Mapping Stairwell Accessibility in Vancouver's Downtown Core

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ABSTRACT

Background: The increase in obesity is due in part to changes in the environment that affect behaviours such as physical activity. Stairwells in buildings present an opportunity to increase physical activity in the workplace. We characterized the stairwell accessibility in business buildings in the downtown core of Vancouver.

Methods: Characteristics of the stairwells in business buildings with two or more floors were obtained. Stairwells were characterized based on their visibility from the main entrance, signage, presence of physical door, and interior lighting and space. Building completion year was obtained from the Vancouver City Hall.

Results: A total of 138 buildings in the pre-designated area were eligible for characterization. Due to security concerns, only 123 were assessed. Of those assessed, 54% had stairwells visible from the main entrance, 33% had locked doors and only 18% had signs on the stairwell doors. Of the 83 stairwells that were accessible, 54% and 36% were considered brightly lit and spacious enough for two people, respectively. Only 11% of the buildings studied had accessible stairwells that met all of our accessibility criteria. More recently built buildings tended to have a higher proportion of locked stairwell doors; otherwise, building completion year was not associated with any of the accessibility criteria.

Interpretation: Based on their environmental characteristics, very few buildings were set up in a way that encouraged stair use. For the work environment to be conducive to increased physical activity, building policy will need to consider the implications of design on activity patterns.

MeSH terms: Physical activity; urban health; public health

La traduction du résumé se trouve à la fin de l'article.

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In Canada, approximately 48% of the adult population is considered overweight (body mass index (BMI) >25 kg/m²) and 16% of the population obese (BMI >30 kg/m²).¹ The rapid increase in the prevalence of obesity¹ rules out any population shift in genetics as a primary cause and leads us to suspect that changes in the environment have adversely affected physical activity and nutrition habits.² This then makes obesity a societal problem, influenced by an environment that encompasses the values and beliefs of its society. Therefore, the solution to the obesity problem lies in identifying feasible ways to cope with and to change the current environment to be more supportive of healthy lifestyle choices, and/or develop strategies that will help individuals manage better within the current environment.³

Efforts to this end have been directed at increasing physical activity by changing the "horizontal" environment through initiatives such as bike paths and increased green space.⁴ In dense city centres, this is not a viable option. An alternative approach is the use of "vertical" space – such as stairs in buildings – for physical activity. As nearly half of adult waking hours are spent at work, recent efforts have been directed towards increasing stair use at work, in order to increase daily physical activity. Health Canada describes stairs as an excellent means to increase energy expenditure as they are present in every building, they have no cost and, because stair climbing is a familiar activity, participants have a high level of confidence in their ability to participate in the activity.⁵ In addition, physical activity can be accumulated throughout the day, thus climbing stairs each time instead of taking the elevator can make a significant contribution to the thirty minutes of moderate physical activity that is recommended each day.

Previous observations of stair use have reported a range between 5-20%,⁶⁻¹³ but there are many factors that may influence whether one uses the stairs, such as location, lighting and access. Minor changes in the environment, including the use of signs indicating the location of stairwells and the beautification of stairwells through music and artwork, can result in modest but significant improvements of stair use.⁶⁻¹³ The purpose of this study was to map business buildings in the downtown core of Canada's third largest city, Vancouver, for stairwell design and accessibility characteristics. The data collected in this study will be used to identify sites for future

stair intervention studies, as a means to increase energy expenditure in workers within the Vancouver downtown core.

METHODS

Non-residential buildings in the Vancouver business core were mapped in the area bound by Burrard, Davie, Cordova, and Cambie Streets (approximately 70 city blocks). All buildings (excluding hotels) located within this quadrant that had two or more floors were considered. In each of the buildings, the number of floors, the number of elevators and the number of accessible stairwells from the entrance were determined. The proximity of the stairwell to the elevators was noted in terms of whether the entrance to the stairwell could be seen directly from the entrance to the building or from the elevator bank. The presence or absence of a door on the stairwell entrance and whether it was glass, solid, locked or had a sign on the door were also assessed. Upon locating the stairwell, the appearance was assessed for lighting (natural, bright or dim artificial lighting) and whether the stairwell had sufficient space for two adults to walk through comfortably side-by-side (if so this was designated as being 'open'). These latter characteristics were assessed in a quasi-subjective manner. In the case where a building had two sets of stairs with different characteristics, only the one that was closest to the entrance was rated. The year of building completion was obtained from the City of Vancouver Water Rates Department based on the year in which water service began.

Continuous data were analyzed by independent t-test. Categorical data were analyzed using the Chi-squared test. Pearson correlation coefficients were used to test for bivariate associations. Data are presented as means and standard deviation for continuous variables. Data were analyzed using SPSS 10.0 statistical package (Chicago, IL).

RESULTS

A total of 138 buildings were identified and mapped in the selected area. Of these, 10 could not be assessed for the following reasons: 4 had security guards who would not allow assessment, 3 had the front door locked and 3 had 'hidden' stairwells for the staff only, as informed by the building security. In addition, 5 buildings did not have any stairwells that could be

Figure 1. Flow diagram outlining stairwell of those 66 buildings with stairwells near the entrance door

found from the main floor. Therefore, 123 of the remaining buildings (90%) were assessed. Those that were not assessed were younger compared to those assessed, 28 ± 18 vs. 45 ± 38 years, respectively. There were no differences with respect to the number of floors.

Of those assessed, the average building age ranged from 0 to 116 years and the average number of floors was 10 ± 7 (range: 2 to 35). As expected, the distribution of building floors was skewed such that there were 45, 27, 21, 20, and 10 buildings with floors of 2-5, 6-10, 11-15, 16-20 and >20, respectively. The number of floors was negatively associated with age of building (-0.20 , $p < 0.05$). Eighty-three (68%) of the buildings had one stairwell; 38 (31%) had two; 1 (1%) had three; and 1 (1%) had four. The number of elevators ranged from 0 to 12 and significantly correlated with number of floors (0.92 , $p < 0.01$). Those with no elevators were predominantly two-storey buildings.

The majority of the stairwells had doors on them at the main level (88, 72%); of these, 40 (45%) had locked doors (33% of total sample). Only 22 of the 123 buildings had a sign on the door indicating a stairwell.

Only those stairwells that could be accessed were scored for light and size ($n=83$). Of these, only 18 had windows to allow for natural lighting, whereas 45 buildings (54%) had stairwells that were considered bright regardless of source of lighting. Thirty of the stairwells assessed (36%) were considered to be spacious enough for two people to pass through.

A total of 66 buildings (54%) had stairwells visible from the entrance, and an additional 13 had stairwells near the elevators. The characteristics of these 66 building stairwells are outlined in Figure 1.

Based on these criteria, only 52% of the stairwells were readily obvious upon entering the building (those with doors that had signs and those without doors).

Of all the stairwells, only 14 met the following criteria: visible from entrance, either no door or with a sign on the door (unlocked), brightly lit and open.

Comparing the oldest and youngest building age tertiles, there was no difference in the proportion of buildings that had a door present at the stairwell, lighting of the stairwell or spaciousness of the stairwell. However, of those buildings with stairwell doors, those in the youngest tertile had a significantly greater proportion of the doors locked (51% vs. 24%, $p < 0.05$).

DISCUSSION

Getting people to use stairs presents an ideal opportunity to increase physical activity; however, based on our results, the overwhelming majority of business buildings in downtown Vancouver do not have stairwells that are conducive to or inviting for use. Indeed, nearly one third of all buildings had a locked door to the stairwell for security reasons and only 54% of the buildings had a visible stairwell from the entrance. When taking all criteria for accessibility into account (visible from entrance, unlocked or no door, brightly lit and large enough for two people), only 11% of the buildings were considered to have characteristics that would make them conducive to regular use.

It is likely that many of the individuals conducting business at these buildings were employees and therefore may have greater awareness of the location of the stairs than just what is readily visible upon entry. However,

for many, visible cues are required for habit-forming behaviours. Habits are automatic behavioural routines developed within a consistent environment, such that changing the environment may encourage conscious decision-making and therefore a change in habit. This is borne out by several studies that have used signs, posters or motivational banners as visual cues to influence people to use the stairs more frequently.⁶⁻¹³ All of these studies reported significant increases in observed stair use coincident with the change in environment. Only one study measured stair use after the intervention, and reported continued increased stair use even after the visual cue was removed,⁶ indicating that this change in environment resulted in a change in physical activity habits. In that respect, we would hypothesize that those employees in buildings with readily identifiable stairwells (either through signs or being visible from the entrance or elevator) would report greater use of the stairs than employees in buildings without same.

Since the invention of the elevator, buildings have increased in height as traversing vertical space has become automated. This has resulted in stairwells being developed primarily as fire escapes subject to local and national building codes and not as a predominant route for people traffic. In order to comply with these codes, architects are restricted from building more inviting stairwells – any extra features that would make the stairwell more attractive comes at an additional cost to the builders or building managers, and in some cases results in stairwells that do not meet the building codes. While fire codes require stairwells to be at least 90 centimetres wide,¹⁴ this is barely enough to allow for two people to pass through side-by-side. Therefore, most stairwells remain enclosed and narrow, with poor artificial lighting; serving as a fire escape, instead of an inviting opportunity for physical activity. Poorly lit stairwells (46% in our observations) can also raise concerns of personal safety and therefore deter individuals from use. Previous studies have demonstrated that increasing lighting and beautifying stairwells can significantly increase use.^{8,12} Increasing the lighting is one of many suggestions from Health Canada to make stairwells more attractive and increase use.⁵

LIMITATIONS

Given the study design, a number of limitations were inherent that need to be

acknowledged. To begin with, we used subjective measures of lighting and size, however all stairwells were rated by the same individual. We also did not assess accessibility from any other floor than that of the main entrance. It is possible that signage and accessibility may differ on other floors, however we have no reason to believe that this would be any different from that of the main floor. Finally, our results are specific to the region that we studied and may not be indicative of other city downtown areas.

Our study indicates that very few buildings within the Vancouver downtown area naturally encourage stair use from the main entrance floor. Given that office buildings require stairwells to meet fire regulations, this presents an obvious opportunity to increase physical activity in the workplace. However, certain code requirements (such as fire doors) can be in conflict with producing an environment conducive to stair use, as can cost. In order to encourage stair use as a means for increasing physical activity, changes in the environment of these buildings are needed. These changes could be as simple as increasing signage to the stairs or increasing lighting in the stairwell. Given the large proportion of adult time spent in the work environment, it would be advantageous for those involved in building policy to consider the implications of design on activity patterns. Until recently, the areas of building and health policy were thought to be unrelated to one another, however evidence exists to suggest otherwise and the built environment is clearly implicated in physical activity patterns and the prevalence of obesity.

RÉSUMÉ

Contexte : L'augmentation de l'obésité est due en partie aux changements environnementaux qui ont des incidences sur les comportements comme l'activité physique. Comme les cages d'escalier dans les immeubles offrent la possibilité d'accroître l'activité physique en milieu de travail, nous avons caractérisé leur accessibilité dans les immeubles commerciaux du centre-ville de Vancouver.

Méthode : Nous avons relevé les caractéristiques des cages d'escalier dans les immeubles commerciaux de deux étages et plus : leur visibilité de l'entrée principale, leur signalisation, la présence matérielle d'une porte, ainsi que l'éclairage et l'espace à l'intérieur des cages d'escalier. L'hôtel de ville de Vancouver nous a fourni les dates de construction des immeubles.

Résultats : Il y avait 138 immeubles dans la zone désignée, mais pour des raisons de sécurité, nous n'en avons évalué que 123. De tous les immeubles évalués, 54 % avaient une cage d'escalier visible de l'entrée principale, 33 % avaient des portes de cage d'escalier verrouillées, et 18 % seulement des cages d'escalier étaient indiquées par un panneau sur la porte. Sur les 83 cages d'escalier accessibles, 54 % étaient bien éclairées, et 36 % étaient assez larges pour deux personnes. Seuls 11 % des immeubles à l'étude avaient une cage d'escalier accessible répondant à nos quatre critères d'accessibilité. Dans les immeubles de construction récente, les cages d'escalier avaient tendance à avoir des portes verrouillées; autrement, l'année de construction n'était associée à aucun des critères d'accessibilité.

Interprétation : Très peu d'immeubles sont conçus pour favoriser l'utilisation des escaliers. Pour que les milieux de travail soient propices à l'activité physique, les politiques de construction devraient tenir compte des conséquences de la conception des immeubles sur les schémas d'activité.

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