alberta.43 They can also be inspired by data reports on young people’s physical activity like the Active Healthy Kids Canada Report Card,44 Statistics Canada’s Population Estimates and Projections,45 or Smart Cities, Healthy Kids.46 Thus, youth programs can be structured around data from validated surveys such as Origin-Destination,47 Healthy Behavior in School-Aged Children,48,49 Space-Time-Activity,50 and Statistics Canada’s National Household Survey.51 The theoretical frameworks of studies with adults as research participants were also highly diverse: they include surveys such as the National Population Health Survey or the Canadian Community Health Survey from 1996 and 1997 to 2008,52,53 theory such as the Diffusion of Innovation Theory,54 initiatives such as the Green, Active and Healthy Neighborhoods initiative,55 or policies such as public support for active transportation.56 The majority of studies analyzed had no theoretical framework;57–63 many were situation reviews.13,64,65

3.2.4. Problems and variables studied

The issues addressed in terms of EFHL are complex and they frequently overlap. Seliske et al.,66 for example, studied urban sprawl and its relationship to active transportation, physical activity, and obesity in Canadian youth. Nevertheless, 4 major issues regarding EFHL stand out in Canadian studies: 2 concerning healthy lifestyles (physical activity and nutrition) and 2 concerning environment (built environment and neighborhood) (Fig. 2). These primary issues apparently define the EFHL concept in Canada in the scientific studies published during the period documented in our study. They can, in fact, be linked to the secondary issues (variables studied), which identified the EFHL components for each theme and sphere.

| Time period | Adult | Youth | Senior | Girl and woman | Other | Total |
|-------------|-------|-------|--------|----------------|-------|-------|
| 1995–1999   | 1 (0.48) | 1 (0.48) | 0 (0) | 0 (0) | 0 (0) | 2 (0.96) |
| 2000–2004   | 1 (0.48) | 1 (0.48) | 0 (0) | 0 (0) | 0 (0) | 2 (0.96) |
| 2005–2009   | 18 (8.61) | 8 (3.83) | 2 (0.96) | 0 (0) | 4 (1.91) | 32 (15.31) |
| 2010–2014   | 64 (30.62) | 50 (23.92) | 12 (5.74) | 2 (0.96) | 12 (5.74) | 140 (66.98) |
| 2015        | 17 (8.13) | 11 (5.26) | 5 (2.39) | 0 (0) | 0 (0) | 33 (15.79) |
| Total       | 101 (48.33) | 71 (33.97) | 19 (9.09) | 2 (0.96) | 16 (7.66) | 209 (100) |

| Time period | International | National or provincial | Regional | Municipal | Local | Total |
|-------------|----------------|------------------------|----------|-----------|-------|-------|
| 1995–1999   | 0 (0)          | 0 (0)                  | 0 (0)    | 2 (0.85)  | 0 (0) | 2 (0.85) |
| 2000–2004   | 0 (0)          | 2 (0.85)               | 0 (0)    | 0 (0)     | 0 (0) | 2 (0.85) |
| 2005–2009   | 2 (0.85)       | 16 (6.84)              | 0 (0)    | 14 (5.98) | 5 (2.14) | 37 (15.81) |
| 2010–2014   | 5 (2.14)       | 45 (19.23)             | 4 (1.71) | 86 (36.75) | 17 (7.26) | 157 (67.09) |
| 2015        | 0 (0)          | 10 (4.27)              | 2 (0.85) | 23 (9.83) | 1 (0.43) | 36 (15.38) |
| Total       | 7 (2.99)       | 73 (31.20)             | 6 (2.56) | 125 (53.42) | 23 (9.83) | 234 (100) |

| Time period | Physical | Political | Sociocultural | Economic | Total |
|-------------|----------|-----------|---------------|----------|-------|
| 1995–1999   | 2 (0.69) | 0 (0)     | 2 (0.69)      | 2 (0.69) | 6 (2.07) |
| 2000–2004   | 2 (0.69) | 0 (0)     | 0 (0)         | 0 (0)    | 2 (0.69) |
| 2005–2009   | 35 (12.11) | 2 (0.69) | 1 (0.35)      | 29 (9.90) | 39 (13.50) |
| 2010–2014   | 144 (49.83) | 15 (5.19) | 26 (9.00)    | 15 (5.19) | 200 (69.21) |
| 2015        | 34 (11.76) | 2 (0.69) | 4 (1.38)     | 2 (0.69) | 42 (14.53) |
| Total       | 217 (75.09) | 19 (6.57) | 33 (11.42)   | 20 (6.92) | 289 (100) |
Transportation, community influence, discourse in favor of sport, environmental influences, perceptions, facilitators, and barriers, season or weather, and walkability. Nutrition involved 5 variables: perceptions, local food exposure and accessibility, food services, product offerings, and the impact of a low socioeconomic status.

Neighborhood environment included 8 variables: community organization and health, living sites, physical activity, quality of neighborhood, recreation, culture, and sport, refugees integration, school travel, and seasonal influence.

Finally, built environment involved 12 variables: air quality and pollution, creative or supportive environment, designing smart cities, geographic transportation, greenness, physical activity, policymaking perspectives, promotion, residential density, risk of injury, safety, and travel distance, duration, and destination. Although the majority of Canadian studies on EFHL analyzed can be divided into these 4 categories, discussions of other issues—smoking, for example—are totally absent or negligible.

3.3. Evolution of the EFHL dimensions studied over the past 2 decades

The evolution of the number of EFHL studies over the past 10 years is illustrated in Fig. 3. The chart confirms a rapid increase in EFHL studies since 2008, with numbers constantly improving. As shown in Table 7, the physical dimension dominates, but the other dimensions follow the same acceleration trend, with the exception of a small decline in 2013–2014.

4. Discussion

First of all, this review shows that the number of EFHL studies has risen sharply since 2010. A glance at the results for 2015 makes this obvious. Most studies on EFHL focus on the province of Quebec, followed by Ontario and British Columbia. They support the findings of Savard et al. that the majority of Canadian provinces, particularly Quebec, Ontario, and British Columbia, have implemented strategies to promote healthy lifestyles, especially as regards students in primary and secondary schools. The 2 main lifestyles affected by these strategies, programs, and interventions are healthy food choices and physical activity. We also observe that between 2010 and 2015, studies on the different dimensions of EFHL continue the same trend, even if most concentrate on the physical dimension (Fig. 3). This sudden interest in EFHL seems strange insofar as no policies or action plans have been implemented in recent years by the federal, provincial, or territorial governments. It would be interesting to see if this trend holds true for countries other than Canada. It may be that international concern about sustainable development and the publication of studies on...
unhealthy lifestyles and their consequences are gradually raising awareness about the importance of EFHL.

Second, this review found that EFHL models aim, on the whole, to improve 2 major lifestyles—physical activity and nutrition—in connection with different associated variables (a total of 14). Both relate, especially, to the physical dimension in the MSSS classification model (2012) and are confirmed by Fig. 3. This leads us to question the silence surrounding other health issues (e.g., tobacco, drugs, sleep, medication, mental health): Is this because Canadian researchers have completely overlooked these problems, or is it because of the limitations of the studies selected? In response, the review leaves the impression that stakeholders may prioritize physical activity and nutrition in their EFHL interventions, because these elements have a concrete relationship with the built environment. This hypothesis is confirmed by the findings we discuss next. With respect to environment, EFHL initiatives and actions occur in 2 major areas: the built environment and the neighborhood. Accordingly, Canadian research appears to define the concept of EFHL based on the environment (land use patterns, urban design characteristics, transportation system) and the influence of the local community and social relations.

Third, organizations or authors attempted to group EFHL initiatives into various types of categorizations. If the categorization of Booth et al. seems to work in many cases (i.e., international, national and provincial, regional, municipal, local), the categorization of the MSSS appears too limited (i.e., physical, political, sociocultural, economic) in that it fails to take underlying elements into account. Most of the studies in this review focus on the physical environment and tend to exclude other types of environment. To the authors’ knowledge, both categorizations are limited in so far as they ignore key environments such as school, community, religion, socioeconomic status, family, and culture, among others. These elements would be helpful for designing a new research agenda with an improved classification that takes into account each EFHL parameter previously mentioned.

Finally, various design methods have been used to explore EFHL in the scientific literature in Canada. There were many situation reviews, but few reviews of the literature (n = 6) (Table 3). In view of the rapid increase in studies, more literature reviews are recommended to guide future research. Adults (17–60 years) and young people (0–16 years) were studied to a greater extent than seniors. Some authors called for more research on the lifetime carry-over effects of EFHL initiatives targeting young people to see if there are effects after they become adults. Furthermore, our findings reveal that studies on seniors are few and far between. This silence is problematic because the elderly population in Canada is growing rapidly, and targeted solutions are needed. We also noticed there were few studies on girls and women (n = 2), while attention was focused on other subjects (e.g., food products, geographic areas, accident risk). These findings should prove beneficial for guiding future studies on EFHL. We observed, too, that municipal and local levels are mentioned far more often than national and provincial levels (Table 6), which poses a question about the involvement of provincial governments in designing and implementing EFHL initiatives. Our study indicates that cities, via their political authorities (e.g., mayor, municipal advisor, councilman), are more proactive and are thus probably the best resources for solving the problem of sedentary lifestyles.

In terms of EFHL development across Canada, recommendations for improving physical activity include facilitating and encouraging access to active transportation by means of safe and attractive infrastructures (e.g., walking and cycling paths, parks, and services). Municipal or local stakeholders can implement these initiatives by, for example, building sports facilities near residential neighborhoods in high and low income areas and providing easy access to attractive sports facilities and equipment (e.g., swimming pool, tennis courts). To promote healthy lifestyles, they can provide safe access to services offering healthy choices and affordable prices or design residential neighborhoods with easy access.
to multiple services and active transportation.\textsuperscript{94,102} At the national and provincial levels, policies must foster collaboration between public health stakeholders and urban designers. The focus must be on facilitating access to infrastructures (e.g., cycling paths, wheelchair access, walking access, lighting, and pedestrian crossings)\textsuperscript{106,115} and designing the built environment with a view to its impact on healthy lifestyles.\textsuperscript{106,117}

In terms of guiding the new research agenda, future studies would do well to further concentrate on the subject of healthy lifestyles as discussed in research projects in Canada. They should document EFHL policies developed by federal and provincial governments and assist in developing new ones. Studies should explore official rules and policies for urbanization; produce impact studies on health dimensions (physical, mental, social); focus on urban planning based on considerations of healthy lifestyle; promote a better understanding of the impact of the built environment on gender, age, and class; and conduct macro (e.g., food companies, car companies, and multilateral agreements websites, transportation policies) and micro analysis (e.g., food shops proximity, school program, local rules for urbanization) related to EFHL.

This systematic review has certain limitations. First, the literature search was performed using 7 electronic databases and a substantial number of eligible articles. Because of the numerous articles found ($n = 264$), it was difficult to summarize and present a uniform body of results, but this is unlikely to have affected findings very much. Second, the review is limited to research published in the scientific or gray literature. Accordingly, it excludes many concrete initiatives that were neither properly related nor published in the scientific or gray literature. Finally, owing to the complexity of these topics covered under EFHL, there was little possibility of examining the links between studies, methods and findings, which underscores the necessity of developing a new EFHL classification.

5. Conclusion

This work offers a first map of Canadian studies on EFHL by presenting structured information on initiatives having to do with environments favorable to healthy lifestyles. It highlights the broad diversity of initiatives, the contexts in which they were implemented, and some negative effects of long-term interventions, which necessitates the involvement of numerous diverse stakeholders. Furthermore, it has led us to identify a new research agenda based on the need to classify EFHL and its components. The definition of EFHL was clarified, which resulted in a detailed exploration of issues, methodologies, stakeholders’ involvement, and dimensions of the subject neglected up to now by researchers, namely, the political and sociocultural spheres of action. Our findings open the door to innovative research perspectives in future.

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Authors’ contributions

TG designed and conducted the study, literature search, data extraction, and data-analysis and drafted the manuscript; MB assisted in its design, data extraction and coordination, and helped draft the manuscript; FT and MCR discussed the paper, provided methodological input, and helped draft the manuscript. All authors have read and approved the final version of the manuscript, and agree with the order of presentation of the authors.

Competing interests

The authors declare that they have no competing interests.

Appendix: Supplementary material

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