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The Built Environment and Physical Activity: Data Collection Tools to Support Intervention

TOPO Summaries by the Nutrition–Physical Activity–Weight Team

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IN THIS ISSUE

- A reminder of the links between the built environment and physical activity
- Methods for defining the built environment and supporting public health stakeholders

And answers to the following questions :

- What data collection methods can be used to characterize the built environment in an intervention context?
- In which contexts should various collection tools be used?
- Are there, in Québec, concrete and practical examples of the use of these data collection tools?

The **TOPO collection** disseminates knowledge to inform practitioners and decision makers on the prevention of weight-related issues. Each publication addresses a theme combining a critical analysis of the relevant scientific literature with observations or illustrations in order to help use this knowledge in the Québec context.

The TOPO collection may be found at **www.inspq.qc.ca/english/topo**

Introduction

Physical activity and sedentary living are important public health issues.[1, 2] Several studies have revealed links between various features of the built environment and physical activityé.[3] In order to develop a profile, better understand the impacts of built environment features, and better direct interventions on the creation of built environments that are conducive to physical activity, using the best information available is essential. The aim of this TOPO is to outline the main methods for collecting this information. Special attention is given to the data collection tools recently developed by the Québec public health network.

Photo: Éric Robitaille

Built environment: The built environment includes all elements of the physical environment except for natural elements. This includes elements that are created, transformed, or organized by humans, such as different land uses, transportation systems, and designs.[3]

Québec

Current scientific knowledge confirms an association between built environment elements and physical activity, during both leisure activities and transportation.[3]

- Residential neighbourhoods with better walkability are positively correlated with citizens engaging in active transportation (walking, biking, public transportation).
- The presence of sidewalks, footpaths, and bike paths in neighbourhoods encourages residents to engage in physical activity when they are going from place to place.
- People use active transportation to a greater extent when several destinations (businesses, schools, etc.) are located near their residence, and when they are connected by routes conducive to biking, walking, and public transportation.
- In addition, a significant number of recreational and sports facilities, such as parks, pools, playgrounds, and sports clubs in neighbourhoods fosters greater involvement in physical activity among both adults and youth.

Photo: Éric Robitaille

Three data collection methods are generally used in the development of measures or indicators to develop a profile of the built environment's characteristics linked to physical activity: georeferenced data; observation (audits), and self-reported data from questionnaires. Traditionally, tools used to collect data on the built environment were developed for research and monitoring.[4] Today, an increasing number of tools are used to develop profiles and guide stakeholders in efforts to create environments conducive to healthy living.[5] The data gathered through the different tools relate to built environment features that may influence physical activity (Table 1).

Table 1: Elements comprising the built environment linked to physical activity, grouped into three dimensions

Dimension	Sub-dimension	Elements
Transportation system	Road network configuration	■ Continuous road network ■ Connectivity[1]
	Non-motorized transportation infrastructure	■ Bike paths ■ Sidewalks ■ Paths
	Public transportation infrastructure	■ Bus stops ■ Train stations
Land use	Diversity	■ Different land uses (e.g., industrial, commercial, recreational, civil, and residential) within the same sector
	Density	■ Number of people within a sector
Urban design	Urban design (street)	■ Width and surface of sidewalks ■ Street lighting and bordering vegetation ■ Traffic-calming measures
	Urban design (site)	■ Parking ■ Pedestrian crosswalks ■ Height and width of buildings, architecture

Source: Bergeron et Reyburn, 2010.

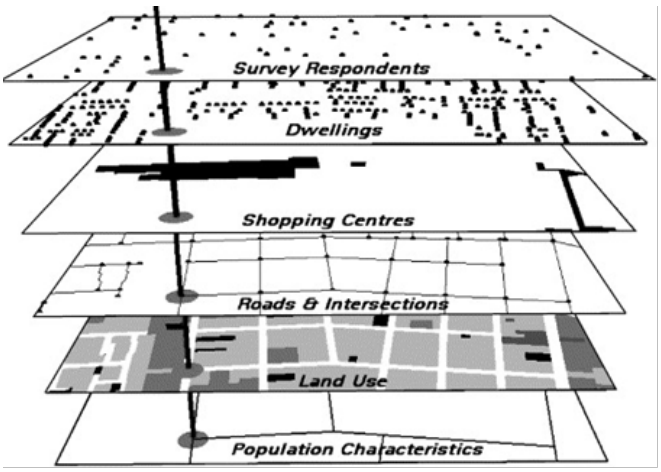
[1] Connectivity is defined by the density of intersections and street grids. The denser a road network is in terms of intersections, the higher the connectivity will be. Individuals will have easier access to their destinations.

Georeferenced data

The first type of information used to develop a profile of built environment features comes from georeferenced data, obtained from geographic information systems (GISs). GISs have the ability to connect different databases, as long as they include a geographical reference, i.e., geocoding information (addresses, postal codes, geographical coordinates) (Figure 1).

The main measures developed through GISs are those related to residential density and density of services, geographical accessibility to certain services, land use diversity, and road network connectivity.[6] Data sources used to operationalize these various measures essentially come from public organizations and private companies. These databases are related to the property assessment roll, road network geometries, services and business directories, and land use files.[6]

Figure 1: Simplified model of a GIS's ability to connect different data through georeferencing[7]



Advantages

Georeferenced data is the only source of information to characterize the built environments of several geographical areas (e.g., local health sectors) simultaneously. It is then possible to analyze the geographical disparities in the built environments' features.

Disadvantages

Georeferenced data collection is time-consuming. People in charge of databases (outside of the public health network) must be contacted and the use of data must be negotiated. It is important to plan data updates. Databases will likely require processing on several levels after they are obtained. This is because the databases (e.g., property assessment roll data on built environment density) were not created to characterize the built environment in relation to physical activity. At this stage, support from a GIS expert will be useful in geolocating and operationalizing the built environment's various indicators.

Examples of applications using georeferenced data

a) The Website: *Portrait de l'environnement bâti et de l'environnement des services: un outil d'analyse pour améliorer les saines habitudes de vie* (profile of the built and service environments: an analysis tool to promote a healthier lifestyle).

This tool is an application developed jointly by the INSPQ and Québec en forme. It enables the visualization and an analysis of the built environment's features for most regions in Québec using an online dynamic mapping application. Indicators have been calculated based on certain components that define the built environment, and these indicators operationalized using GISs.[6] In the interactive application, indicators on diversity, connectivity, walkability, accessibility to recreational infrastructure and food stores, and socio-economic characteristics can be accessed. Data is available across the diffusion areas,[1] local health sectors, municipalities, neighbourhoods and boroughs, regional county municipalities (RCMs, known as MRCs in French), Québec en forme's local partner groups, and health regions.[2]

b) *Portrait de l'environnement bâti en milieu urbain défavorisé de la Montérégie* (built environment profile of disadvantaged urban areas in the Montérégie region)[3]

This profile, developed by the Direction régionale de santé publique (DRSP - regional public health authority) de la Montérégie, provides access to a range of data on the built environment. The profile characterizes the region's most underprivileged sectors by addressing five themes: housing, land use, transportation, risks and harmful effects, and accessibility. The main purpose of this profile is to serve as a "stimulus for action" in the field. It includes more than 60 indicators operationalized by using GISs and originating from 14 different databases. Indicators on residential density, connectivity, diversity, availability of public transportation, availability of services, as well as on socio-economic and environmental aspects, have been created. Data is available across the Conférences régionales des élus (CRÉ - regional conference of elected officials), local health sectors, and municipalities. Tables, maps, and backgrounders are also available to help interpret results.

Georeferenced data have been used to:

- Characterize territories as part of health impact assessments (HIA).[9, 10]
- Create built environment profiles linked to physical activity.[11, 12]

Using georeferenced data is recommended for...

1. Establishing a built environment profile for several geographical sectors simultaneously.
2. Stimulating discussions between organizations on features of the built environment and on actions that can be taken to modify them.
3. Identifying intervention territories.
4. Capturing built environment features on a macro scale (neighbourhoods, local health sectors, health regions).

Observation checklists (audits)

Another method to collect measures on built environment features relies on observation data gathered through audits or observation checklists. Audits help analyze the built environment aspects of a sector, road stretch, park, or trail. Data is collected by trained observers or by organizing exploratory walks to record built environment features at pre-determined observation points. Observers fill out a checklist of several objective measures of the built environment. The audit makes it possible to establish a profile of the point visited. Visiting several points makes it possible to establish profiles for geographical sectors, parks, or routes.

[1] The smallest geographical unit for which census data are disseminated. It includes 400 to 700 people.[8]

[2] Indicators are available on the following Website: http://environnementbati.inspq.qc.ca. Online training on the optimal use of the mapping application is also available. (http://campusvirtuel.inspq.qc.ca/pages/environnement-bati).

[3] http://extranet.santemonteregie.qc.ca/sante-publique/sante-environnementale/amenagement-territoire-cadre-bati/projet-habitat.fr.html.

Measures from audits cover the architectural features of buildings; the presence and condition of infrastructure linked to biking, walking (sidewalks, traffic-calming measures, greenness, lighting, incivilities, park and trail cleanliness, road markings, etc.), and the presence and condition of equipment (e.g., play structures, loan counters).

Advantages

Audits provide information on unique aspects (appearance, atmosphere, quality) of the built environment that can be linked to physical activity among individuals (5). In addition, certain audits have been developed for specific categories of the population (youth, seniors) (e.g., Walking Route Audit Tool for Seniors).[4]

Disadvantages

Observation requires some logistics: site selection (sample), observer training, data collection, data management, and data analysis. Training is necessary to ensure consistency in the observations by the different observers. The main barriers to this method are cost-related and linked to the time required[5] for data collection. Several observation points are required to establish an accurate profile for a sector based on an audit. For example, 512 intersections were analyzed by six observers for a survey on road development at different intersections in Montréal.(14)

Two methods are proposed to reduce costs related to the use of observation tools and to avoid unnecessary site visits. First is the use of georeferenced data to select sites to be visited; this will make it possible to obtain a sample of observation points that is more representative of the built environment features of a geographical sector. Second is the use of data that are available on the Internet, such as that on Google Street View.(15) In fact, Google Street View can be used, with certain precautions, to fill out built environment checklists. The features of certain elements of the built environment such as infrastructure for pedestrian safety, traffic, and those facilitating active transportation can be evaluated through images on Google Street View. However, elements such as the presence of incivilities, waste, and broken windows are harder to detect using this type of image.

Examples of audits

a) Safe and active transportation audit for walkable neighborhoods (PPAS)

The Direction régionale de santé publique (DRSP – the regional public health authority) de Montréal supported the development of the safe and active transportation audit for walkable neighborhoods (Audit de potentiel piétonnier actif et sécuritaire - PPAS) tool. Audits made it possible to study various components of the built environment in several sectors: urban functions, features of sidewalks and adjacent spaces (urban furniture, lighting, street type, etc.), intersection configurations, urban atmosphere, walking experience, and access to public transportation and bike paths. In studying these components, each audit, was carried out using three walkability audit tools. Two of the tools had already been validated and published in scientific journals. The third tool came from community organizations advocating for walkability improvements. For optimal use of the PPAS audit, the DRSP de Montréal provides training, support, and a toolbox.[6]

b) *Grille d'observation sur les aménagements potentiellement liés à la sécurité des piétons* (observation checklist on installations potentially linked to pedestrian safety)

Developed in 2008 by the DRSP de Montréal in collaboration with civil engineers, this checklist includes a range of elements on the features of a road intersection. The checklist makes it possible to gather information on signs and signals, the number and type of traffic lanes, traffic-calming measures, pedestrian crosswalks, parking, visibility, length of crossings, and width of road stretches.(14)

c) *Grille d'analyse du potentiel de déplacements actifs* (GAPDA - analysis checklist on active transportation potential)

The GAPDA checklist is an audit tool adapted for small- and mid-sized municipalities (1 500 to 50 000 residents) that was developed by the DRSP de la Montérégie in collaboration with the local health sectors. It is intended to diagnose and analyze various aspects of a given built environment to determine its walkability and bikeability for utilitarian travel. According to the audit's designers, the GAPDA is user-friendly and allows for active participation by the municipal sector. It covers the following themes: land use planning (zoning, types of services and residences); specific features of the cycling and pedestrian infrastructure (width, snow removal, connectivity, etc.); adjacent spaces and comfort (greenness, lighting, urban furniture, etc.); configuration of lanes and intersections; and road safety. Proper use of the GAPDA requires training and support from experts at the DRSP de la Montérégie.

Use of the observation checklists (audits):

- The GAPDA checklist was used to establish the profile of the active transportation potential in three municipalities in 2011. In 2012, the GAPDA was used by the four local health sectors of ten municipalities in the Montérégie region and for several health impact assessments (HIAs).[7] (9,17)
- The observation checklist on installations potentially linked to pedestrian safety was recently used to establish a profile of the features of a representative sample of intersections, which covered the territory of the island of Montréal.(14)

4 http://activelivingresearch.org/files/WRATS_AuditTool_07.17.09_0.pdf

5 The time required to fill out an observation checklist has been estimated to vary between 5 and 30 minutes per observation point.(13)

6 https://hcbdclasp.files.wordpress.com/2013/03/montreal-safe-active-transportation-audit.pdf

7 Health impact assessment (HIA): "Is a combination of procedures, methods and tools by which a policy, program or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population" EUROPEAN CENTRE FOR HEALTH POLICY (1999:4) (16).

- The PPAS audit was used to establish the profile of four neighbourhoods in Montréal (Centre-Sud, Mercier-Est, Galt, and Saint-Pierre).[8] At the DRSP de Montréal, the PPAS is part of a larger assessment project for mobilizing stakeholders in the community to create more favourable environments for sustainable mobility (cycling, walking, public transportation).[18]

Using observation data (audits) is suggested for...

1. Capturing features of the built environment on a micro scale (streets, intersections, parks and green spaces, walking trails).
2. Identifying priorities in terms of the changes to be made to the built environment to make it more supportive of physical activity.
3. Supporting decision-making by competent authorities regarding the implementation of planning measures conducive to safe and active transportation.

Self-reporting data questionnaires (survey)

Questionnaires are used to collect self-reported data. The information is gathered by phone, mail, through face-to-face interviews, or via the Internet (Figure 2). It reflects the surveyed individuals' perception of built environment features. The information does not therefore necessarily represent the objective reality of the built environment. However, that perception can have a significant impact on an individual's decision to take part in a form of physical activity or not.[4, 19] For example, the impact that the perceived neighbourhood crime rate has on physical activity can be much greater than the impact of the actual measured crime rate.

There are several examples of data collection tools for defining the built environment using self-reported measures. In a recent literature review, Brownson et al. (2009) listed 19 different questionnaires to collect perception-based data on built environment features.

Advantages

The measures obtained through self-reported data have certain strengths. The first one is linked to the perceptual nature of the gathered information. Second, exclusive information on the built environment can be collected, such as the infrastructure's quality, and the neighbourhood's walkability and bikeability (Figure 2). For example, perception-based data can indicate why the activity rate is low in a built environment considered favourable based on information gathered through observation or georeferenced data.

Disadvantages

To create a profile on a local scale through self-reported data, a sufficiently large sample of individuals is required, which can entail significant costs. In addition, response rates can vary widely. It should be noted that short questionnaires have higher response rates.[4] Finally, the perception of certain built environment features can vary from one individual to the other. The perceived presence of physical elements of the built environment, such as the presence of sidewalks, is usually constant between individuals. However, perceptions on crime and safety can vary from one individual to another. It is difficult to develop profiles for geographical sectors when there is significant variability in terms of individual perception.

Example of a tool for self-reported measures

a) *Enquête santé et habitat : projet pilote dans une municipalité québécoise* (health and housing survey: pilot project in a Québec municipality)

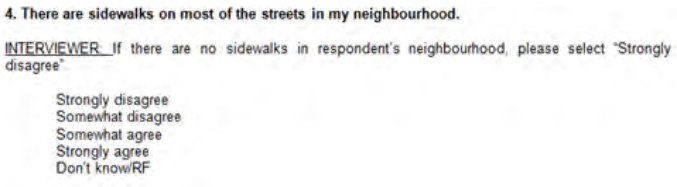
The Enquête santé et habitat pilot project is an initiative of the INSPQ and the DRSP de la Capitale nationale. The purpose of the project is to meet a need in the public health network to acquire information on the relation between built environment features and health. The analysis of the data collected during the survey was intended to inform, raise awareness among, and mobilize local authorities in creating built environments that support health. Several tools were developed in the context of this survey, including a tool to gather information on household occupants' perceptions of built environment features. The variables collected through face-to-face interviews were related to: general features of a neighbourhood (buildings, zoning), general condition and maintenance, common and recreational spaces, proximity to services and factors supporting physical activity and healthy eating, safety of the immediate environment, and noise pollution. The data collection tool was inspired by the European survey known as LARES (Large Analysis and Review of European Housing and Health Status).[20]

The use of self-reported data is suggested...

1. To complement tools to gather objective data on the built environment (georeferenced data and observation data).
2. To capture the public's perception of the built environment features.

[8] http://www.dsp.santemontreal.qc.ca/dossiers_thematiques/environnement_urbain/thematiques/transport/documentation/ppas.html

Figure 2: Example of a question from a self-reported data questionnaire[21]



4. There are sidewalks on most of the streets in my neighbourhood.

INTERVIEWER: If there are no sidewalks in respondent's neighbourhood, please select "Strongly disagree".

Strongly disagree
Somewhat disagree
Somewhat agree
Strongly agree
Don't know/RF

To summarize

- Three data collection methods to establish profiles of the built environment were outlined in this TOPO: georeferenced data, observation checklists (audits), and questionnaires (Table 2);
- Georeferenced data come from commercial or public databases that make it possible to characterize the built environment;
- The observation checklists comprise a series of objective indicators of the built environment collected by onsite observers;
- Questionnaires make it possible to gather data on individuals' perceptions of the built environment;
- Tools enabling the development of profiles of the built environment in relation to physical activity were recently developed and implemented in Québec. These tools are used in stakeholder mobilization, community profiles, and Health Impact Assessments, for example;
- Training and support are provided to ensure optimal use of the data collection tools developed in Québec.

Table 2: Presentation of the types of data that may be used to develop a profile of the built environment in relation to physical activity

Collection tool	Types of data	Examples in Québec	Advantages	Disadvantages	Reminders…
Georeferenced data	Georeferenced data; Objective data; Information on a macro scale (neighbourhoods, municipalities, regions).	Profile of the built and service environment; Profile of the built environment in under-privileged urban areas.	Makes it possible to characterize the built environment of several geographical sectors simultaneously.	Time-consuming and costly; requires expertise in processing georeferenced data.	Remember to update.
Observation checklists or audits	Observation data; Objective data; Information on a micro scale (streets, parks, trails).	Safe and active transportation audit for walkable neighborhoods; Observation checklist on installations potentially linked to pedestrian safety; Analysis checklist on active transportation potential.	Make it possible to capture specific elements of the built environment features.	Time-consuming and costly; requires expertise in tool design and result analysis.	Select the sites to visit with care.
Questionnaires	Self-reported data; Perceptual data.	Health and housing survey.	Make it possible to capture information on the individuals' perception of the built environment features.	Time-consuming and costly; requires expertise in sampling and result analysis.	Prioritize short questionnaires

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AUTHOR

Éric Robitaille,
Développement des individus et des communautés

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