

# Sustainable Halton



## Physical Activity and the Built Environment

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This is a draft final background report for the Sustainable Halton planning process. As the project continues and as we receive public feedback, there may be slight adjustments made to the content of this report.

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## EXECUTIVE SUMMARY

Obesity is increasingly becoming a major public health problem in Canada and around the world. This is contributing to a dramatic rise in illnesses such as type 2 diabetes, heart disease, stroke, and some cancers. For non-smokers, poor nutrition, physical inactivity and overweight are the leading causes of chronic health problems in Ontario. The trends in Halton are 67 percent of men and 39 percent of women considered overweight or obese. Unfortunately, this is not just a problem with adults. The 2000 Canadian Community Health Survey found that about 25 percent of boys and 15 percent of girls (age 12 to 18) in Ontario were either overweight or obese.

To achieve and maintain a healthy weight, people have to be physical active enough each day to achieve a balance between energy in and energy out. As well, the types and quantities of food that we eat are important determinants of weight and reducing chronic diseases. Physical activity does not necessarily mean participating in sports or other organized activities. People can build more movement and physical activity into their daily lives by making small changes, such as taking the stairs, walking or cycling to do errands, or walking to school or work. Our environments such as our homes, our schools, our workplaces and our communities, can either encourage or discourage physical activity.

Canada's Physical Activity Guidelines for Healthy Active Living recommend that adults participate in 30 to 60 minutes of activity daily to maintain or improve their health. It is particularly important to note that health benefits can be achieved by accumulating these 30 to 60 minutes of physical activity over ten-minute increments. Physical activity in ten-minute increments is easily achievable by encouraging people to be active throughout the day. The benefits of daily moderate physical activity have the potential to be more effective than more structured, vigorous forms of exercise such as jogging or aerobics because of increased levels of adherence to these. In other words, the more opportunities that people have to integrate activities in their day-to-day lives, the more likely it is that they will be able to maintain these beneficial behaviours.

The reasons that people are not active are numerous. There are personal barriers that restrict a person's motivation to be active such as lack of time, inability, lack of social support, and child-care responsibilities. And, there are environmental barriers that are related to the conditions within our surroundings that make physical activity difficult or impossible. These barriers include lack of bike lanes, lack of facilities, safety, and lack of places to go. The two most commonly reported barriers for physical activity are distance, an environmental barrier, and time, a personal barrier. In order to design an effective physical activity program, these barriers must be addressed.

Utilitarian physical activity refers to those activities that serve the practical purpose of transporting someone from one place to another. These are activities that are transportation related and can involve substituting an automobile trip with a physical activity. Another common term for this type of activity is “Active Transportation”, which refers to any form of human-powered transportation. Examples of facilities necessary for utilitarian physical activity include sidewalks, trails, bicycle lanes, and amenities such as stores, community centres, libraries, and restaurants. The neighbourhood is particularly important for encouraging utilitarian activity. Access to the necessary facilities to engage in utilitarian physical activity is critical for allowing people to make the choice to walk or cycle instead of driving. Utilitarian activity almost always occurs on publicly provided transportation infrastructures such as sidewalks and bicycle paths.

Focusing on encouraging more utilitarian activity also allows us to contend with the issue of lack of time. Unlike leisure-time physical activity, when we promote utilitarian activity we are not trying to replace an activity. Instead, people are encouraged to do the same activity in a different way. For example, people could be encouraged to walk to the store instead of driving to the store. The activity itself is the same, i.e. going to the store. It’s how people go to the store that is important. This directly addresses the issue of time because people are not being asked to do something additional to what they do already. Instead, the focus is on active living and encouraging people to integrate regular physical activity into their daily lives.

The results of many studies suggest that designing neighbourhoods for walking and bicycling use could help many people achieve sufficient levels of physical activity for health benefits. Some of the key elements of the built environment that have been shown to be related to physical activity levels include:

- 1. Connectivity** refers to the directness or availability of alternative routes from one point to another within a neighbourhood. A highly connected street network allows people many possible routes between destinations. When streets are not connected and the route to get someplace is very indirect, it is less conducive to walking and bicycling.
- 2. Density** refers to the amount of a certain variable found in an area. Density can refer to the number of people in an area or the number of jobs in an area. Communities that have low density typically have lower levels of both population and employment density. In these communities, people typically live far away from businesses, jobs, stores and schools.
- 3. Land-use mix** refers to the kinds of different land-uses within a given area and their proximity to one another. A mixed-use neighbourhood has homes, workplaces, amenities and services that people might require to meet their daily/weekly needs. This is a critical factor for achieving effective densities, rather than simply having higher residential densities. A neighbourhood could

have a large number of homes but if residents do not have access to services and amenities within a reasonable walking distance, they will still be required to use their car for transportation.

**4. Aesthetics** refers to the qualities that contribute to the attractiveness and appeal of an area. It includes building design, size of windows, location of the entrance door, landscaping and availability of facilities such as lighting and benches.

**5. Safety** from injury and crime is also an element of the built environment that may have an impact on physical activity. Unfortunately, at this time, the measures of safety are generally unreliable. The studies do not show a consistent association between safety and pedestrian activity. It is not clear how much crime affects physical activity and the direct links between traffic safety and levels of activity are weak in the literature/ For example, one study found that men who perceived traffic to be less of a problem were less likely to increase their walking. However, women were more likely to increase their walking if their perceptions of traffic improved.

**6. Transit** has the potential to increase physical activity levels since people tend to walk or cycle to reach local public transit. As well, public transit allows people to visit destinations outside of their immediate neighbourhood. This is particularly important if we are encouraging people to move away from using a car more often.

The built environment can have an important influence on the more vulnerable in our society. Children and the elderly are the two groups most vulnerable to automobile-pedestrian collisions. In the United States, elderly pedestrians accounted for 17% of all pedestrian fatalities in 2002 and child pedestrian injury remains the second-leading cause of unintentional injury-related death among children ages 5-14.

Children make trips to school, parks, libraries, and to visit friends. More and more, children's travel is conducted in a car. There are fewer opportunities for children to incorporate physical activity, such as walking or biking to school, into their daily lives. This can be due to parental influences, long distances and hazardous streets, and lack of safe sidewalks. Children who do the majority of their travelling by car while growing up may continue that behaviour into adulthood.

The elderly and the disabled experience more difficulty going from place to place if they are not able to use a car because our environments are not supportive of walking. Nearly all seniors will face the problem of being unable to drive at some point during their retirement. Overall, they are more isolated and have greater mobility issues than the general population. The elderly who can no longer drive safely need amenities and services that are close to home and easily walkable.

Many low-income individuals do not have access to vehicles because they pay a disproportionate amount of their monthly income on food and shelter. . Income, mobility, and time constraints together limit the range of destinations within reach of low-income individuals and families. This makes the choices available to them as consumers more limited.

In order to ensure that all residents of Halton have the opportunity to be physically active every day:

- Halton Region should encourage the development of “complete” communities that include:
  - Connected street networks
  - Densities that support public transit and amenities within walking distance of all households
  - Mixed land uses that includes a mix of housing and access to a full range of amenities and services within walking distance
  - That are designed to encourage alternate modes of transportation such as walking, cycling and public transit
- Develop alternative modes of transportation such as public transit and bike paths that can be used within and between communities in Halton Region and the Greater Toronto Area



## **1.0 INTRODUCTION**

This report is one of a series documenting the context and background of the "Sustainable Halton" exercise. Sustainable Halton is a process that will:

- Ensure Halton Region policies conformity of Growth Plan, Provincial Policy Statement and other relevant legislation;
- Review the current Regional Official Plan;
- Determine Halton Region's goals and objectives for growth; and,
- Determine what policies are needed to reach those goals.

The newly revised Regional Official Plan was designed to accommodate growth in the Region's population from about 375,000 in 2001 to about 628,900 in 2021 and growth in the employment from about 189,000 in 2001 to about 340,000 in 2021 (Halton, 2006a). The Province's Places to Grow Growth Plan, which plans for growth in the Greater Golden Horseshoe out to 2031, requires that Halton Region accommodate about 780,000 people and 390,000 jobs by 2031 (Ministry of Public Infrastructure Renewal, 2005).

## **2.0 OBJECTIVE AND NATURE OF REVIEW**

The specific objectives of the "Physical Activity and the Built Environment" report is:

- To describe the trends in obesity and demonstrate that obesity is a major consequence of physical inactivity levels
- To describe physical activity and provide background on physical activity levels, types of physical activity, and important theories
- To describe the evidence that links the built environment to physical activity and outline key elements that impact the levels of physical activity
- To outline how the built environment impacts upon the health of vulnerable population groups including children, the elderly and people living on low income; and
- To identify actions that can be taken to support physical activity in the built environment.

This report provides a summary of the relevant literature that should be considered in the review of the Sustainable Halton Plan in light of the Health and Social issues report being prepared by the Region of Halton.

## **3.0 OBESITY AND OVERWEIGHT RATES**

Obesity is increasingly becoming a major public health problem in Canada and around the world. This is contributing to a dramatic rise in illnesses such as type 2 diabetes, heart disease, stroke, and some cancers (Basrur, 2004). For non-

smokers, poor nutrition, physical inactivity and overweight are the leading causes of chronic health problems in Ontario (Basrur, 2004).

To determine whether someone is a healthy weight, Health Canada uses an internationally accepted classification system referred to as the Body Mass Index (BMI) that is calculated using a person's height and weight. For the full calculation, refer to the Glossary. Table 1 shows the ranges of BMI associated with being underweight, a healthy weight, overweight and obese and their associated risk of health problems.

**Table 1. Health Risk Classification According to Body Mass Index (BMI)**  
For use with adults age 18 and older. Not for use with pregnant or breastfeeding women.

BMI Category	Classification	Risk of developing health problems
<18.5	Underweight	Increased Risk
18.5-24.9	Normal Weight	Least Risk
25.0-29.9	Overweight	Increased Risk
30.0 and over	Obese	
30.0-34.9	Class I	High Risk
35.0-39.5	Class II	Very High Risk
≥40.0	Class III	Extremely High Risk

Source: Health Canada. Canadian Guidelines for Body Weight Classification in Adults. Ottawa: Minister of Public Works and Government Services Canada; 2003.

Table 1 illustrates that the health risks associated with being overweight and obese increase as people's weight increases. According to the Chief Medical Officer of Health for Ontario, obese individuals have a higher risk of developing coronary heart disease, high blood pressure, joint problems, low back pain, fertility problems and hormone related problems (Basrur, 2004). Obese people are three times more likely than people with healthy weights to have type 2 diabetes, gall bladder disease and breathing problems. Overweight people have a 16 percent greater risk of premature death and obese people have a 25 percent greater risk of premature death compared to people with a normal weight.

In 2004, the Chief Medical Officer of Health for Ontario reported an epidemic of overweight and obesity that is threatening Ontario's health (Basrur, 2004). Obesity is a problem that has been on the rise for a number of years. Figure 1 shows a steady increase in obesity rates in Canada since 1985.

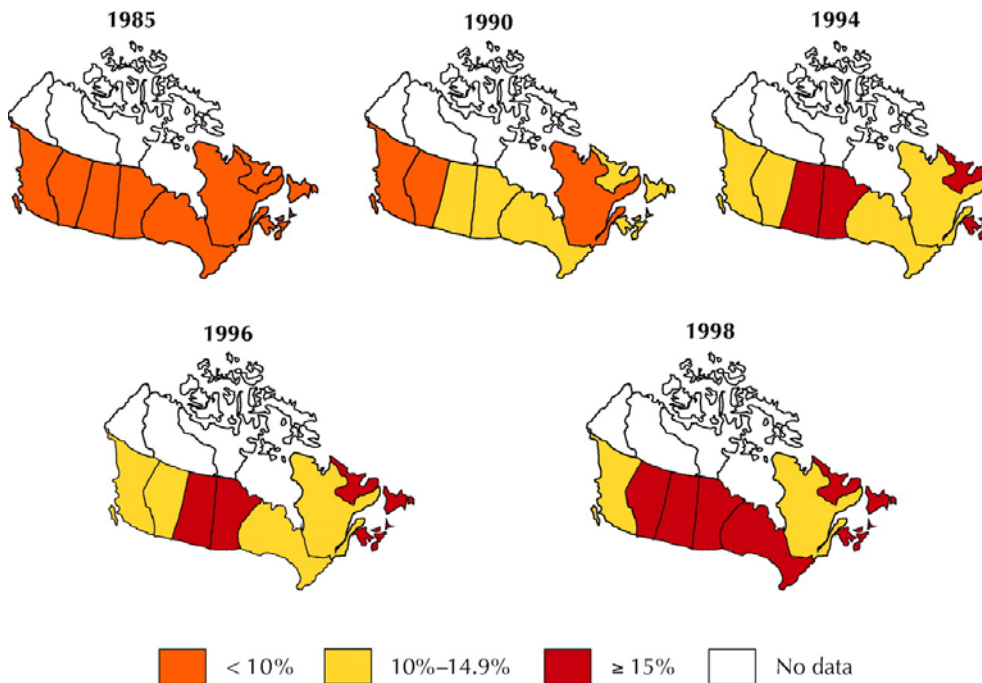


Fig. 1: Prevalence of obesity among Canadian adults in 1985, 1990, 1994, 1996 and 1998. (Katzmarzyk, 2002)

Figure 1 illustrates that in 1985, less than 10 percent of the Ontario population was obese. However, by 1998 over 15 percent of the population was obese. Further, when the numbers of overweight individuals are included, the numbers increase substantially. In 2003, almost half of Ontario adults were overweight or obese (Basrur, 2004). The trends are similar in Halton with 67 percent of men and 39 percent of women considered overweight or obese. Table 2 below presents the obesity and overweight prevalence for adults in Canada and Halton.

**Table 2. Prevalence of Overweight and Obesity by Sex for Adults (18+) in Canada and Halton in 2004**

Gender	BMI Category	Percentage (%) of Halton adults	Percentage (%) of Canadian adults
<b>Males</b>	Overweight	50	42.0
	Obese	17	22.9
<b>Females</b>	Overweight	28	30.2
	Obese	11	23.2

Source: Halton Data- Rapid Risk Factor Surveillance System Wave 37-48 (2004), Canadian Data - Statistics Canada, Canadian Community Health Survey, Nutrition, 2004

Unfortunately, this is not just a problem with adults. The 2000 Canadian Community Health Survey found that about 25 percent of boys and 15 percent of girls (age 12 to 18) in Ontario were either overweight or obese. Table 3 shows the proportion of Ontario children that are overweight or obese:

**Table 3: Percentage of Ontario Population 12-18 by Body Weight Category and Sex, 2000**

	<b>Overweight</b>	<b>Obese</b>	<b>Under/Normal</b>
<b>Male</b>	19.1	5.2	75.7
<b>Female</b>	11.1	3.3	85.6

Source: Statistics Canada, Canadian Community Health Survey, 2000

This is particularly troubling because childhood obesity poses specific health risks for children. Childhood obesity affects growth and development, and contributes to psychosocial problems. Young people who are overweight may suffer from self-blame and low self-esteem because of the social stigma attached to being overweight. Obese children also face greater health risks for cardiovascular disease (Basrur, 2004).

Weight within individuals is determined by genetics and the energy they take in and the energy they put out. However, genetic factors are not the main cause of the increase in overweight and obesity that is occurring in Canada (Basrur, 2004). To achieve and maintain a healthy weight, people have to be physical active enough each day to achieve a balance between energy in and energy out. As well, the types and quantities of food that we eat are important determinants of weight and reducing chronic diseases. Physical activity does not necessarily mean participating in sports or other organized activities. People can build more movement and physical activity into their daily lives by making small changes, such as taking the stairs, walking or cycling to do errands, or walking to school or work.

With both healthy eating and physical activity there are multiple opportunities and choices people make in their efforts to maintain a healthy weight. Our environments such as our homes, our schools, our workplaces and our communities, can either encourage or discourage healthy choices. In Public Health, multiple, complimentary, comprehensive strategies are used to address major public health issues such as obesity. Strategies include focusing on individuals, populations and environments. This paper is focused on the importance of the built environment, which is a key component of a multi-pronged strategy.

## 4.0 PHYSICAL ACTIVITY AND HEALTH

Physical activity is any body movement that results in energy expenditure and includes activities such as walking, cycling, playing, climbing stairs and sports. Canada's Physical Activity Guidelines for Healthy Active Living recommend that adults participate in 30 to 60 minutes of activity daily to maintain or improve their health. The time needed to be active depends on the amount of effort an individual is exerting: the more vigorous the activity, the less time is required (Basrur, 2004). It is particularly important to note that health benefits can be achieved by accumulating these 30 to 60 minutes of physical activity over ten-minute increments. Physical activity in ten-minute increments is easily achievable by encouraging people to be active throughout the day. The benefits of daily moderate physical activity have the potential to be more effective than more structured, vigorous forms of exercise such as jogging or aerobics because of increased levels of adherence to these activities (L. D. Frank & Engelke, 2001). In other words, the more opportunities that people have to integrate activities in their day-to-day lives, the more likely it is that they will be able to maintain these beneficial behaviours.

### 4.1 Physical Activity Trends

The trends in physical activity show that there is still a large portion of the population that does not get enough physical activity to achieve health benefits. The 2005 Canadian Community Health Survey reports that in Ontario 42.4 percent of men and 49 percent of women are inactive. In Halton 44.6 percent of men and 42.3 percent of women are inactive. Table 4 illustrates the prevalence levels of physical activity in Canada and in Halton.

**Table 4: Prevalence of Physical Activity for Adults in Ontario and Halton by Sex in 2005**

Physical Activity Level	Sex	Percentage (%) of Halton population (12+)	Percentage (%) of Ontario population (12+)
Moderate/High	Male	55.0	54.5
	Female	52.5	48.2
Inactive	Male	44.6	42.4
	Female	42.3	49.0

Source: Statistics Canada, Canadian Community Health Survey (CCHS 3.1), 2005

Although Halton female residents are better than the Ontario average in terms of being active, the overall picture still shows that there is almost half of the population that is not getting enough physical activity to achieve health benefits.

## 4.2 Costs of Physical Inactivity

Physical inactivity has become a major health concern over the last several decades.

Lack of physical activity has been linked to the following health factors:

- Obesity
- Coronary heart disease
- Stroke
- Type 2 Diabetes
- Some types of cancers
- Hypertension and high blood pressure
- Osteoporosis and osteoarthritis
- Depression

(Pulleyblank-Patrick et al., 2006)

A study that looked at the economic burden of physical inactivity in Canada concluded that in 1999 about \$2.1 billion or 2.5 percent of the total direct health care costs in Canada were directly attributable to physical inactivity (Katzmarzyk, Gledhill, & Shephard, 2000). The authors further conclude that if there was a 10 percent reduction in physical inactivity levels, it would potentially reduce direct health care expenditures by \$150 million per year. A relatively small change in the population would have a large economic impact.

Physical activity, even at moderate levels, reduces the risk of developing numerous chronic diseases. The Public Health Agency of Canada summarized the research that supports the role of physical activity in disease prevention. Specifically, they found that:

- Physical inactivity, along with smoking, high blood pressure and high blood cholesterol are recognized risk factors for cardiovascular disease. Since physical inactivity is more prevalent than the other factors, it has the highest potential to reduce population cardiovascular disease.
- Physical activity can reduce the risk of colon cancer by as much as 50 percent. Research also shows that physical activity may protect against breast cancer in women.
- Physical activity can reduce the risk of developing type 2 diabetes by as much as 50 percent.
- The risk of osteoporosis is reduced through regular physical activity during childhood and adolescence and there is also evidence for maintenance of bone mass through physical activity and calcium supplementation in adulthood.
- Regular physical activity improves function and relieves symptoms among people with osteoarthritis and rheumatoid arthritis. In many cases, fewer medications are then necessary.

(Public Health Agency of Canada, 2003)

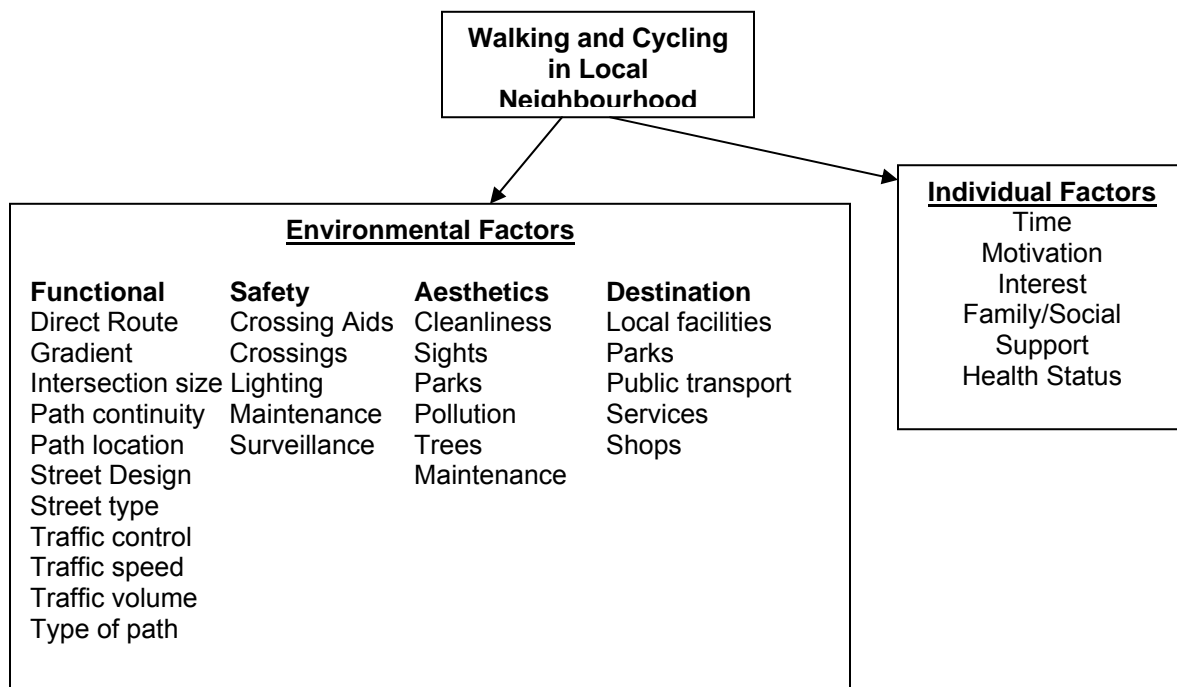
It is important to encourage people to be more physically active every day.

### **4.3 Intentions and Barriers**

When encouraging behaviour change such as increased physical activity, it is important to understand the intentions of the population related to the behaviour as this helps in the decision of what interventions to use. If a proportion of the population is not even considering being physically active, one strategy that Public Health would use to reach this group would be to conduct an awareness campaign. This campaign would focus on encouraging people to consider being physically active by promoting the benefits of activity. If there is another proportion of the population that is considering being active or intends to be active then a different set of strategies are needed. These strategies focus on the barriers and motivators that someone has for being active. Using a number of strategies to promote physical activity is more likely to reach a greater proportion of the population.

Therefore, it is important to understand whether Canadians are interested in being active. The 2004 Physical Activity Monitor studies the intention to be active and found that the majority of Canadians fully intend to be active in the next six months (Cameron, Craig, & Paolin, 2005). This is important because it tells us that since Canadians are considering being active we do not need to convince the majority of people of its importance. Instead, we should focus on the removing the barriers and enhancing the motivators for being active. The authors of the Physical Activity Monitor further suggest that because intention is related to attitudes and perceived control over choice, Public Health should focus on making the decision to be active an easy and attractive one (Cameron, Craig, & Paolin, 2005). In other words, making the healthy choice the easiest choice. They believe that this strategy will move individuals from fully intending to be active to actually being active.

The reasons that people are not active are numerous. There are personal barriers that restrict a person's motivation to be active such as lack of time, inability, lack of social support, and child-care responsibilities. And, there are environmental barriers that are related to the conditions within our surroundings that make physical activity difficult or impossible. These barriers include lack of bike lanes, lack of facilities, safety, and lack of places to go. (L. D. Frank & Engelke, 2001).



**Figure 2: Factors related to Walking and Cycling in Local Neighbourhoods**  
Source: Region of Waterloo Public Health (2005)

#### 4.4 Types of Physical Activity

One strategy that Public Health employs to encourage people to be more physically active is to promote a concept called “active living”. Active living refers to encouraging people to integrate regular physical activity into their daily lives. For example, people can be encouraged to take the stairs instead of the elevator, walk to the store instead of driving, or garden instead of watching television. By integrating physical activity into daily living, it is easier to accumulate the necessary levels of physical activity to see health benefits.

Incorporating activities such as walking into daily living has the potential to address a number of key personal barriers to being physically active. Research suggests this is a good strategy to reach people who dislike vigorous, structured activity, do not have access to facilities, or do not have enough time for structured activities such as sports (L. D. Frank & Engelke, 2001). A number of studies have demonstrated that as physical activity becomes more difficult the less likely it is that people will continue to participate in that activity (Lind, Joens-Matre, & Ekkekakis, 2005).

Physical activity can be categorized into four types of activities:

- Leisure or recreational activities
- Work-related activity
- Household-related activity



- Utilitarian or transportation-related activity

(Lee & Moudon, 2004)

For the purposes of this paper, we will only be focusing on leisure and utilitarian activities, as they are the most directly related to the built environment.

#### **4.4.1 Leisure-Time Physical Activity**

Leisure or recreational physical activities are those activities that take place during our spare time. Examples include playing sports, taking a stroll, and playing outside. These are activities that do not have another purpose other than for fun and physical activity. When addressing the environmental barriers for leisure-time physical activity, Public Health typically addresses issues related the availability and proximity to facilities. Examples of facilities are:

- Sidewalks
- Trails
- Parks
- Recreation Centres
- Health Clubs and Gyms

The neighbourhood is particularly important for encouraging recreational activity because the closer someone lives to recreational facilities the easier they will be to get to and people will therefore be more likely to access them. In their review of the literature, Lee and Moudon (2004) found that people are more likely to use their neighbourhood streets (46%) for physical activity compared to health clubs (11%) or recreation centres (9%). This is particularly important because distance is one of the top barriers that people have to being active. The farther away a park is from someone's house, the less likely he or she will use the park. A built environment that has leisure-time facilities close to where people live can support physical activity and can help eliminate an important barrier.

Unfortunately, it is more difficult to contend with time as a personal barrier when focusing on leisure-time physical activity. The most common way to address time as a barrier is to encourage people to replace a less healthy behaviour with the desired behaviour. For example, one program would promote turning off the television and playing outside instead. In this instance, we are encouraging less of one activity (television viewing) for more of another activity (playing outside). This can be challenging because often the behaviours are unrelated. Further, these recreational activities would be the first activities to be eliminated as people's schedules get busier.

Although promoting leisure-time physical activity is important, studies suggest that the real opportunity to increase physical activity levels is by focusing more on the idea of active living or integrating physical activity into daily living through utilitarian activity.

## 4.4.2 Utilitarian Physical Activity

Utilitarian physical activity refers to those activities that serve the practical purpose of transporting someone from one place to another. These are activities that are transportation related and can involve substituting an automobile trip with a physical activity. Another common term for this type of activity is “Active Transportation”, which refers to any form of human-powered transportation. There are many modes of active transportation such as in-line skating and skateboarding. However, walking and cycling are the most common forms.

Examples of facilities necessary for utilitarian physical activity include:

- Sidewalks
- Trails
- Bicycle Lanes
- Amenities such as:
  - retail stores
  - community centres
  - libraries
  - restaurants
  - entertainment, such as theatres
  - personal services such as hairdressers
  - health services such as dentists and doctors

Just as with leisure-time physical activity, the neighbourhood is particularly important for encouraging utilitarian activity. Access to the necessary facilities to engage in utilitarian physical activity is critical for allowing people to make the choice to walk or cycle instead of driving. Utilitarian activity almost always occurs on publicly provided transportation infrastructures such as sidewalks and bicycle paths (L. D. Frank & Engelke, 2005).

There is a real opportunity to increase the total number of walking and cycling trips through active transportation strategies. Studies indicate that most trips (estimated at approximately between 70 and 83%) are short, for non-work purposes and take place relatively close to home (Pulleyblank-Patrick et al., 2006). There is a high degree of willingness among Canadians to walk or cycle instead of driving, with 82 percent willing to walk more and 66 percent willing to cycle more if there are safe and convenient facilities (Go for Green/ Environics, 1998).

Focusing on encouraging more utilitarian activity also allows us to contend with the issue of lack of time. Unlike leisure-time physical activity, when we promote utilitarian activity we are not trying to replace an activity. Instead, people are encouraged to do the same activity in a different way. For example, people could be encouraged to walk to the store instead of driving to the store. The activity itself is the same, i.e. going to the store. It's how people go to the store that is

important. This directly addresses the issue of time because people are not being asked to do something additional to what they do already. Instead, the focus is on active living and encouraging people to integrate regular physical activity into their daily lives. Further, if the destinations are too far away, the time required to reach the destination by walking or cycling may exceed the time available. Community layout can help this through connectivity and mixed uses as discussed later.

In their paper that explores the built environment and activity patterns Frank and Engelke (2001) suggest that people are only willing to invest a fixed amount of time each day into travel. They refer to it as the “law of constant travel time”. This means that as commute times increase householders will automatically adjust the amount of time they devote to travel using other modes. When you take into consideration that time is the number one barrier associated with physical activity, it makes sense to focus on active transportation as one solution to encourage people to be more active as it allows walking or cycling to serve a dual purpose of exercise and transportation (Lee & Moudon, 2004). A built environment that has facilities for active transportation close to where people live can support physical activity and can help eliminate an important environmental barrier.

#### **4.4.3 Walking: An Important Activity**

Finally, it is important to mention walking as an important way of being physically active for both leisure-time and utilitarian physical activity. Walking is the number one activity that people report being interested in doing to stay active. The 2004 Physical Activity Monitor reports that 69 percent of Canadians aged 20 and older report walking during their leisure time during the previous three months (Cameron et al., 2005). And as already mentioned, 82 percent of Canadians indicate that they would be willing to walk more for transportation purposes.

Walking is an activity that is generally easy for all age groups, involves little skill, is inexpensive, and provides convenient means of incorporating physical activity into one’s daily routine (Cameron et al., 2005). In 2002, the World Health Organization stated that

A systematic review of strategies that promote physical activity concluded that walking is the most important form of physical activity that should be encouraged to improve public health given that is the activity most widely available.

Providing opportunities for people to walk both for leisure and for utilitarian purposes will be important for moving people from intending to being active to actually being active. Even a small increase in walking would help to substantially improve the health and quality of life of most people (Handy, Boarnet, Ewing, &

Killingsworth, 2002). However, in order to encourage more levels of utilitarian and leisure physical activity, the built environment must be supportive.

## **5.0 PHYSICAL ACTIVITY AND THE BUILT ENVIRONMENT**

To increase the proportion of the population that engages in physical activity additional attention should be paid to the built environment. Making the healthy choice the easiest choice through the built environment involves ensuring that the communities where people live, work and play allow everyone the option to choose to be active. An increasing amount of research is demonstrating that the way our communities are designed has an impact on physical activity levels.

A review by Humpel, Owen and Leslie (2002) identified 19 quantitative studies that assessed the relationship between physical activity and elements of the built environment. The results of these studies showed that environmental factors such as accessibility, opportunities, safety and aesthetics have consistent associations with physical activity behaviour. A further review analysed studies of 6 communities and found that on average, residents in highly walkable neighbourhoods took twice as many walking trips as people in less walkable neighbourhoods. Virtually every study they reviewed demonstrated associations between built environment variables such as density, connectivity, and land use mix and walking/cycling. Residents from communities deemed highly walkable according to environmental characteristics had higher rates of walking/cycling in comparison to residents from low-walkable communities. Further, they suggest it is purposeful trips, such as going shopping, that are the source of overall differences in walking trips between high and low walkable neighbourhoods. The reason for this conclusion is because walking for exercise did not differ between the two neighbourhoods (Saelens, Sallis, & Frank, 2003).

A prospective study by Humpel et al. (2004) examined the association between changes in perceptions of the built environment with changes in neighbourhood walking. Results showed that men who reported positive changes in aesthetics and convenience were twice as likely to increase their walking and women who reported positive changes in convenience were more than twice as likely to have increased their walking. Frank and Engelke (2005) conducted a study that measured walkability and compared it to moderate-intensity physical activity in adults. They studied 357 adults and measured land use mix, residential density and street connectivity unique to each household. Then, they measured the adults' physical activity levels over a two-day period using accelerometers, a monitoring device that measures the amount and intensity of an activity. The results indicated that when people have many destinations near their homes and can get there using a direct pathway, they are more likely to engage in moderate physical activity for 30 or more minutes on a random day. They further found that people living in better connected, more compact, mixed use neighbourhoods were more likely to be active enough to achieve health benefits. The results

were incremental so that each increase in walkability increased the likelihood of being physical active.

The results of these studies suggest that designing neighbourhoods for walking and bicycling use could help many people achieve sufficient levels of physical activity for health benefits. Figure 3 and the following sections outline some of the key elements of the built environment that have been shown to be related to physical activity levels.

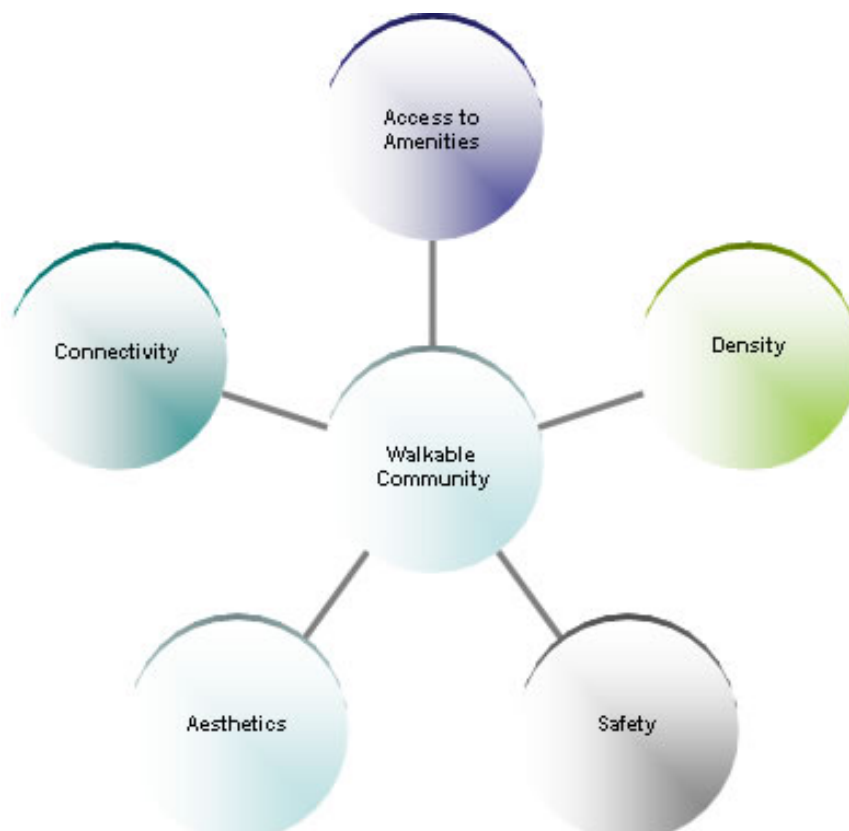


Figure 3: Elements of the built environment affecting walkability  
Source: walkON, [www.walkon.ca](http://www.walkon.ca)

It is important to note, however, that it is often difficult to isolate each individual variable when studying the built environment. Density is related to land use mix and proximity is closely related to connectivity. Land development patterns that are conducive to walking and cycling are often found in the same neighbourhoods as those where street networks and design also favour non-motorized travel (L. D. Frank & Engelke, 2001).

### 5.1 Connectivity

Connectivity refers to the directness or availability of alternative routes from one point to another within a neighbourhood. A highly connected street network allows people many possible routes between destinations (Handy et al., 2002).

When streets are not connected and the route to get someplace is very indirect, it is less conducive to walking and bicycling (Bray et al., 2005).

Saelens et al. (2003) reviewed a number of studies and found that facilities that support walking, such as sidewalks that are well connected, were related to higher numbers of people walking to commercial centres even when other factors, such as density and land-use mix, were constant.

## **5.2 Density**

Density refers to the amount of a certain variable found in an area. Density can refer to the number of people in an area or the number of jobs in an area (Handy et al., 2002). Communities that have low density typically have lower levels of both population and employment density. In these communities, people typically live far away from businesses, jobs, stores and schools (Bray et al., 2005). Density measures are the most common land-use measures in physical activity and built environment studies because they are easy to obtain and measure (Pulleyblank-Patrick et al., 2006).

The importance of density varies with each study. However, generally speaking higher population and employment density are related to more walking and cycling trips (L. D. Frank & Engelke, 2001; Saelens, Sallis, & Frank, 2003). In a report completed by Pulleyblank-Patrick et al. (2006) that reviewed the literature on the relationship between the built environment and public health, they noted that both transit use and walking increase as density and land-use mix increase while single-occupant vehicle usage declines.

However, we need to be cautious about increasing density without ensuring that there is the public transit infrastructure and other amenities necessary to support physical activity. According to Frank (2000) “The worst possible scenario would be to mandate increased compactness without providing viable local and regional mobility options to the car” (pg.11). Increasing density without the presence of local amenity destinations and ensuring that active and public transportation is a viable choice will simply create greater congestion, poorer air quality and health problems through increased number of cars on the road.

A report by the Ontario College of Family Physicians (2005) indicates that many areas in Toronto achieve higher densities without high-rise buildings. The former city of East York has less than 12% of its residential units in buildings higher than 5 stories, yet achieves a gross density of 63 residents per hectare. On the other hand, the area near Don Mills Road north of Sheppard Avenue achieves the same 63 residents per hectare but has 55% of residential units in apartment buildings higher than 5 stories (Bray et al., 2005). High density is often mistakenly thought to refer to living in high-rise buildings. However, this does not need to be the case.

### 5.3 Land-use Mix

Land-use mix refers to the kinds of different land-uses within a given area and their proximity to one another. A mixed-use neighbourhood has homes, workplaces, amenities and services that people might require to meet their daily/weekly needs (Handy et al., 2002). This is a critical factor for achieving effective densities, rather than simply having higher residential densities. A neighbourhood could have a large number of homes but if residents do not have access to services and amenities within a reasonable walking distance, they will still be required to use their car for transportation (Bray et al., 2005). Land-use mix is more difficult to measure than density. However it is often regarded by reviewers of the literature as more accurate measure of walkability than density (Pulleyblank-Patrick et al., 2006). Distance of services and amenities plays a key role in determining the mode of transportation that individuals will choose to go to their destination.

Pulleyblank-Patrick et al. (2006) report that in employment centres, land use-mix influences decisions about how people choose to go to work and mode by which they will travel through the day. Land use mix also encourages transit use in neighbourhoods.. In their review of the literature, Saelens, Sallis and Frank (2003) found that land use mix, especially the close proximity of shopping, work, and other nonresidential land use to housing was related to greater walking/cycling. Their review also found evidence that the closer proximity or accessibility of jobs and services is associated with more walking and cycling and that long trip distances were negatively related to the likelihood of walking/cycling.

A 2003 study conducted by Lund tested the significance of local access to parks and or a neighbourhood shopping areas with pedestrian travel. This study defined local access as being within ¼ mile (or approximately 0.55 km) because the literature supports this as a comfortable walking distance. The results of this study supported the claim that local access to park and shopping amenities increased utilitarian activity, and local access to retail shops was particularly important.

Lee and Moudon (2004) reviewed 20 studies and found that the presence of and proximity to facilities in a neighbourhood plays a role in people's level of physical activity, which is consistent with findings that distance to destination is a determining factor for transportation mode choice. Further, the facilities found to support and encourage leisure-time physical activity include public facilities such as footpaths, trails, parks, and open public spaces as well as private facilities such as gyms and recreation centres (N. Humpel et al., 2002; Lee & Moudon, 2004). Lee and Moudon suggest that due to the large amounts of walking and biking on streets, appropriate street design and proximity of routine destinations such as retail shops and service facilities will likely increase levels of walking and biking for travel.

## **5.4 Aesthetics**

Aesthetics refers to the qualities that contribute to the attractiveness and appeal of an area. It includes building design, size of windows, location of the entrance door, landscaping and availability of facilities such as lighting and benches. It is the most intangible of the five built environment dimensions to measure (Handy et al., 2002).

Subjectively measured variables such as the perception of enjoyable scenery are found to influence physical activity (Lee & Moudon, 2004). Amenities and aesthetic features are shown to increase the use of local parks, and the perception of environmental aesthetics and convenience are associated with increased level of walking for exercise (Lee & Moudon, 2004).

One component of aesthetics that is shown to be associated with physical activity is the scale of the street. This refers to the three-dimensional space along a street as bounded by buildings or other features. Scale can often be described by terms such as “human-scale” or “automobile-scale”. The ratios of building heights and street widths or the setbacks of buildings are a few of the components that are measured (Handy et al., 2002).

The rate of travel speed determines the amount of the built environment that someone is capable of processing. Motorists can process only a fraction of the detail that exists in the built environment compared with a pedestrian or a cyclist (L. D. Frank & Engelke, 2005). The pedestrian and the cyclist are more sensitive to urban design features of the built environment than the motorist. Walking and cycling travel is much slower than automobile travel, which allows the traveller to notice differences in landscape. A rich pedestrian environment has streets that change abruptly, are irregular and complex as these factors maintain the pedestrian’s interest (L. D. Frank & Engelke, 2001).

## **5.5 Safety**

Safety from injury and crime is also an element of the built environment that may have an impact on physical activity. Unfortunately, at this time, the measures of safety are generally unreliable. The studies do not show a consistent association between safety and pedestrian activity. It is not clear how much crime affects physical activity and the direct links between traffic safety and levels of activity are weak in the literature (Loukaitou-Sideris, 2004). For example, Humpel et al. (2004) found that men who perceived traffic to be less of a problem were less likely to increase their walking. However, women were more likely to increase their walking if their perceptions of traffic improved.

Despite this lack of clear evidence for the general population, the safety data related to seniors and children more clearly links perceived safety with an



increase in physical activity. This will be discussed in greater depth in the section titled “Impacts on Vulnerable Populations”.

## **5.6 Transit**

Although included in previous sections, it is necessary to further emphasize the importance of public transit. Transit has the potential to increase physical activity levels since people tend to walk or cycle to reach local public transit. As well, public transit allows people to visit destinations outside of their immediate neighbourhood. This is particularly important if we are encouraging people to move away from using a car more often.

It is well known that density is directly related to a region’s capacity to offer public transit. A study of the Seattle area found a significantly higher proportion of trips via transit and walking where densities were sufficiently high where the trip began and where the trip ended (Frank, 2000). Further, transit use can support people in achieving their 30 to 60 minutes of daily physical activity. A study by Besser and Dannenberg (2005) examined the transit-oriented walking times for transit users. Their results showed that participants who used transit spend a median of 19 minutes daily walking to and from transit and 29 percent achieved 30 minutes or more of physical activity daily solely by walking to and from transit.

## **6.0 IMPACTS ON VULNERABLE POPULATIONS**

The built environment can have an important influence on the more vulnerable in our society. Children and the elderly are the two groups most vulnerable to automobile-pedestrian collisions. In the United States, elderly pedestrians accounted for 17% of all pedestrian fatalities in 2002 and child pedestrian injury remains the second-leading cause of unintentional injury-related death among children ages 5-14 (Loukaitou-Sideris, 2006). The following sections will describe how the built environment impacts on children, the elderly, people living with a disability and those living on a low-income.

### **6.1 Children and Youth**

Children make trips to school, parks, libraries, and to visit friends. More and more, children’s travel is conducted in a car. There are fewer opportunities for children to incorporate physical activity, such as walking or biking to school, into their daily lives. This can be due to parental influences, long distances and hazardous streets, and lack of safe sidewalks (Bray et al., 2005). This trend is troubling because children’s early activity levels may be very important for future physical activity. Children who do the majority of their travelling by car while growing up may continue that behaviour into adulthood (Mcmillan, 2005, World Health Organization, 2002).

In a report titled “Kids on the Move in Halton and Peel”, O’Brien and Gilbert (2003) summarize the health impacts of transport on children and state the following:

- Traffic fatalities are the leading cause of injury death in Canada for children over the age of one year
- Less than half of Canadian children walk to school. Most children who live within three kilometres of school do walk, but a sufficient number live farther from school bringing the average that walk down to less than half of all children.
- Heavy traffic reduces the independent mobility of children and youth
- Opportunities and locations for spontaneous, non-structured play are severely restricted by traffic

Further, O’Brien and Gilbert found that in 2001 young people of all assessed ages were doing more of their travelling by car than in 1986. In 1986, 27 percent of trips by 11-15 year olds were by car; in 2001, 42 percent of such trips were by car. And, there were fewer walking and cycling trips and trips by transit or school bus. O’Brien and Gilbert (2003) go on to state:

Compared with their counterparts in the inner part of the present City of Toronto, children and youth in Halton and Peel make more trips overall, many more trips by car and school bus, many fewer trips by transit, and at least up to age 13, fewer trips cycling and walking

The 1998 National Survey on Active Transportation found that just over one in three (36%) Canadian children walk to school most of the time. They found that:

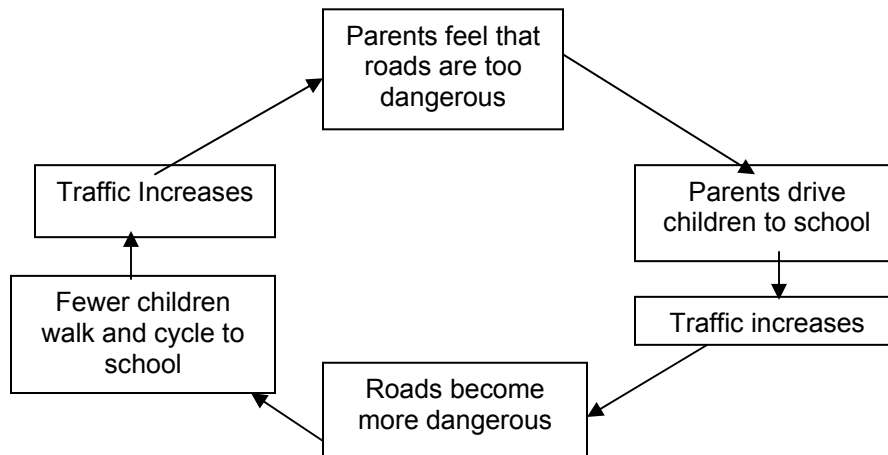
- 86 percent of children living within one kilometre of school walked most of the time
- only 50 percent of children living within one and three kilometres walked most of the time (Go for Green/ Envirionics, 1998).

However, O’Brien and Gilbert (2003) note that when over 6,000 Ontario elementary children we surveyed about their preferred mode of transportation, almost 75 percent said they would prefer to walk or cycle on a regular basis.

In a study conducted by Kerr et al. (2006) on the association of environmental characteristics and parent concerns with active commuting to school they found that both parent concerns and the built environment were associated with children’s active commuting to school. Of the perceived environmental variables, stores within a 20-minute walk and neighbourhood aesthetics showed the strongest associations with commuting behaviour. In this study, residential density was the component of walkability most related to active commuting.

However, the strongest explanatory variable was parental concerns. Children were five times as likely to actively travel to schools when parents had few concerns as when parents had many concerns. They found that parental

concerns were related to safety issues such as presence and quality of walking and cycling facilities as well as traffic danger. Studies have shown that parents believe that the streets closest to the school grounds are some of the most dangerous because of the high period-specific traffic volumes created as parents drive their children to school (McMillan, 2005). Figure 4 depicts the circle of motorized traffic and the school journey:



**Figure 4. The circle of increasing motorized traffic and the school journey**  
 Source: World Health Organization, 2002

The responsible way to reduce parental concerns about children walking or cycling to school may be improvement in the walking and biking infrastructure, protection from traffic, and aesthetics of routes to school (Kerr et al., 2006).

## 6.2 The Elderly and People Living with a Disability

Regular physical activity plays an important role in countering many of the physical problems that the elderly experience such as decreased mobility, falls, osteoporosis, and the impacts of chronic diseases such as heart disease and diabetes. However, the elderly face difficulties in engaging in physical activities in the built environment. Many elderly have some deterioration of eyesight, hearing, and balance (the latter also being a result of, not only a cause of, decreased physical activity). A deterioration in any of these physical capabilities can make it difficult for an elderly person to navigate the built environment safely and the consequences of this are that safety is a major consideration for elderly (L. D. Frank et al., 2003)

The elderly and the disabled experience more difficulty going from place to place if they are not able to use a car because our environments are not supportive of walking (Bray et al., 2005). Nearly all seniors will face the problem of being unable to drive at some point during their retirement (L. D. Frank et al., 2003).

Overall, they are more isolated and have greater mobility issues than the general population. The elderly who can no longer drive safely need amenities and services that are close to home and easily walkable.

Walking is the prominent physical activity for older adults and they are greatly influenced by safety and security concerns (Loukaitou-sideris, 2006). The risk of falling is a major concern for the elderly as falls can be life threatening. Poor conditions of roads and sidewalks can increase the risk of the elderly falling and can be difficult to navigate for seniors with disabilities. Falling and tripping accidents are far more frequent than pedestrian-automobile collisions so it is important to keep sidewalks well maintained and clear of obstructions (Loukaitou-sideris, 2006).

The design of the built environment can greatly enhance or prevent a person with disabilities from being active, using transportation systems and being socially integrated into their community. Persons in wheel chairs benefit from communities that have sidewalks and curb depressions (Bray et al., 2005).

### **6.3 Low-income**

The built environment can also impact individuals and families living on a low income. Many low-income individuals do not have access to vehicles because they pay a disproportionate amount of their monthly income on food and shelter. Each year, the Halton Region Health Department conducts the Nutritious Food Basket Survey. In 2005, a single man aged 24 living on Ontario Works in Halton does not have enough money to pay rent and bills and to buy sufficient nutritious food (Halton Region Health Department, 2005). This leads to a greater reliance on public transit and non-motorized travel than the general population. This is why people living on low incomes are more impacted when the built environment does not support these active modes of travel. Income, mobility, and time constraints together limit the range of destinations within reach of low-income individuals and families. This makes the choices available to them as consumers more limited (Clifton, 2004).

Because auto ownership rates are lower for low-income households than for higher-income ones, low-income households have a much greater difficulty in reaching all destinations within a region, including employment, commercial, and retail (Frank et al., 2003). In the United States, low-income households make 20 percent fewer trips than wealthier households, and they travel only half as far in terms of vehicle miles (Frank et al., 2003). According to Frank, Engelke and Schmid, the built environment has particularly harmful impacts on people living with low-incomes because

Transit, rarely, if ever services an entire region; transit provision is notoriously bad in most suburban growth areas, where many jobs and services are clustered. The prospects for walking and bicycling are often

not much better. Most recent suburban development simply makes distances too great to make walking and bicycling practical forms of travel... Accident statistics between motorists and pedestrians generally show that the poor suffer a disproportionate number of injuries and fatalities while walking than do members of wealthier groups.  
(pg. 120)

Further, child pedestrian injuries occur significantly more often in poor neighbourhoods with restricted access to play space and streets with high traffic (Loukaitou-sideris, 2006).

The built environment also impacts low-income families' ability to access healthy food both in terms of its availability in the community and in terms of their access to it using available transportation. Research over the past few decades has documented the shortage of retail and service establishments in low-income urban communities (Clifton, 2004). Low-income households rely on options such as convenience stores, which often supply goods at higher prices without as many healthy options. A 2004 case study by Clifton examined how working families cope with the transportation and accessibility disadvantages as they acquired food and the consequences for their household well-being. This study found that the households studied have limited flexibility and personal control over their schedules and expend time connecting with existing transport opportunities, arranging for new ones, or compensating for the uncertainty in their transportation. The author suggested many policy implications which included ensuring transit systems cater to the non-work travel needs of poor household and increasing retail and services, including supermarkets, in the area local to low-income households.

## **7.0 CHALLENGES**

One challenge of studying the built environment and physical activity is the inability to randomly assign individuals to different neighbourhoods. It is not feasible in most cases to manipulate neighbourhoods to make them either more or less walkable for the purposes of a study. And, people may choose to live in an environment that meets their behavioural inclination (Lee & Moudon, 2004). This is known as self-selection and means that there is a possibility that individuals who live in less walkable neighbourhoods live there because they do not want to walk. They choose this lifestyle, which is why the research demonstrates an association. One strategy that researchers are beginning to employ is following individuals as they move residences. However, this is still a very new area of research and needs to be explored further.

One study reviewed by Saelens et al. (2003) assessed the changes in individuals' travel patterns after they moved from one community to another. This 11-year prospective study concluded that some shifts in household

members' travel (transit and non-motorized) occurred with the introduction of a different neighbourhood. However, another study that assessed household travel choices before and after a residential relocation from one type of neighbourhood to another found that there were few significant differences in travel behaviour when households relocated from standard suburban to traditional neighbourhoods, characterized by connectivity and proximity to amenities, and vice versa (Frank, 2001).

A recent unpublished study by Eid et al. (2006) followed people as they moved neighbourhoods and concluded that urban sprawl does not cause weight gain. People who are more likely to be obese are also more likely to move to sprawling neighbourhoods. Although the authors recognized that the built environment may still place constraints on the type of physical activity that people are able to do, for them the most important point is that individuals who have a lower propensity to be obese will choose to avoid neighbourhoods that put such constraints on them (Eid, Overman, Puga, & Turner, 2006). More research is needed to confirm these findings. However, it is possible that there is some element of self-selection playing a role in the association between the built environment and obesity. On the other hand, there are cross-sectional studies that show a clear increasing risk of overweight or obesity with sprawl (Lopez, 2004).

Other literature suggests that although self-selection may play a role in where someone lives, self-selection is still an important outcome. Levine, Inam and Tornig (2005) studied people's preferred neighbourhood and the choices available in both urban and suburban Atlanta and Boston. They found that the people with the strongest preferences for pedestrian and transit neighbourhoods in Boston had an 83 percent probability of living in an area that was considered pedestrian/transit friendly. However, their Atlanta counterparts with identical preferences had only a 48 percent chance of living in a neighbourhood considered pedestrian friendly. This means that there is a large percentage of the population in Atlanta who would prefer to walk or cycle but live in community that does not support them in making that choice. The authors concluded that the ability to act on one's preferences is related to the choices available and in this study the lack of walkable neighbourhoods led to people not being able to live in a community that they preferred.

The researchers of this article address the issue of self-selection directly by suggesting that should more pedestrian and transit friendly neighbourhoods become available, they would be filled by people who have distinct preferences for such housing and who had previously lacked the ability to satisfy those preferences. They state

Self-selection in this case would be a real effect, but it would hardly negate the impact of urban form on travel behaviour. This is because in the absence of such development, those households would be unlikely to

reside in a pedestrian neighbourhood and would have little choices but to adopt auto-oriented travel patterns. Where pedestrian neighbourhoods are undersupplied ... the self-selection effect associated with expansion of these neighbourhoods can be a very real impact – perhaps even the most significant impact – of the urban form, rather than a source of statistical bias to be isolated and discarded (Levine et al., 2005).

This finding is particularly important from a public health perspective and illustrates quite clearly the role of a supportive environment in allowing people to make healthy choices. Personal attitudes toward physical activity play a significant role in predicting individual behaviour (Lund, 2003). However as stated earlier, if the built environment is not structured to support walking and cycling, people will opt for the car. If we give people who do have the propensity to engage in utilitarian walking and cycling the opportunity to do so, the impacts from a public health perspective could be quite substantial.

Finally, improving access to physical activity through the built environment will not necessarily lead to increased levels of physical activity. However, in order for physical activity to be a choice, whether it be for utilitarian or leisure purposes, the opportunity must exist. Improvements to a neighbourhood's built environment are necessary for someone to have the option to be active but they may not be sufficient for ensuring people will choose to be active (Loukaitou-Sideris, 2006; Zhang, 2006); the availability of the choice will not necessarily lead to someone making the choice. The built environment is one key strategy that can support increased physical activity. Other strategies include workplace and school health programs, community awareness campaigns, skill-building programs and policy programs that impact the cost of driving (Frank, 2000).

## **8.0 CONCLUSIONS AND RECOMMENDATIONS**

### **8.1 Conclusions**

There are important opportunities for achieving greater levels of physical activity in Halton by focusing on the built environment. Creating a built environment that supports physical activity has the potential to alleviate some of the key barriers, such as time and distance, that may impede people from being active. Children, the elderly, people living with a disability and people living on low-incomes are more likely to suffer from built environments that are focused on the needs of motorists. There are several key components of the built environment that impact physical activity: connectivity, density, land-use mix, scale, aesthetics, safety and transit. Each plays an important role in encouraging physical activity and each should be considered when designing our communities to facilitate walking and cycling instead of driving.

This paper supports the provincial growth plan for the Greater Golden Horseshoe “Places to Grow”. That plan encourages the development of complete communities that are well-designed, offer transportation choices, accommodate people at all states of life and have a mix of housing, jobs and amenities to meet daily needs. Specifically, the plan states that population growth will be accommodated by reducing dependence on the automobile through the development of mix-use, transit supportive, pedestrian-friendly environments (pg 13-14).

## **8.2 Recommendations:**

In order to ensure that all residents of Halton have the opportunity to be physically active every day:

- The Region of Halton should encourage the development of “complete” communities that include:
  - Connected street networks
  - Densities that support public transit and amenities within walking distance of all households
  - Mixed land uses that includes a mix of housing and access to a full range of amenities and services within walking distance
  - That are designed to encourage alternate modes of transportation such as walking, cycling and public transit
- Develop alternative modes of transportation such as public transit and bike paths that can be used within and between communities in Halton Region and the Greater Toronto Area



## GLOSSARY

Accelerometer – a monitoring device that measures the intensity of an activity.

Accessibility – distance to or from destinations

Active Transportation – any form of human-powered transportation

BMI – Body Mass Index – one of the most commonly used measures for defining overweight and obesity, calculated as weight in pounds divided by the square of height in inches, multiplied by 703.

Built Environment – comprises urban design, land use, and the transportation system, and encompasses patterns of human activity within the physical environment.

Connectivity – the directness of travel to destinations

Density – typically measured as employment or population per square kilometre/mile

Health – a state of complete physical, mental and social well-being, not merely the absence of disease

Land Use – refers to the distribution of activities across space, including the location and density of different activities, where activities are grouped into relatively coarse categories such as residential, commercial, office, industrial and other activities

Land-use mix – diversity or variety of land uses

Leisure-time Physical Activity – activities that take place during our spare time

Non-motorized travel – travel by non-motorized means, including walking, cycling, small-wheeled transport (e.g. skates, skateboards, push scooters, hand carts), and wheelchair

Obesity – Adults are defined as obese if they have a Body Mass Index of 30 or greater

Overweight – Adults are defined as overweight if they have a Body Mass Index of between 25 and 30

Physical activity – any body movement that results in energy expenditure

Transportation System – includes the physical infrastructure of roads, sidewalks, bike

paths, railroad tracks, bridges and so on as well as the level of service provided as determined by traffic levels, bus frequencies and the like

Urban Design – refers to the design of the city and the physical elements within it, including both their arrangement and their appearance and is concerned with the function and appeal of public spaces

Utilitarian Physical Activity – activities that serve a practical purpose of transporting someone from one place to another

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