Gender Differences in School and Work Commuting Mode Through the Life Cycle

Exploring Trends in the Greater Toronto and Hamilton Area, 1986 to 2011

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Reducing auto dependence and increasing the use of active and sustainable modes of transportation for school and work travel are necessary for alleviating traffic congestion issues that are typical in today's North American cities and regions. While there is a growing interest in increasing the use of active and sustainable modes of travel for commuter trips in transportation planning, less attention has been paid in practice to gender differences in travel demand. This descriptive study explores gender differences in active transportation, public transit, and automobile use through the life cycle to assess temporal changes in gendered transport over the past 25 years in the greater Toronto and Hamilton area, Canada. Findings suggest that female children and youths are driven to school more frequently than males; however, males drive more than females during the years of labor force participation. Differences between female and male automobile use increase with age, but the gender gap has declined since the mid-1980s. Factors such as having one vehicle per household, more than six household members, and living and working in the city of Toronto are shown to associate with the largest differences in driving between full-time employed women and men. Distances between home and work have increased, particularly for women, and the percentage of women with a driver's license has increased. Although driving remains higher for men than women during the part of the life course that includes labor force participation, the gender gap in active transportation, public transit, and automobile use appears to be lower today than in the mid-1980s.

The traffic congestion that plagues much of the urbanized Global North typically produces traffic environments that are unsafe and costly for individuals of all ages. Congestion during peak commuting hours creates a financial burden on cities and regions because of the productivity costs of time lost to long commutes and the direct and indirect costs associated with motor vehicle injuries and fatalities. To alleviate these issues, a reduction in automobile dependence and an increase in the use of active and sustainable modes of transportation such as walking, cycling, and public transit is required during daily school and work commutes. While there is growing interest in increasing levels of active transportation for school and work travel in transportation planning practice, inadequate attention has been given to gender differences in daily travel and how gender roles relate to mobility. The regional transportation plan for the greater Toronto and Hamilton area, Canada, *The Big Move*, envisions that one third of work trips will be taken by transit and one in five trips will be taken by active modes of transportation (e.g., walking and cycling) by 2031 (*1*). This regional plan aims to facilitate an increase in sustainable modes for daily travel; however, mention of gender differences in mobility is largely absent.

In this paper, gender is acknowledged as a social construct that transcends the typical male–female gender binary. Measurement, however, because of the use of secondary data, is limited to the often used male–female, men–women, and boy–girl category labels. These terms are used as a tool to connect this study to other research where gender has been similarly essentialized without nuanced consideration of its construction. The social construction of gender and the role of girls and women in society affect the mobility patterns of females through the life cycle, a process that arguably begins in childhood.

For children and youths, active school transport (AST), such as walking or cycling to school, provides an opportunity for daily physical activity that may help to reduce the risk of overweight and obesity while protecting against the onset of chronic disease later in life (*2–5*). Despite the potential health benefits, North American research suggests that AST has decreased in recent decades (*6–8*), with girls less likely to engage in AST than boys (*9, 10*). This gender gap in school travel could be related to parental risk perceptions associated with female independent travel and a contemporary model of good parenting in much of the Global North that is characterized by a high level of child supervision by adults (*10–14*).

Research into commuting mode choice for adults also indicates differences in the travel behavior of men and women. The term "mode choice" implies that there is an option for women and men to make decisions about their travel patterns, but historically women have had reduced access to certain modes of transportation and lower daily mobility when compared with men. Research on gender and transport reveals that gender and class norms dictate the level of mobility, or immobility, of women (*15*). While some argue that gender disparities have decreased since the early twentieth century, women's automobile use has remained lower than men's (*16*). Men's

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access to private cars increases their freedom and flexibility, facilitates efficient and time-sensitive travel, and creates opportunities to travel to new and often more distant destinations. Women, however, often rely on alternative modes of travel that may limit their mobility, contributing to a reproduction of gender inequalities with regard to employment and household responsibilities.

Research shows that women's mobility is not only affected by male-dominated automobile use, but also by household responsibilities often associated with motherhood. By 1990, there were more families with two working parents than those with a working father and a stay-at-home mother (*17*). Many households had two parents who traveled to and from work each day, took children to and from school, and incorporated other activities and trips related to running a household into their schedules (*17*). Journey-to-work research indicates that women typically traveled shorter distances to employment than men (*17–22*). Reasons for these shorter distances have been shown to include income, domestic responsibilities that women conduct on a daily basis, access to transport, and labor market segmentation (*23*). Women tend to make more trips for a wider variety of purposes, develop more trip chains (i.e., stop at one or more locations before arriving at a destination), have more multimodal trips (i.e., the use of two or more modes of travel for one trip), and have shorter trips than men (*24*). Despite increased labor force participation during and since World War II, the activities and travel related to childcare, shopping, and other household errands remain largely carried out by women. Complex patterns of activity and travel demand exist for women as they enter and experience child-rearing stages of life associated with generally carrying out a wider range of unpaid labor.

The increased labor force participation of women during the past several decades may have affected the ways in which household responsibilities and transportation decisions are negotiated. This study examines gender differences in active transportation, public transit, and automobile use through the life cycle, with a view to identifying changes in gendered mobility in recent decades. This descriptive piece explores three main research questions: (*a*) How does the gender gap in school and work travel change as individuals age? (*b*) How does the gender gap in school and work travel today differ from that of the past (i.e., from 1986 to 2011)? and (*c*) How do household characteristics and factors such as distance and licensing associate with gender differences in commuter mode share? The remainder of the paper is organized into four sections. The first section outlines the study area, data, and methods employed. Research findings are then presented, with a focus on the interplay between gender and age, household characteristics, distance, and licensing. Findings are then discussed in terms of how they relate to the complex social construction of gender in society.

METHODS

Study Area and Data

This study was situated in Canada's largest metropolitan region, the greater Toronto and Hamilton area, and used data drawn from the Transportation Tomorrow Survey (TTS). The TTS is a repeat cross-section household travel survey collected with a computer-assisted telephone interview (CATI) procedure for one weekday in the fall of each survey year. The TTS has been conducted every five years since 1986 and includes questions related to school and work travel as well as personal and household characteristics. The survey represents a 5% random sample (4.2% in 1986) for the city of Toronto and surrounding region. This study used elementary, secondary, and postsecondary school trip data and full-time work trip data for five study years over a 25-year period (1986, 1996, 2001, 2006, and 2011) across six regional municipalities (Durham, Halton, Hamilton, Peel, York, and Toronto). Survey year 1991 is excluded because in that year the survey included only areas with rapid growth since 1986. A census-based expansion factor was used to produce population level travel data. Population weighted expansion numbers were used to calculate mode share.

Age and Gender

Because the TTS collects only data for household members above age 11, 11- to 13-year-olds are used to represent elementary school students, and 14 to 17-year-olds are used to represent secondary school adolescents. This age classification method is used to expose any differences in travel mode share among elementary and secondary students. The 18- to 24-year-old age category is used for data related to both postsecondary school trips and full-time work trips. The Association of Universities and Colleges Canada considers 18 to 24 to be the key youth age range for enrollment in postsecondary education (*25*). This age group marks the last school trip age category (i.e., postsecondary trips) and the first work-age category (i.e., full-time work trips). The full-time work-age categories are based on Census of Canada age groupings that divide the population into 5-year intervals. Gender is essentialized as male or female on the basis of the response of the individual being surveyed or the family member who responded on behalf of all members of the household. For this reason, the gender indicated for children and youths may reflect the gender that has been ascribed to them by a parent or guardian rather than the gender with which they identify.

School and Employment Status

Trip data for school and work were extracted to reflect the daily mobility patterns of children, youths, and adults. Children, youths, and young adults of ages 11 to 17 and 18 to 24 must be considered full-time students to be included in this study, and workers (18- to 24 years old and 25 years and older) must have full-time employment status. This enables comparisons between the travel patterns of females and males who have similar school and work circumstances. In this study, work is defined as full-time paid labor outside the home. Part-time workers were not included in this analysis because of the different activity, scheduling, and travel context associated with part-time employment or hours, particularly the timing at which part-time commuting occurs. The focus on school and work trips allows for a greater understanding of gendered mobility patterns on a daily basis rather than for unique discretionary trips.

RESULTS

School and work trip-mode shares for all age categories by gender and year are shown in Figure 1. In this figure, "GO Transit" refers to the use of the interregional transit system that offers bus and train services in and between regions of the greater Toronto and Hamilton area. This differs from municipality-focused "local transit" services.

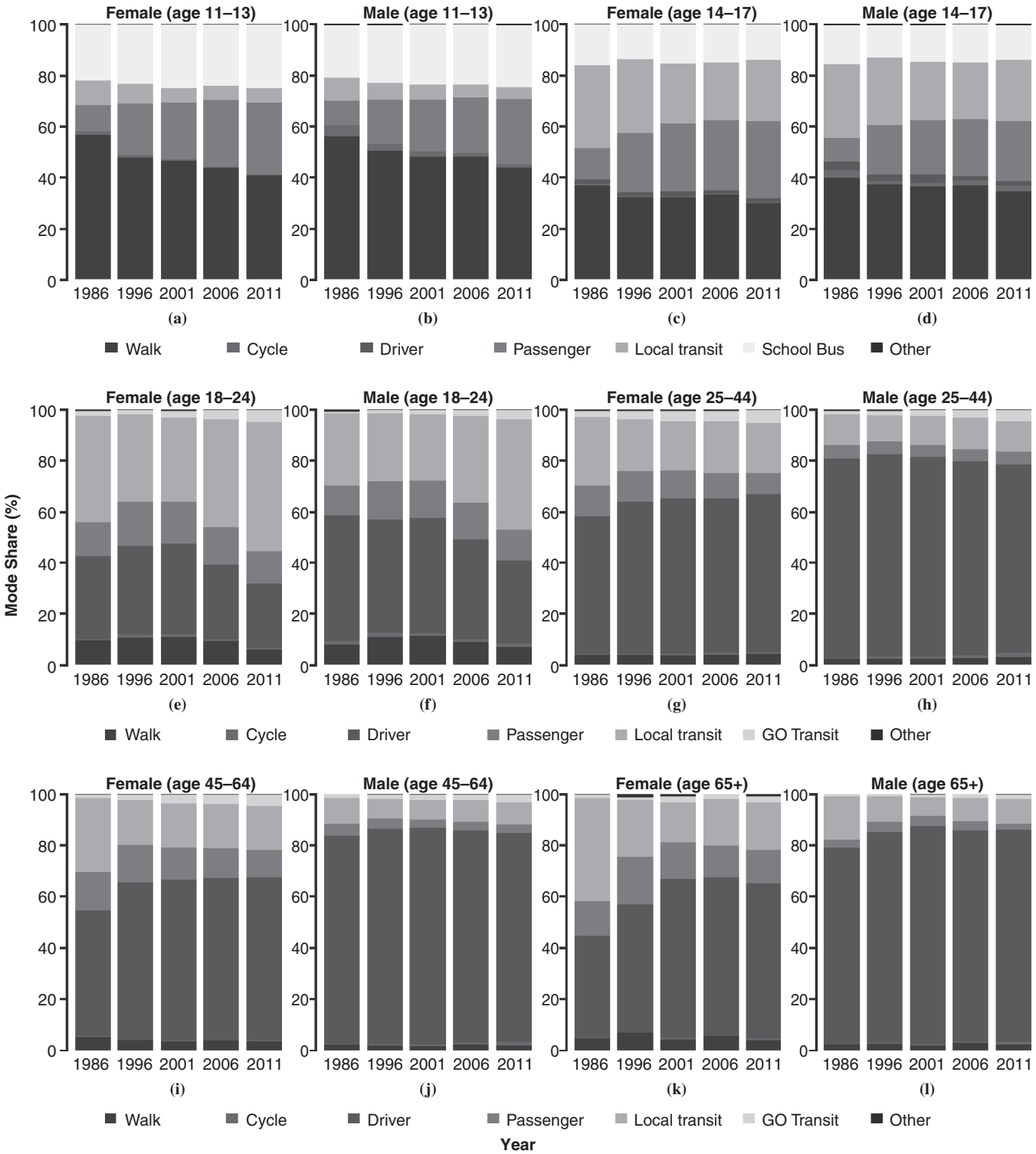

FIGURE 1 Daily school and work mode share (percentage of trips) in the greater Toronto and Hamilton area by age, year, and gender, 1986–2011.

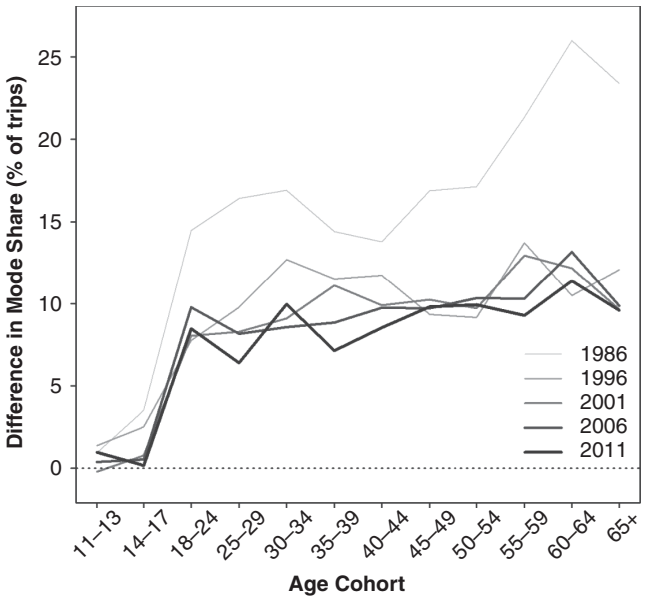

FIGURE 2 Difference between female and male public transit mode share (percentage of daily school and work trips taken by local or regional transit) in the greater Toronto and Hamilton area by age [calculated as female transit mode share (%) − male transit mode share (%)].

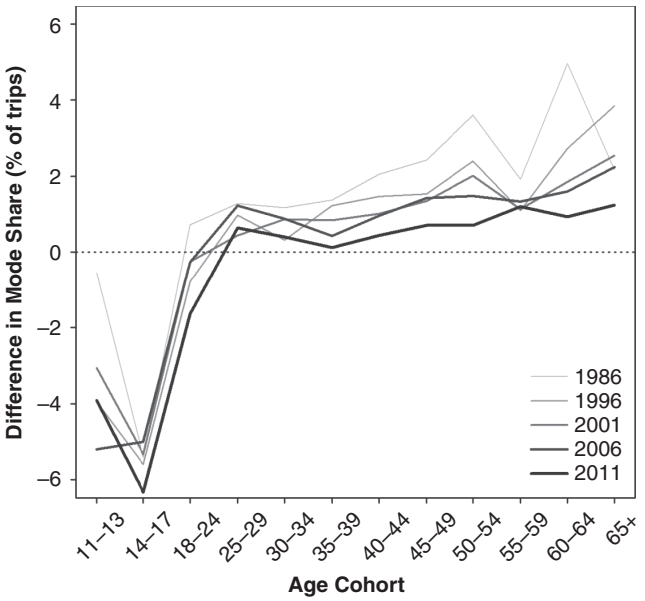

FIGURE 4 Difference between female and male active transport mode share (percentage of daily school and work trips taken by walking or cycling) in the greater Toronto and Hamilton area by age [calculated as female AT mode share (%) − male AT mode share (%)].

These two categories are combined in Figure 2 to represent total public transit use. Similarly, the automobile mode-share used to explore gender differences includes trips where the respondent was either a driver or passenger of a personal vehicle (Figure 3). The purpose of combining driver and passenger trip types was to trace changes in automobile use through life-cycle stages beginning in childhood, where children are passengers (e.g., a parent, sibling, or guardian). The gender gap in mode share in Figures 2, 3, and 4 is expressed as the difference between female and male mode share (Figures 2–4). A positive value indicates greater female than male mode share. The gender gap in automobile use during working years, therefore, refers to the higher automobile mode share for men than for women.

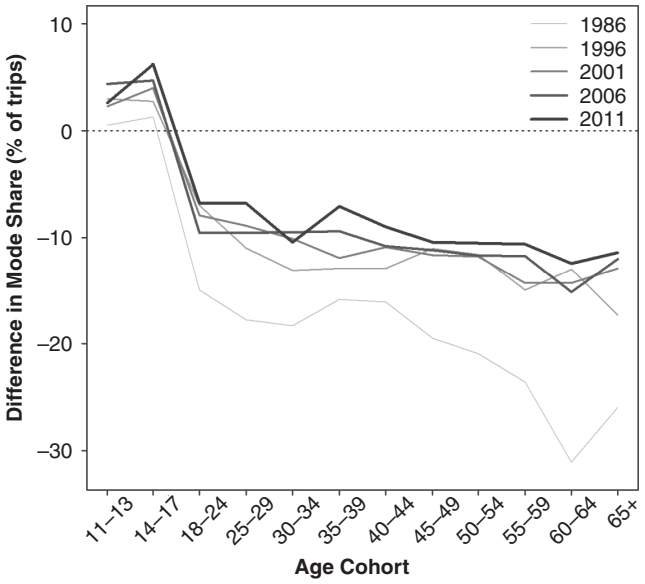

FIGURE 3 Difference between female and male automobile mode share (percentage of daily school and work trips taken as an automobile driver or passenger) in the greater Toronto and Hamilton area by age [calculated as female auto mode share (%) − male auto mode share (%)].

Gender and Age

Active and Public Transportation

Over the past few decades, AST has declined for children and youths, but has decreased more for females than for males. In 1986, 57.4% of females and 57.9% of males 11- to 13 years old walked or cycled to school; whereas, only 41.2% of females and 45.1% of males used active modes of transportation in 2011 (Figure 1). The more rapid decrease in walking and cycling for females than for males indicates a widening of an AST gender gap. The most recent survey data reveals that boys are 3.9% more likely to travel using active modes, an increase from 0.5% in 1986 (Figure 2). Similar results are observed for 14- to 17-year-old students, who have also experienced a decline in walking and cycling since 1986, particularly females. Public transit use for elementary and secondary school travel has decreased slightly for both males and females (Figure 1). There does not appear to be a substantial gender gap in public transit during these years (Figure 2).

For postsecondary students and full-time workers in the 18 to 24 year age group, active transportation has decreased from 9.6% to 7.6% (Figure 1). The general trend in active transportation for the adult work commute suggests that women are more likely than men to travel to full-time employment using active modes. The gender gap

in active transportation increases as commuters age, with the largest gap observed for those older than the age of 65, when women used active modes of transportation 1.2% more than men in 2011 (Figure 4). However, this value has decreased from previous survey years, indicating that the gender difference in active commuting has narrowed somewhat over time. There is a more substantial gender gap in public transit than in active transport. Women are approximately 5% to 10% more likely than men to use public transit for work trips (Figure 2). The gender gap in public transit also appears to have decreased over time and increases with age (Figure 3).

Automobile Use

Between 1986 and 2011, the automobile mode share (drivers and passengers as percentage of total trips) in the greater Toronto and Hamilton area increased for all age groups and both for females and males (Figure 1). During this 25-year period, the automobile mode share for females increased from 12.1% to 27.7% and from 14.0% to 31.3% for 11- to 13- and 14- to 17-year-olds, respectively. Male automobile use for these age groups increased from 11.6% to 25.1% and from 12.7% to 25.1%. Driving has increased more for females than for males; there is a wider gender gap for 2011 than for 1986 for students 11 to 17 years of age (Figure 3). The most recent data indicate that female children and female youths of ages 11 to 17 years are more likely to be driven or drive to school than males. However, as youths transition to postsecondary school or full-time work (18 to 24 years), males are more likely to drive or be driven to school and work. This effect is present in all survey years beginning in 1986, where 46.1% of females and 61.1% of males used the automobile to commute (Figure 1).

While the gender gap in automobile use increased from 1986 to 2011 for elementary and secondary students, it decreased for postsecondary and full-time work trips. In 2011, women of ages 18 to 24 years traveled by automobile 6.8% less than men, whereas they drove 14.9% less than men in 1986 (Figure 3). Women also continue to have lower auto use for their commute throughout adulthood than do men. Since 1986, women in the remaining age groups ($\geq$ 25 years) have been less likely to drive or be driven to work than men. While a gender gap in automobile use persists into 2011 and increases with commuter age, the region's gender gap is less prominent than it was 25 years ago (Figure 3).

Gender and Household Characteristics

Since 1986, women have been less likely to drive to work than men, a finding that remains when accounting for the household characteristics selected in this study. In 1986, in households where only one vehicle was present, men had a driving mode share that was 33.6% greater than women (Table 1). This effect is present in 2011, but has reduced to a difference of 22.5% (Table 1). The gender gap in driving to work decreases as the number of cars per household increases, but driving to work remains higher for men than for women, regardless of the number of vehicles.

With an increase in household size, the gender gap in driving to work increases as well. In the 1986 survey, men drove to work 37.8% more than women in households with six or more members, but drove only 24.9% and 26.3% more often in households with one to two and three to five members, respectively (Table 1). The 2011 survey results report similar findings of increased gender differences with household size increases, but the difference between female and male driving is found to be lower than in 1986.

The distance between home and work may affect the gender gap in commuting. The smallest difference between female and male auto trip distance is observed at 0–2 km, with a difference of 20.5% in 1986 and 7.7% in 2011 (Table 1). In 1986, the greatest difference was observed at distances of 7 to 10 km and 11 to 19 km; however, on the basis of the 2011 survey, the gender gap appears to increase with trip length.

For work trips, the gender gap in driving appears largest for city of Toronto households. In 1986, the male automobile driver mode share was 31.2% higher than that for females and 21.6% higher in 2011 (Table 1). The work trip gender gap also appears largest for commuters traveling to workplaces located in the city of Toronto in both 1986 and 2011. In some of the other parts of the study area, and in the city of Hamilton, the gender gap in work travel appears to have narrowed somewhat by 2011. For example, for both household and workplace location, Hamilton had a gender gap of approximately 21% in 1986 but only approximately 9% by 2011 (Table 1). Overall, the male driving mode share has remained relatively consistent, with increased driving by females appearing to narrow the gender gap over time.

Gender and Distance

The distance between work and home differs between full-time employed men and women. In 1986 and 2011, females took more short trips than males (Figure 5). For both men and women, straight-line trip distances have increased since 1986, with more commuters making longer trips today than 25 years ago. The difference in trip length between women and men decreased between 1986 and 2011; however, women still appear to work closer to their homes than do men. The median straight-line trip distance to the nearest kilometer was 7 km for women and 10 km for men in 1986. In 2011, those distances increased to 10 km for women and 12 km for men.

Gender and Licensing

Twenty-five years ago, women of all ages had lower driver licensing rates than men. In 1986, between 38.3% and 47.4% of licensed drivers were women, and between 52.6% and 61.7% were men (Figure 6). A general upward trend in licensing for women is observed since this date for age cohorts older than age 25; however, a downward trend in female drivers is observed after 2001 for 16- to 24-year-olds. In 2006 and 2011, women between the ages of 16 and 24 had lower licensing rates than in previous years, suggesting that females may be acquiring licenses later in life than men.

DISCUSSION OF FINDINGS

Gender and Age

Trips made between home and school shape a child's travel experiences and may influence their future mobility patterns. A greater focus on active and sustainable transportation options for children and youths could potentially produce a transport future with less traffic congestion and autodependence than what is typical in today's North American cities and regions. AST to elementary and secondary school has declined over time and has decreased more for

TABLE 1 Driving Mode Share, Percentage of Daily Work Trips, by Gender and Household Characteristics

	1986 (%)			2011 (%)		
Variable	Female	Male	Difference	Female	Male	Difference
Number of vehicles in household						
0	0.7	2.9	−2.2	0.4	1.9	−1.5
1	36.6	70.2	−33.6	43.0	65.6	−22.5
2	68.7	87.7	−19.1	76.5	86.3	−9.8
3+	74.3	88.0	−13.8	81.7	88.6	−6.8
Number of persons in household						
1–2	48.8	73.7	−24.9	59.0	72.6	−13.5
3–5	52.7	79.0	−26.3	63.7	78.3	−14.6
6+	37.6	75.4	−37.8	58.3	77.9	−19.6
Straight-line trip distance between home and work (km)						
0–2	38.9	59.4	−20.5	42.4	50.1	−7.7
3–6	46.3	71.6	−25.2	56.8	71.1	−14.3
7–10	47.4	76.0	−28.6	60.7	76.7	−16.0
11–19	48.8	78.2	−29.5	64.0	79.1	−15.1
20–29	58.2	82.6	−24.3	61.2	78.4	−17.2
30+	58.4	83.2	−24.7	60.9	78.7	−17.8
Regional municipality of household						
Toronto	38.4	69.6	−31.2	42.5	64.1	−21.6
Durham	70.8	84.6	−13.9	76.1	85.9	−9.7
York	69.0	87.1	−18.1	74.5	85.2	−10.7
Peel	64.6	85.4	−20.7	71.4	85.7	−14.3
Halton	74.9	86.6	−11.7	80.6	84.9	−4.4
Hamilton	61.6	82.8	−21.2	76.4	85.6	−9.2
Regional municipality of workplace						
Toronto	39.4	69.8	−30.4	43.2	61.1	−18.0
Durham	74.5	85.2	−10.7	86.0	89.8	−3.8
York	71.0	87.1	−16.1	82.7	91.0	−8.3
Peel	71.7	88.4	−16.7	79.3	90.4	−11.1
Halton	79.0	89.2	−10.2	86.4	91.1	−4.7
Hamilton	60.8	82.5	−21.7	74.5	83.4	−9.0

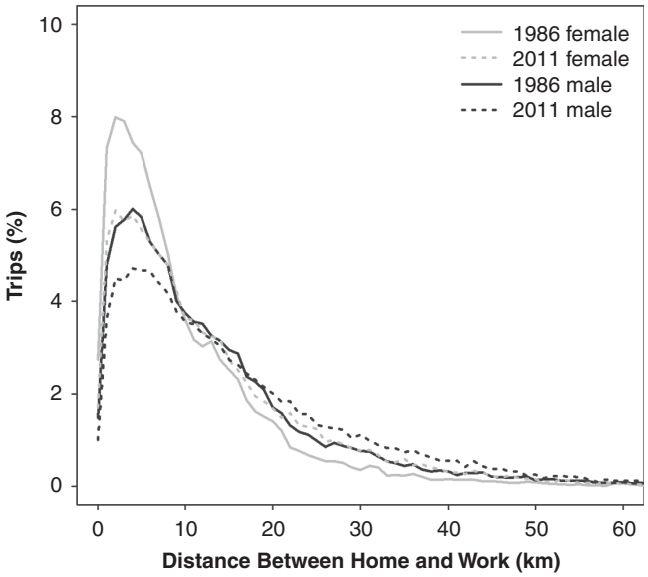

FIGURE 5 Straight-line trip distances between home and work for males and females with full-time employment in the greater Toronto and Hamilton area.

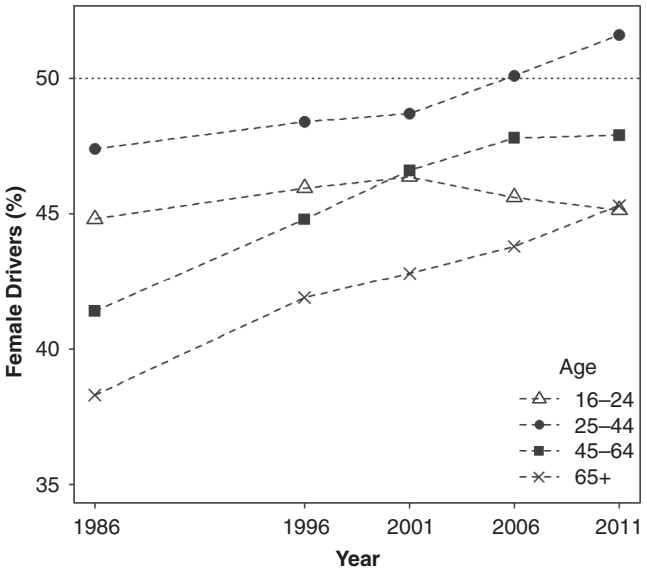

FIGURE 6 Females with driver's licenses as a percentage of total licensed population by age in the greater Toronto and Hamilton area, 1986–2011.

girls than boys, producing a greater AST gender gap in 2011 than was present in 1986. The lower level of AST for females may be attributed to parental perceptions of risk surrounding abductions by strangers and the idea that a child is protected when driven to school (*26*). Qualitative research on school travel in the city of Toronto suggests that fear of abductions, strangers, and traffic safety may be primary reasons for driving children to school (*26*). The sensationalism of stranger abductions in the media also likely produces and reinforces parental fears regarding independent travel by females and may result in less participation in active travel among girls. Parents may believe they are reducing safety risks by driving their children (especially their daughters) to school (i.e., risk of abduction and injury from pedestrian collisions); however, automobile-occupant injury presents a much greater risk. The occupant fatality rate (ages 0 to 19) in Canada in 2005 was seven times greater than the pedestrian fatality rate (*27*). Driving children to school, particularly females, has increased in recent decades and contributes to an overall increase in automobile dependence.

As adolescents age and transition into postsecondary school or full-time work, automobile use increases, with the male automobile mode share surpassing that of females for 18- to 24-year-olds). One factor influencing a greater proportion of male drivers than female drivers is the age at which individuals obtain their driver's license. In the greater Toronto and Hamilton area, females may be acquiring their driver's licenses later than males or may be deciding not to become licensed at all. In 1994, the province of Ontario introduced a graduated licensing system that requires two license levels before obtaining full license privileges. The licensing procedure requires completion of a written test and two road tests, a process lasting, at a minimum, 20 months. While this system may prolong license procurement for all young adults, it appears to have had a greater impact on females. Data from 2011 suggest that females acquire their licenses later in life and drive less to work than males.

The gender gap in active transportation, public transit, and auto use for full-time workers increases as individuals age, which may be related to a number of factors, including household responsibilities, distance to work, and access to a personal vehicle. The lower levels of automobile use for women along with higher levels of use of alternative modes (e.g., walking, public transit) is a finding consistent with literature (*28, 29*). Increased female labor-force participation during and following World War II and the rise of the two-worker (paid employment outside the home) household produced new decisions and new ways of negotiating mobility and transport in households. This study suggests that the gender gap in work trip travel mode has decreased over time.

Gender and Household Characteristics

Findings suggest that gender differences in school and work mode share change with factors including distance, location, and vehicle or license ownership. Research regarding the journey-to-work has pointed to a number of reasons for lower automobile use for women than for men, typically related to the gendered quality of good parenting, motherhood, income, and labor market participation. One limitation of the TTS is that it does not collect household or individual income data, which restricts arguments that can be made surrounding type of employment, income status, and travel patterns. A measure that may provide partial information about affluence is vehicle ownership; higher income households are shown to have higher levels of car ownership (*30*).

Although men are more likely to drive to work regardless of the number of vehicles per household, the difference between female and male driving is substantially greater in households with lower automobile ownership. However, these results support other studies that found lower car use for women than for men in households where there were fewer automobiles than drivers (*29*). With only one vehicle present, 65.6% of full-time working men and 43% of full-time working women drove to work in 2011. Other research in the city of Toronto suggests that distance and income influence car allocation and that men and women living in higher income areas with long trip distances tend to have higher car ownership (*30*).

Household size can also provide information about household gender dynamics and transportation. In households with six or more members, women are less likely to drive to work than in smaller households. This is likely because of the larger amount of unpaid labor that women engage in and tasks associated with running a large household. To accomplish these tasks, women may work closer to home as a shorter distance between home and work enables ongoing maintenance of household responsibilities. The Household Responsibility Hypothesis (HRH) suggests that women have greater household responsibilities than men, causing them to choose shorter commutes to work (*21*). The 2011 TTS data suggest that the gender difference in driving based on household size has decreased, which could suggest that either (*a*) the HRH may be less prevalent today than in the past, or (*b*) that women are simply scheduling unpaid work into other times of the day and simply working longer hours inside and outside the home. As mentioned previously, the gender gap has decreased due to the increasing use of the automobile for women. Higher automobile use by females has likely occurred because many regions of the greater Toronto and Hamilton area have become increasingly suburban and car-oriented. Women with paid work outside the home could in many cases quite justifiably perceive that public transit will not provide the required level of service necessary to support the perfect storm of having paid work outside the home, while continuing to engage in the lion's share of household maintenance and child-related tasks (i.e., particularly transport and communication) (*31*).

The introduction of graduated licensing in Ontario may be associated with the lower number of women acquiring a driver's licenses at a young age. The later age at which women obtain their driver's license may also be a product of their travel experiences during childhood. Girls are chauffeured to school more often than boys and may participate in independent travel later than males, which minimizes the need for a driver's license at a young age. Women may obtain their license later in life than men, but the proportion of female drivers today is greater than that in 1986 (Figure 3). This supports research in the United States that found an increase in female drivers as a percentage of total drivers from 1963 to 2010 (*32*). This increase in licenses for women in recent decades may translate into increased driving to work and represents a higher level of observed mobility potential for women than was observed in the past.

CONCLUSION

This study demonstrates a narrowing of the gender gap over time and a widening of the gender gap as individuals age. To alleviate issues of traffic congestion in the greater Toronto and Hamilton area, it is important to determine what is driving the narrowing of the gap over time. Further research is required to unpack why this effect is present within specific parts of the lifecycle and how societal changes in

parenthood and labor force participation may have influenced such changes. *The Big Move*, the regional transportation plan for greater Toronto and Hamilton area, overlooks the complexities of gender in the conversation about transportation and travel demand. This major document, guiding transportation planning practices in greater Toronto and Hamilton area until 2031, makes no mention of gender as it relates to travel demand. A better understanding of why, where, and how this gender gap changes is required to determine ways in which the increased use of automobile use for everyone can be addressed. Transportation policy makers who wish to develop policy to increase the use of active and sustainable modes should give more attention to the gendered qualities of transportation systems and travel demand.

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