

Barriers to Teenage Mobility in the Greater Toronto Area, Ontario, Canada

Attitudes, Concerns, and Policy Implications

Reihane Marzoughi

Conventional approaches to the management of transportation demand have had limited success in reducing automobile dependency. As a result, it has become increasingly important to understand the decision-making processes involved in determining travel behavior. To develop a more complete picture of travel behavior, research should consider diverse groups of travelers with various mobility abilities and needs. Research on urban form and travel behavior was extended beyond adult travel by examining teen travelers of 13 to 19 years of age in the greater Toronto area, Ontario, Canada. The issue was probed through the collection of quantitative and qualitative travel data from first-year students at the University of Toronto. The survey explored attitudes toward different modes in relation to the locational attributes of the respondent's hometown neighborhood. The narratives of the survey participants illustrate that the final travel choice is determined by the presence of supportive infrastructure that not only facilitates active mode choices but also shapes the perceptions and attitudes that teens form as a result of daily travel experiences. Findings underscore the importance of providing genuine choices that meet the needs of teens and other travelers with limited mobility.

It is widely recognized that the current approach toward transportation and land use planning is socially, economically, and environmentally unsustainable. There is a large body of literature examining the role of built form in shaping and influence travel behavior; however, most of this research focuses on the average traveler, that is, adults with standard work schedules. There is a need for further research that examines the ways in which different groups of travelers negotiate their urban environment. Commuting adults are but just one group of travelers within any given metropolitan area. Cities are filled with people who do not work regular hours, who may have income constraints, and who may be too old, or not old enough, to access certain modes. Studying groups with limited mobility enriches the literature on urban travel by helping shed light on some of the barriers faced by a wider demographic of travelers.

There is a limited body of research exploring the specific transportation needs of teens, and a larger body of research focused on child travel in general. Within the teen literature, a lack of access to independent means of travel has been identified, causing teens to rely

on adults for much of their travel. In general, North American youth travel is dominated by automobiles, with nearly 75% of trips being made in private vehicles (1). This focus on the automobile has negative health (2, 3) and environmental implications (4), while also straining the schedules of caregivers. Children have often been included as a variable in transportation studies to determine the extent of their influence and constraint on the scheduling of activities and trips (5, 6).

The findings also have equity implications; North American children are five times more likely to travel with their mothers as with their fathers (1). Several other studies have shown that women bear most of the responsibility for chauffeuring children and make more trips to serve passengers than do men (7–9). Once youth reach driving age, their behavior dramatically favors the automobile, with 40% of U.S. teens of 16 to 18 years of age reporting to be the primary driver of a household vehicle (10). Studies suggest that teens in sprawling counties were more than twice as likely to drive more than 20 mi/day than do teens in compact counties, a trend most prominent among the youngest drivers (11, 12). Research conducted in various communities in the United States shows that teens gain greater independence as they age; however, this independence comes with a greater reliance on the automobile. Younger teens use a wider variety of transportation modes (13). By late adolescence, the automobile is a well-established part of the lives of U.S. teens. Relatively little is known about the degree of automobile dependence among teenagers in the Canadian context. Examining this group may enable researchers and practitioners to obtain a more nuanced picture of North American teen travel behavior.

Recently, attention has been placed on the trip to school, focusing on the shift from children walking to school to being predominantly driven there by a parent (14–20). The body of literature on discretionary teen travel is relatively smaller. Tal and Handy examined children's biking for nonschool purposes, specifically exploring the factors associated with biking to Saturday morning youth soccer games in Davis, California (21). The findings showed that more than three-quarters of players and their parents drove to the game, with fewer than 20% biking. Although this study focuses on a specific case, it points to the need for more research exploring the influence of physical, attitudinal, and logistical factors on a child's mode choice.

Building on the previously mentioned literature, this paper examined the travel behavior of teenagers in the greater Toronto area (GTA), Ontario, Canada, particularly the ways in which they meet their discretionary travel needs. There is a focus on the ability for teens to travel independently, and the factors that ultimately influence their mode choice. A goal of this work was to shed light on the ways in which this age group negotiates the barriers to their

Department of Civil Engineering, University of Toronto, 35 Saint George Street, Toronto, Ontario M5S 1A4, Canada. rei.marzoughi@utoronto.ca.

Transportation Research Record: Journal of the Transportation Research Board, No. 2231, Transportation Research Board of the National Academies, Washington, D.C., 2011, pp. 61–67.
DOI: 10.3141/2231-08

travel and whether these are related to built form, parental influences, or social attitudes. This work attempts to determine the role these various factors play, individually or in combination, in determining travel outcomes. The work does not attempt to quantify the relative influence of various aspects of built form on teen mode and route choice and is mostly a qualitative and descriptive exploration of the ways in which teens use their built environment and the reasons behind their choices.

RESEARCH METHODS

Because there are no large-scale data sets that focus on teenagers in the GTA, the work required the collection of new data. To do this, an online teen travel survey was developed and distributed to first-year university students at the University of Toronto. This survey asked participants to reflect on their travel experiences throughout their high school years. Questions focused on gathering specific information regarding where each respondent went to high school, the modes used for various discretionary trips, the degree of independent travel undertaken, and mobility barriers identified by respondents. The analysis expanded the understanding of the kinds of discretionary trips GTA teens make, as well as the ways in which Toronto teens differ from the rest of the region.

Study Area

The GTA consists of two single-tier municipalities (in which there is only one level of municipal government: Hamilton and Toronto) and four regional or upper-tiered municipalities (similar to and at the same government level as a county but generally providing more services: Durham, Halton, Peel, and York). Downtown Toronto and its inner suburbs are served by the Toronto Transit Commission, which provides a grid network of surface routes (buses and streetcars) that feed into a radial subway system. The rest of the GTA is served by buses with varying levels of frequency and reliability. These bus lines are poorly integrated, making travel across different municipalities challenging and costly.

In general, neighborhoods in the downtown Toronto core exhibit a mixture of uses and sufficient density to support transit. The rest of the GTA exhibits typical suburban characteristics, such as separated land uses, large arterial roads with minimal pedestrian amenities, and larger distances between origins and destinations.

Survey Sample

The survey was e-mailed to all first-year engineering students at the University of Toronto in September 2009 ($n = 1,208$). University students, particularly first-year engineering students, may represent individuals with particular educational backgrounds, family traits, and so forth. Although the resulting data appear to represent a variety of backgrounds and experiences, there is likely some sampling bias at play. Demographic data for first-year engineering students were not available for use in this study, and thus sampling error was not assessed. A total of 481 surveys was collected, representing a response rate of 40%. Of these responses, 417 were complete and 64 were discarded, making the useful response rate 35%. The sample is not a perfect representation of the total teen population in the GTA. Nevertheless, it is possible to draw some externally valid conclusions on the basis of the selected sample.

ANALYSIS OF RESPONDENTS

There were a total of 417 useful responses, with 57% male respondents and 43% female respondents. Of these responses, 62% ($n = 257$) were from students who grew up in the GTA, with 56% of them being male and 44% being female. Within the GTA group, 49% lived in the City of Toronto ($n = 125$). This group was asked to estimate the distance between their home and the Toronto central business district in kilometers. Approximately 36% of respondents lived within 5 km of the downtown core, whereas 44% lived more than 10 km from downtown.

Students were asked to indicate whether they had their driver's license, and if so, how old they were when they got it. Results indicated that 56% of the sample had their license, but only 16% of that group grew up in Toronto. Looking at the Toronto sample, 32% had their license, whereas 80% of the GTA (not including Toronto) had their license. This result was consistent with data from the 2006 Transportation Tomorrow Survey (22), which showed that approximately 38% of Toronto teens between the ages of 16 and 19 had their license, in contrast to approximately 54% to 60% for most other GTA regions. Table 1 shows a breakdown of when each respondent obtained his or her license.

The data show that Toronto respondents tend to get their license later than the rest of the GTA. Whereas 90.5% of the GTA respondents with a license obtained it by the time they were 17 years old, this percentage was only 47.5% for the Toronto respondents. Furthermore, 12.5% of the licensed Toronto respondents obtained their license after graduating from high school.

TRIP TO SCHOOL

Table 2 summarizes the modes used most commonly by respondents for their trips to and from high school. The results echo Transportation Tomorrow Survey findings: The dominant overall mode for school transportation in the GTA is walking, followed by auto passenger and transit. Looking more closely at Toronto versus the rest of the GTA, walking and transit dominate over other modes, followed by auto passenger (with a parent driver) and cycling. In fact, 49% of Toronto respondents reported that they either walked or biked to school. Cycling also appears to have a significant mode share within this sample. The GTA mode shares (excluding Toronto) are slightly different. School bus travel plays a role in the trip to and from high school for the GTA respondents, whereas none of the Toronto respondents mentioned using this mode. This is because in the city of Toronto, when a child attending middle school (grades 6 to 8) or high school (grades 9 to 12) lives more than 4.8 km from their school, they can request to receive transit tickets from the school

TABLE 1 Age at Which Respondents Obtained Their License

Age Obtained	Toronto, $n = 125$ (%)	GTA, $n = 132$ (%)
16	30.0	50.5
17	17.5	40.0
18	40	9.5
19	7.5	0
>19	5.0	0

TABLE 2 Modes Most Commonly Used for Trips to and from School

Number of Respondents	Walk (%)	Bike (%)	Drive (%)	Driven by Parent (%)	Driven by Friend (%)	Transit (%)	School Bus (%)
Toronto, 125	36.8	12.0	3.2	13.6	1.6	32.8	0.0
GTA, 132	26.7	4.8	9.6	26.0	6.8	9.6	16.4
Total, 257	31.4	8.1	6.6	20.3	4.4	20.3	8.9

board. This policy could explain why the Toronto respondent transit mode share is 23.2% higher than that of the GTA. The GTA respondents walk mode share is almost equal to the auto passenger mode share. However, approximately 42% of the GTA respondents reported using the automobile to get to school versus 18.4% of Toronto respondents. The GTA respondents were also more likely to be driven to and from school by a friend than were the Toronto respondents. This finding is not surprising given that the Toronto respondents had a smaller portion of licensed drivers.

DISCRETIONARY TRAVEL

Respondents were asked to rank the modes used most frequently for discretionary travel during the first and second half of high school (see Tables 3 and 4). Results indicated that as teens age, their walk trips decrease and are replaced by either car or transit trips. Looking at just Toronto respondents, transit dominates, but only slightly, over walking and auto passenger mode for the younger group. However, for the older group, auto passenger mode becomes much less important. The GTA respondents have a stronger tendency to use cars, but they also have a larger cycling mode share than Toronto respondents do. For older GTA teens, the “driven by adult” mode share decreases whereas the “driven by friend” mode share increases, suggesting higher levels of independent travel. In addition, auto driver becomes a very important mode for this group. Once they get their license, teens are highly motivated to obtain vehicle access to make independent driver trips. In light of research detailing the safety risks associated with teen driving, this result is somewhat worrisome (23).

TABLE 3 Discretionary Modes Most Frequently Used When Respondents Were Between 13 and 15 Years of Age

Number of Respondents	Walk (%)	Bike (%)	Driven by Adult (%)	Driven by Friend (%)	Transit (%)
Toronto, 125	28.0	10.3	27.4	2.9	31.4
GTA, 132	13.2	13.7	53.7	3.5	15.9
Total, 257	19.7	12.2	42.3	3.2	22.6

TABLE 4 Discretionary Modes Most Frequently Used When Respondents Were Between 16 and 19 Years of Age

Number of Respondents	Walk (%)	Bike (%)	Driven by Adult (%)	Driven by Friend (%)	Transit (%)	Drive Self (%)
Toronto, 125	22.2	9.4	19.2	6.9	36.5	5.9
GTA, 132	10.3	10.3	26.1	7.3	18.4	27.8
Total, 257	15.8	9.8	22.9	7.1	26.8	17.6

To get a sense of how important the automobile is for discretionary travel, respondents were asked to indicate the frequency with which they require a vehicle to make such trips. The idea was to assess how bound respondents are to automobile travel and to cross-check their response with some of the built form characteristics of the neighborhood they grew up in (e.g., sidewalk characteristics, distance to amenities, street layout, level of activity on the streets at different times of day).

Looking at Table 5, approximately 59% of respondents indicated needing an automobile for almost all their discretionary trips. This figure decreases when looking at just Toronto respondents but increases by 20% for the rest of the GTA. Of those who indicated needing a car for almost all their trips, 68% also indicated that their neighborhood was poorly served by transit, and approximately 70% indicated living in single-family homes in areas with mostly curvilinear street patterns. These factors suggest that those respondents relying on automobile trips likely reside in dispersed, suburban areas lacking adequate transit.

Another goal of the survey was to gain a better sense of how mode use may change depending on whom the respondent is traveling with and where they are going. Thus, respondents were asked to indicate the modes they use for specific trips. Respondents were more likely to take transit when shopping with friends than with parents. This finding is particularly true for the Toronto group. Thus, it can be assumed that parental involvement in discretionary trip making has an impact on mode choice. Very few respondents living outside of Toronto took any mode other than the automobile when traveling with their parents to shop. In fact, 90% of the 13-to-15-year-old group and 75% of the 16-to-19-year-old group said they would get a ride with their parents. Even when traveling alone, most GTA respondents within the 16-to-19-year-old group drive to their discretionary destinations. By contrast, driver mode shares were relatively low for the Toronto group.

For Toronto respondents, transit emerges as an important mode for both age groups. Although auto passengers represent a significant mode share, transit tends to dominate, particularly for the older group and for trips made without parental accompaniment. Walk mode shares were slightly higher for the Toronto group than for the rest of the GTA; however, this mode is not as significant for discretionary trips as it was for school trips.

TABLE 5 Frequency with Which Respondents Require a Vehicle for Discretionary Travel

Number of Respondents	Rarely (%)	Less Than ½ Trips (%)	About ½ Trips (%)	Almost All Trips (%)
Toronto, 125	26.4	16.8	18.4	38.4
GTA, 132	4.5	5.3	11.4	78.8
Total, 257	15.6	10.9	14.8	58.8

PARENTAL INFLUENCE

To further probe the issue of parental influence on mode choice and independent travel, respondents were asked a series of questions regarding parental input on mode choice and safety. To begin with, students were asked whether their parents allowed them to travel alone after dark once they turned 16 (see Table 6). The majority of respondents (75%) said that they were allowed to travel alone after dark. Looking at the gender breakdown, it was found that of those not allowed out after dark, 80% of the total, 74% of Toronto and 88% of GTA respondents, were female. Toronto had a higher percentage of respondents who were not allowed to travel alone after dark. This could be because of the different perceptions of safety associated with suburban and urban areas.

Respondents were also asked to comment on whether their parents encouraged or discouraged them to take transit on their own. Many indicated that their parents encouraged them to take transit independently. This percentage was higher for Toronto respondents (58%) than for GTA respondents (42%). Of those discouraged from taking transit alone, 72% were female respondents (56% of Toronto group and 81% of GTA group). Respondents who were discouraged from using transit on their own were asked to comment on possible reasons behind this sentiment. Approximately 80% said that their parents felt riding transit was unsafe, 51% felt transit is too expensive, 27% were afraid their child would get lost, and 22% discouraged transit use in favor of their child using active modes such as walking and biking.

Finally, respondents were asked to comment on how their parents felt about them walking around their city alone. In this case, 56% of total respondents indicated that their parents encouraged them to walk to their destinations without adult accompaniment, 19% were discouraged, and 25% felt that their parents did not express an opinion. The percentage of encouraging parents was slightly higher for the Toronto respondents (58%) and lower for the GTA respondents (49%). In total, 19% of respondents indicated that they were discouraged from walking alone (27% of GTA respondents and 18% of Toronto respondents). Of this group, 44% of respondents were female (37% for Toronto group and 54% for GTA group). Again, respondents were asked to comment on why they thought their parents discouraged them from walking alone to their destinations. Approximately 80% said that their parents felt it would be unsafe, and 62% said that their parents worried about them getting lost. Several respondents commented that their parents felt that walking would be too time-consuming because of the distance between their home and their discretionary destinations.

ATTITUDES, PERCEPTIONS, AND CONCERNS

The last part of the survey was designed to gather information regarding the attitudes and perceptions teenagers have toward taking transit, walking, and biking. Participants were also asked to identify

barriers to their independent travel. This section used multiple choice questions, as well as open-ended questions. Participants were given the opportunity to elaborate on their multiple choice answers or to choose "other" and provide their own explanations. The analysis of the Transportation Tomorrow Survey showed that discretionary transit mode shares have been decreasing over the past decade for this age group. In light of this finding, most questions in this section focused on transit to determine possible reasons for this decrease.

Transit Concerns

Participants were asked to rate the transit system in the city where they went to high school. Overall, 36% of respondents felt that the transit system was good, whereas 38% felt it was fair. Looking at Toronto respondents, 64% felt that the transit system was either very good or good, compared with 36% of the GTA respondents. The more positive perception of transit held by Toronto respondents is likely a result of superior transit accessibility and supply in the Toronto core.

To further probe the reasons behind varying attitudes toward transit, participants were asked whether they had ever had a particularly unpleasant experience on transit and to indicate the nature of this experience. Approximately 53% of respondents reported having had an unpleasant experience on public transit ($n = 136$). Of this group, 38% said they had to deal with a long wait or delayed bus or subway service, 23% said they were treated unkindly by an employee, 18% said they got lost in the transit system, 18% said they were treated unkindly by another passenger, and 4% said they were assaulted.

Barriers to Transit Use

Participants were also asked to consider a list of possible transit barriers and to rank them in terms of their importance. The most highly rated concern was infrequent service, followed by expensive fares, lengthy trips, and irregular service. Approximately 51% of participants mentioned that transit service is too infrequent and impeded their ability to use this mode. Only 35% of these respondents grew up in Toronto, the rest grew up in other GTA areas, with more dispersed development patterns. Respondents commented that infrequent service is particularly an issue during nonpeak travel times. Teenagers often travel outside of peak times and, as a result, run into service problems.

Similarly, 79% of respondents ranked the long length of transit trips as being a major concern; approximately 37% of this group grew up in Toronto. Respondents mentioned that long transit trips are often a result of multiple transfers. Others mentioned long wait times for buses and streetcars, again, particularly during off-peak times.

In terms of service irregularities, Toronto respondents made up 71% of those who ranked this concern highly. An explanation could be that suburban regions have less extensive transit systems with a lower chance of being thrown off schedule because of traffic congestion and other complications. Furthermore, infrequent service in suburban regions leads to less spontaneous trip making and a reliance on schedules, whereas in Toronto, travelers assume frequent service. It is possible that these expectations lead to more irritation when unexpected delays occur.

Participants were also given the opportunity to comment on additional barriers not provided in the list. They were particularly vocal with regard to funding issues, fare hikes, and lack of new infrastructure. Some complained that there has not been enough subway expansion in the GTA. They feel that the cost of transit in the GTA does not reflect the level of service throughout the region, particularly

TABLE 6 Attitude of Parents Toward Child Traveling Alone After Dark

Number of Respondents	Encouraged (%)	Discouraged (%)	Expressed No Opinion (%)
Toronto, 125	71	23	6
GTA, 132	79	17	4
Total, 257	75	20	5

outside of the downtown core. These concerns are not specific to this age group, but clearly, teens have an opinion on the level of transit service they are getting.

Participants also had a lot to say about transit accessibility, or lack thereof, in the suburbs. Many mentioned lack of service in neighborhoods outside of the downtown core to be a serious barrier to their independent mobility. They felt that bus stops in the suburbs are “poorly placed” and that the distances they have to walk to get to a transit stop are unacceptable. Some participants felt that poor land use planning and lack of population density were the culprits: “Good public transit depends on population density, the denser the population the better the public transit. There are not enough people using transit in the suburbs, which means there is not enough reason to increase the number of bus routes.”

Another barrier is the lack of coordination between regional transit agencies and the Toronto Transit Commission. A few participants mentioned having trouble using transit because they found trip planning from their neighborhood to a downtown neighborhood to be confusing. They felt that transit agencies were not doing enough to make this process easier, and as a result, some suburban teens abandoned the idea of taking transit altogether.

A major concern for transit users is that fact that most buses and streetcars share the road with cars, and as such, get stuck in traffic during the peak hour. This slows down their transit trips, particularly in the downtown core and during the summer when there is construction on many routes. Overcrowding on buses and subways during the peak hour is another barrier, mentioned primarily by those who lived in the Toronto area.

Safety is another concern. Several participants said they felt unsafe waiting at bus stops, especially if the area is not well lit. Waiting can also be a problem in cold weather or if it is raining and there is no bus shelter at the stop. A few people mentioned feeling unsafe on transit, but this was not a common complaint.

Barriers to Walking

The most commonly cited barrier to walking was the distance between origins and destinations within neighborhoods. Many respondents said that walking simply takes too long and is not a convenient, viable mode of transportation. They would rather get a ride, sacrificing some of their freedom to travel independently, than have to walk long distances. Several respondents expressed “feeling stuck” because of this barrier. When walking distances are long, weather becomes a more pronounced barrier (24).

Another built form barrier is the lack of pedestrian infrastructure in certain areas. Participants mentioned that it is unpleasant walking in areas that do not have trees or in areas that lack sidewalks. One respondent complained that in her town (a suburb of Toronto) there are “no good bike paths or walkways; travel destinations are too far apart (>10 km); sidewalks disappear, forcing [a] pedestrian to walk on [a] major road.”

They do not like having to cross “large, busy intersections” or highway ramps because they find them dangerous. Some of these intersections have “poorly timed traffic lights that favor drivers over pedestrians.” Many participants mentioned that within suburban areas, there are careless, distracted drivers who do not expect to see pedestrians: “Drivers tend to neglect to signal and have very little regard for cyclists and pedestrians” (female, GTA).

Respondents also mentioned feeling unsafe walking at night in certain areas of the city because of the presence of strangers. One

participant mentioned living in a housing project and not feeling safe traveling around it at night because of the presence of “dangerous people.” A few participants mentioned that poorly placed fences and blocked off areas are a barrier, resulting in having to take alternative, lengthier routes. Several participants also mentioned that empty streets with a lack of activity made them feel more vulnerable.

Barriers to Biking

Finally, participants were asked to identify barriers to utilitarian cycling. Almost all participants identified a lack of bike lanes and other cycling infrastructure as a barrier to cycling in the GTA. Sharing the road with cars, trucks, buses, and streetcars was a serious safety concern for this group. This problem was made worse when construction projects took place on already crowded, narrow roads. Another issue affecting Toronto cyclists is the presence of streetcar tracks, which can be hazardous to bikes. Thinner bike tires can get caught in the tracks, causing the cyclist to be thrown. Participants noted that only experienced cyclists can cope against these obstacles.

Another barrier identified by participants related to finding good information on bike routes in the GTA. A few respondents mentioned that they were unfamiliar with bike routes and could use some information on the best ways of getting around the region by bike. They felt that information on this topic is not readily available to people in their age group.

CONCLUSIONS

The analysis of the online travel survey yielded some interesting results regarding teenage mobility in the GTA. In general, it appears that respondents were able to articulate the reasons behind choosing or not choosing certain modes and indicated a certain awareness of the role land use and transportation planning play in facilitating or impeding their travel. Many of the concerns expressed by the participants can directly inform policy that would benefit not only this age group but all GTA travelers as a whole.

Implications for Policy

Two general types of policy could help teens in the GTA meet its independent travel needs, and both involve making car-free travel more feasible: (a) policies that make improvements to public transit, and (b) policies that make active travel easier and safer.

Improving Public Transit

Transit is a very important mode for teenagers; however, shortcomings in the level of service could push them to seek alternative modes. To retain this demographic, it is necessary to improve the level of service provided by transit. Findings suggest that teens who rely mostly on cars for their discretionary travel likely reside in more dispersed, suburban areas lacking in adequate transit. Increasing the frequency of service along suburban routes and extending service hours, at least on weekends, would help this group of travelers. Significantly increased service in all suburban areas would not be economically viable as a result of low density planning. However, in certain cases, it would help to simply add service on routes that

currently do not run at all on weekends. Extending weekend service hours could also help reduce drunk-driving incidences among teens. Increased service on the Toronto Transit Commission network would also help alleviate issues of overcrowding on subways, buses, and streetcars during peak periods.

As with any large region containing several smaller municipalities, improved coordination between the various transit systems across the GTA would help suburban teens a great deal. Participants identified the need for better information regarding how to use various systems in combination and felt that the current situation is confusing and difficult to navigate.

Improvements to service reliability would also be particularly helpful for the innercity travelers. This can be done in a number of ways. One way suggested by participants of this study is to have more buses and streetcars in designated (right-of-way) lanes to prevent them from competing with car and truck traffic. Other ways include using Global Positioning Systems on buses and streetcars to exercise more control on timing and avoid situations in which there are three vehicles in a row heading west, and zero heading east. Obviously, this type of control is made easier when buses and streetcars are not stuck in the same peak hour traffic as cars and trucks.

Improving Active Travel Options

Walking Improving the pedestrian experience is a very important part of facilitating independent teen mobility. The most commonly cited barrier is the distance between origins and destinations within many GTA neighborhoods. Although this is not as much of a problem downtown, it makes walking in the suburbs very difficult. Increasing the density of destinations in the suburbs will help alleviate this problem.

Pedestrian infrastructure, particularly outside of the downtown core, also needs some improvement. Participants described various infrastructure issues that make walking difficult, uncomfortable, or dangerous. Destination density would help in this case as well because teens tend to feel safer in areas that are well populated. The more active storefronts and streets are, the more people will be around, and thus, the safer travelers will feel. Traffic calming measures such as narrowed streets could also make walkers feel safer by forcing cars to drive more slowly. Teens do not enjoy walking on long, busy, arterials that are difficult to cross and filled with fast-moving cars. Suburban streets with no sidewalks are another problem that can be rectified by changing the design approach.

Biking Cyclists in the GTA have been fighting for years to improve biking conditions, infrastructure, and safety. The policy implications of this work fall in line with those from other studies (25–27). In short, there are not enough bike lanes in the GTA, making cycling very dangerous. Participants were clear that without bike lanes, especially ones that are separated from traffic, cyclists run the risk of being hit by cars, trucks, or buses; being hit by people opening their car doors; and getting their wheels stuck in streetcar tracks.

Another way to improve cycling for teens is to provide better information on cycling safety and best practices. Maps showing bike paths and safe bike routes throughout the city could be distributed through high school offices. This would go a long way in improving the confidences of teen cyclists and perhaps encouraging them to use this mode more often.

Suggestions for Research

Future research in this area could include conducting a large study of just teen travelers in the GTA to get a more statistical snapshot of some of the topics explored in this work. In addition, the economics of various mode choices could be teased out to determine the different costs associated with various household transportation options that involve youth travelers. The methodological framework can also be extended to look at other mobility-limited groups such as low-income travelers and the elderly.

To lessen auto-oriented travel behavior in general, it is important for large regions such as the GTA to coordinate land use planning with transportation planning. Current planning patterns make it difficult to implement quick fixes for improving the transit system. It is hard to increase the frequency of service in regions that are not built to generate high numbers of transit users. However, what does this mean for those living in these areas, without access to a private vehicle? These planning patterns make autonomous travel very difficult for this group. Therefore, the most important, overarching message is that dispersed, low-density, single-use planning will never be conducive to efficient public transportation and walkable neighborhoods.

ACKNOWLEDGMENTS

This research was funded by the Social Sciences and Humanities Research Council, as well as by the Government of Ontario.

REFERENCES

1. McDonald, N. C. Exploratory Analysis of Children's Travel Patterns. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 1977, Transportation Research Board of the National Academies, National Research Council, Washington, D.C., 2006, pp. 1–7.
2. Frank, L. D., and H. A. McKay. Time to Walk the Talk: Embracing the Built Environment to Promote Physical Mobility. *British Journal of Sports Medicine*, Vol. 44, No. 9, 2010, p. 615.
3. Panter, J. R., and A. P. Jones. Associations Between Physical Activity, Perceptions of the Neighbourhood Environment and Access to Facilities in an English City. *Social Science and Medicine*, Vol. 67, No. 11, 2010, pp. 1917–1923.
4. Anderson, W. P., P. S. Kanaroglou, and E. J. Miller. Urban Form, Energy and the Environment: A Review of Issues, Evidence and Policy. *Urban Studies*, Vol. 33, No. 1, 1996, pp. 7–35.
5. Bhat, C. R. A Model of Post-Home Arrival Activity Participation Behavior. *Transportation Research, Part B*, Vol. 32, 1988, pp. 387–400.
6. Damm, D., and S. R. Lerman. A Theory of Activity Scheduling Behaviour. *Transportation and Planning*, Vol. 13A, 1981, pp. 703–718.
7. McDonald, N. C. Household Interactions and Children's School Travel: The Effect of Parental Work Patterns on Walking and Biking to School. *Journal Transport Geography*, Vol. 16, 2008, pp. 324–331.
8. Blumenberg, E. En-Gendering Effective Planning: Spatial Mismatch, Low-Income Women, and Transportation Policy. *Journal of the American Planning Association*, Vol. 70, No. 3, 2004, pp. 269–281.
9. Kwan, M. Gender, the Home–Work Link, and Space–Time Patterns of Nonemployment Activities. *Economic Geography*, Vol. 75, No. 4, 1999, pp. 370–394.
10. Cain, A. Teenage Mobility in the United States: Issues and Opportunities for Promoting Public Transit. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 1971, Transportation Research Board of the National Academies, Washington, D.C., 2006, pp. 140–148.
11. Trowbridge, M. J., and N. C. McDonald. Urban Sprawl and Miles Driven Daily by Teenagers in the United States. *American Journal of Preventive Medicine*, Vol. 34, No. 3, 2008, pp. 202–206.
12. McDonald, N. C. Critical Factors for Active Transportation to School Among Low-Income and Minority Students. Evidence from the 2001

- National Household Travel Survey. *American Journal of Preventive Medicine*, Vol. 34, No. 4, 2008, pp. 341–344.
13. Clifton, K. J. Independent Mobility Among Teenagers: Exploration of Travel to After School Activities. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 1854, Transportation Research Board of the National Academies, Washington, D.C., 2003, pp. 74–80.
 14. Pooley, C., D. Whyatt, M. Walker, G. Davies, P. Coulton, and W. Bamford. Understanding the School Journey: Integrating Data on Travel and Environment. *Environment and Planning A*, Vol. 42, No. 4, 2010, pp. 948–965.
 15. McDonald, N. C., E. Deakin, and A. E. Aalborg. Influence of the Social Environment on Children's School Travel. *Preventive Medicine*, Vol. 50, 2010, pp. S65–S68.
 16. Larsen, K., J. Gilliland, P. Hess, P. Tucker, J. Irwin, and M. He. The Influence of the Physical Environment and Sociodemographic Characteristics on Children's Mode of Travel to and from School. *American Journal of Public Health*, Vol. 99, No. 3, 2009, pp. 520–526.
 17. Buliung, R. N., R. Mitra, and G. Faulkner. Active School Transportation in the Greater Toronto Area, Canada: An Exploration of Trends in Space and Time (1985–2006). *Preventive Medicine*, Vol. 48, 2009, pp. 507–512.
 18. Ewing, R., W. Schroeder, and W. Greene. School Location and Student Travel: Analysis of Factors Affecting Mode Choice. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 1895, Transportation Research Board of the National Academies, Washington, D.C., 2004, pp. 55–63.
 19. Fulton, J. E., J. L. Shisler, M. M. Yore, and C. J. Caspersen. Active Transportation to School: Findings from a National Survey. *Research Quarterly for Exercise and Sport*, Vol. 76, 2005, pp. 352–357.
 20. McMillan, T. E. The Relative Influence of Urban Form on a Child's Travel Mode to School. *Transportation Research, Part A*, Vol. 44, 2007, pp. 69–79.
 21. Tal, G., and S. L. Handy. Children's Biking for Nonschool Purposes: Getting to Soccer Games in Davis, California. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 2074, Transportation Research Board of the National Academies, Washington, D.C., 2008, pp. 40–45.
 22. Data Management Group. *Transportation Tomorrow Survey 2006 Data Guide*. Department of Civil Engineering, University of Toronto, Toronto, Canada, 2008. http://www.dmg.utoronto.ca/pdf/tts/2006/dataguide2006_v1.pdf. Accessed May 29, 2011.
 23. García-España, J. F., K. R. Ginsburg, D. R. Durbin, M. R. Elliott, and F. K. Winston. Primary Access to Vehicles Increases Risky Teen Driving Behaviors and Crashes: National Perspective. *Pediatrics*, Vol. 124, No. 4, 2009, pp. 1069–1075.
 24. Saneinejad, S., C. Kennedy, and M. J. Roorda. Modeling the Impact of Weather on Active Transportation. *Canadian Transportation Research Forum Conference Proceedings*, 2010, pp. 43–56.
 25. Pucher, J., J. Dill, and S. Handy. Infrastructure, Programs, and Policies to Increase Bicycling: An International Review. *Preventive Medicine*, Vol. 50, 2010, pp. S106–S125.
 26. Akar, G., and K. J. Clifton. Influence of Individual Perceptions and Bicycle Infrastructure on Decision to Bike. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 2140, Transportation Research Board of the National Academies, Washington, D.C., 2009, pp. 165–172.
 27. Chang, H.-W., and H.-L. Chang. Students' Perceptions of Difficulties in Cycling to School in Urban and Suburban Taiwan. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 2060, Transportation Research Board of the National Academies, Washington, D.C., 2008, pp. 123–130.

The Traveler Behavior and Values Committee peer-reviewed this paper.