

# The Effects of Long Commutes and What To Do About Them

*An Annotated Bibliography*



Prepared by  
**Close  
Commute**  
SYSTEMS INC.

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CloseCommute Systems Inc., a BC-based benefit corporation, is creating two catalysts – an Action Plan blueprint for governments and a toolkit for employers – to drive widespread adoption of the CloserCommutes sustainability strategy.

# Executive summary

**CloserCommutes** is a common-sense efficiency initiative that could reduce the commuting distances and times for millions of commuters around the world. The process – for commuters and their employers – is simple to understand and implement, at very little cost and significant financial, environmental and societal benefits.

The CloserCommutes approach calls for multi-worksite employers – school boards, banks, municipalities, health authorities, retail and hospitality chains, etc. who collectively employ about 40% of the urban workforce – to modernize their human resources policies to reduce unnecessary long commutes in these ways:

1. **Swapping work locations.** Allow and encourage people doing the same job to switch locations to improve the commute for both parties. Maintain data on employees' commutes and regularly examine for potential voluntary swap matches.
2. **Internal openings and new hires.** Consider transfer candidates' commute times as a criterion when filling internal job openings. Maintain a roster of employees' desired worksites. Assign new hires to sites near their homes.

A pilot project at 30 Seattle-area bank branches demonstrated a 17% reduction in total employee commute distance could be achieved within 15 months.

**Peer-reviewed research in this annotated bibliography** points to these results/benefits:

- For long commuters – more quality time each day; less stress; improved mental and physical health; better social and family interactions; reduced commuting costs; etc.
- For employers – reduced costs for absenteeism, hiring, training and healthcare; higher productivity; etc.
- For society and the environment – potentially \$100s of millions in economic benefits to each metro area; reduced traffic load and congestion; less pollution; decreased emissions.

In **Part 1, Research on the effects of long commutes**, studies establish that long commutes have adverse effects on commuters' mental and physical health, activities and social life, family relationships, finances, etc. Long commutes have been linked to negative effects for their employers, society and the environment: reduced productivity, absenteeism, workplace injuries, traffic congestion, infrastructure costs, pollution, healthcare costs, vehicular accidents, greenhouse gas emissions, etc. We have included a sampling of articles from popular media discussing the effects of long commutes.

In **Part 2, Calculating the costs of long commutes**, we examine approaches for *quantifying* the benefits to various stakeholders that accrue from reducing commute distance and duration. *Part 2a* introduces methodologies for commuting vehicle costs, mostly focused on the commuter personally ["internal costs"]. In *Part 2b*, calculators are presented for the "external costs" including transportation system infrastructure, greenhouse gases, reduced commercial productivity due to transport congestion, regional economic impact, etc.

In **Part 3, Proximate Commuting: A transportation planning perspective**, we review the history and the transportation planning profession's perspective on ProximateCommute<sup>sm</sup> (now called CloserCommutes).

In **Part 4, Implementing CloserCommutes – process, costs/benefits & what to expect**, we describe the implementation process, then discuss an employer's potential implementation costs and benefits, and other considerations associated with a CloserCommutes long commuting reduction program.

# 1. Research on the effects of long commutes

Peer-reviewed research from many countries indicates that longer commutes are linked to increased worker stress, unhappiness, sedentary living (lack of exercise) and obesity, and pollution exposure, leading to reduced productivity and job dissatisfaction, illness and absenteeism, and domestic conflicts among other impacts. Studies have identified correlations between long commutes and the following outcomes:

## Physical health

- obesity or adiposity [severe or morbidly overweight] (Jacobson et al., 2011) (Jilcott et al., 2010) (Lopez-Zetina et al., 2006) (Hoehner et al., 2012) (Sacker et al., 2014) (Sugiyama et al., 2016)
- higher daily exposure to particulate matter and black carbon (Karanasiou et al., 2014) (Shekarrizfard et al., 2016)
- more visits to general practitioner (Künn-Nelen, 2016)
- lower cardiorespiratory fitness (Hoehner et al., 2012) and higher cardio-metabolic risk (Hoehner et al., 2012) (Sugiyama et al., 2016)
- higher blood pressure (Novaco et al., 1979)
- chronic fatigue (Kageyama et al., 1998)
- diabetes mellitus (Tsuji et al., 2015)
- self-reported poor health, serious backache, headaches, sleep disorders and fatigue (Hämmig et al., 2009)

## Mental health

- anxiety and depression, lack of energy and optimism (Hämmig et al., 2009)
- chronic stress, being in a sympathodominant state (Kageyama et al., 1998)
- increased stress and anxiety (Pohanka et al., 2004)
- lower sense of well-being (Stutzer et al., 2008)

## Activities

- reduction in sleeping, physical activity and food preparation which over time may contribute to obesity and other poor health outcomes (Christian, 2012)
- less physical exercise (Künn-Nelen, 2016) (Hoehner et al., 2012) (Nomoto et al., 2015)
- fewer sleeping hours (Nomoto et al., 2015)

## Work Performance

- increased sickness absence (Ala-Mursula et al., 2006) (Künn-Nelen, 2016)
- longer average paid time loss days due to work-related injury (Fan et al., 2013)
- fewer working hours (Nomoto et al., 2015)
- more accidents (Pohanka et al., 2004)
- lower job satisfaction and decreased intention to stay with same employer (Steinmetz et al., 2014)

## Social life

- less access to social capital (Besser et al., 2008); less time with friends (Sandow, 2011); and social isolation (Pohanka et al., 2004)
- higher time- and strain-based work-life conflict [WLC] (Hämmig et al., 2009)
- strain on relationships and likelihood of divorce (Sandow, 2011)
- low social participation and low general trust (Mattisson et al., 2015)

[Note: *Part 2* provides various methods for **quantifying the financial effects** of long commuting for the commuter and for society.]

## 1a. Studies published in the scientific literature

### Ala-Mursula et al., 2006

L Ala-Mursula, Vahtera J, Kouvonen A, Väänänen A, Linna A, Pentti J, Kivimäki M (2006). "Long hours in paid and domestic work and subsequent sickness absence: does control over daily working hours matter?" *Occupational and environmental medicine*, September 1, 2006; 63 (9); 608-16

This 2000-01 study explored the associations of working hours (paid, domestic, commuting, and total) with sickness absence, and examined whether these associations vary according to the level of employee control over daily working hours. Prospective cohort study among 25,703 full-time public sector employees in 10 towns in Finland. **Long commuting hours were related to increased rates of sickness absence.**

### Besser et al, 2008

LM Besser, Marcus M, Frumkin H (2008). "Commute Time and Social Capital in the U.S." *American Journal of Preventive Medicine*, March 2008 Volume 34, Issue 3, Pages 207–211 [http://www.ajpmonline.org/article/S0749-3797(07)00745-3/abstract]

The suggested declining trend in social capital among Americans could be due, in part, to long commute times associated with urban sprawl. In 2007, the 2001 National Household Travel Survey (NHTS) was used to determine the association between commute time and socially-oriented trips, a proxy measure of social capital, while controlling for individual-level and regional-level characteristics. Socially-oriented trips were those taken to: attend school/religious activities; attend social/recreational activities; visit friends/relatives; go out for entertainment; attend funerals/weddings/social events; exercise/play sports; attend to family/personal obligations; participate in organizational meetings; or transport someone.

Higher commute time (>20 minutes) was significantly associated with no socially-oriented trips (adjusted OR=1.17, 95% CI=1.09–1.25). The strongest association was among 90+ minute commuters (adjusted OR=1.50, 95% CI=1.16–1.94).

Conclusions: **This study suggests that individuals with longer commutes have less access to social capital, as indicated by fewer socially-oriented trips.**

### Christian, 2012

TJ Christian (2012). "Trade-Offs Between Commuting Time and Health-Related Activities," *Journal of Urban Health*, Vol. 89, No. 5, pp. 746-57; summary at [www.ncbi.nlm.nih.gov/pubmed/22689293](http://www.ncbi.nlm.nih.gov/pubmed/22689293).

This study examined individuals' trade-offs between health-related activities and commuting time. A cross-section of 24,861 working-age individuals employed full-time and residing in urban counties is constructed from the American Time Use Survey (2003-2010). **Spending more time commuting is associated with a reduction in aggregate health-related activities including sleeping, physical activity and food preparation. These results indicate that longer commutes are associated with behavioral patterns which over time may contribute to obesity and other poor health outcomes.**



### Fan et al., 2013

ZJ Fan, Foley MP, Rauser E, Bonauto DK and Silverstein BA (2013). "Effects Of Residential Location And Work-Commuting On Long-Term Work Disability," *Journal of Occupational Rehabilitation*, Vol. 23 (4), pp. 610-20; at <http://link.springer.com/article/10.1007/s10926-013-9424-2>.

This study examined 149,110 incident claims while adjusting for multiple risk factors in a large sample of Washington State workers' compensation claims during 2002-2008.

**Compared to those who live in the Urban Core, workers in other areas [i.e., longer commuters] experienced longer average paid time loss days due to work-related injury.** The association between residential location and long-term disability was significant and persisted after controlling for injury nature, socio-demographic, employment-related, and claim administrative characteristics.

### Hämmig et al., 2009

O. Hämmig, Gutzwiller F, Bauer G (2009). "Work-life conflict and associations with work- and nonwork-related factors and with physical and mental health outcomes: a nationally representative cross-sectional study in Switzerland," *BMC Public Health*, January 1, 2009; 9 (); 435

The aim of the present cross-sectional study was to examine work- and nonwork-related factors and physical and mental health outcomes associated with combined **time- and strain-based work-life conflict (WLC)** among adult employees living and working in Switzerland as well as possible gender differences in this regard. The analysis was restricted to 4,371 employees aged 20 to 64 years.

**12.5% of the study population had a high or very high WLC score. Prevalence rates are clearly above average in men and women with higher education [and] long commuting time to work.... In both men and women, WLC is associated with several physical and mental health problems. Employees with high or very high WLC show a comparatively high relative risk of self-reported poor health, anxiety and depression, lack of energy and optimism, serious backache, headaches, sleep disorders and fatigue.**

### Hoehner et al., 2012

CM Hoehner, Barlow CE, Allen P, Schootman M (2012). "Commuting Distance, Cardiorespiratory Fitness, and Metabolic Risk" *American Journal of Preventive Medicine*, June 2012, 42-6, pp 571-578 [http://www.ajpmonline.org/article/S0749-3797\(12\)00167-5/abstract](http://www.ajpmonline.org/article/S0749-3797(12)00167-5/abstract)

This cross-sectional study included 4297 adults who had a comprehensive medical examination between 2000 and 2007 and geocoded home and work addresses in 12 Texas metropolitan counties.

**Commuting distance was negatively associated with physical activity and cardiorespiratory fitness, and positively associated with BMI, waist circumference, systolic and diastolic blood pressure, and continuous metabolic score in fully adjusted linear regression models. Commuting distance was adversely associated with physical activity, cardiorespiratory fitness, adiposity [severe or morbidly overweight], and indicators of metabolic risk.**

### Jacobson et al., 2011

SH Jacobson, King DH, Yuan R (2011). "A note on the relationship between obesity and driving," *Journal of Transport Policy*, 1-5. Retrieved from [http://www.ahtd.info/yahoo\\_site\\_admin/assets/docs/A\\_note\\_on\\_the\\_relationship\\_between\\_obesity\\_and\\_driving.173153035.pdf](http://www.ahtd.info/yahoo_site_admin/assets/docs/A_note_on_the_relationship_between_obesity_and_driving.173153035.pdf).

The study found **that vehicle use (measured in annual vehicle-miles traveled) correlated as high as 99 percent with annual obesity rates.**

#### **Jilcott et al., 2010**

SB Jilcott, Liu H, Moore JB, Bethel JW, Wilson J, Ammerman AS (2010), "Commute Times, Food Retail Gaps, and Body Mass Index in North Carolina Counties," *Preventing Chronic Disease*, Vo. 7, No. 5, pp. A107; at [www.cdc.gov/pcd/issues/2010/sep/09\\_0208.htm](http://www.cdc.gov/pcd/issues/2010/sep/09_0208.htm).

We examined correlations between percentage of rural residents, commute times, food retail gap per capita, and body mass index (BMI) among North Carolina residents. **Individual-level BMI was positively associated with county-level commute times and food retail gaps. This suggests that longer commute times and greater retail gaps may contribute to the rural obesity disparity.**

#### **Kageyama et al., 1998**

T Kageyama, [Nishikido N](#), [Kobayashi T](#), [Kurokawa Y](#), [Kaneko T](#), [Kabuto M](#) (1998). "Long Commuting Time, Extensive Overtime, and Sympathodominant State Assessed in Terms of Short-Term Heart Rate Variability Among Male White-Collar Workers in the Tokyo Megalopolis," *Industrial Health*, Vol 36 (3), pp. 209-17; summary at [www.ncbi.nlm.nih.gov/pubmed/9701898](http://www.ncbi.nlm.nih.gov/pubmed/9701898).

To investigate the possible effects of long commuting time and extensive overtime on daytime cardiac autonomic activity, the short-term heart rate variability (HRV) both at supine rest and at standing rest of 223 male white-collar workers in the Tokyo Megalopolis was examined. Workers with a one-way commute of 90 min or more exhibited decreased vagal activity at supine rest and increased sympathetic activity regardless of posture, and those doing overtime of 60 hr/month or more exhibited decreased vagal activity and increased sympathetic activity at standing rest. **These findings suggest that chronic stress or fatigue resulting from long commuting time or extensive overtime caused these individuals to be in a sympathodominant state.**

#### **Karanasiou et al., 2014**

A. Karanasiou, Viana M, Querol X, Moreno T, de Leeuw F (2014). "Assessment of personal exposure to particulate air pollution during commuting in European cities - recommendations and policy implications," *The Science of the total environment*, August 15, 2014; 490 (); 785-97

Commuting is considered as one of the high-exposure periods among various daily activities, especially in high vehicle-density metropolitan areas. There is a growing awareness of the need to change our transportation habits by reducing our use of cars and shifting instead to active transport, i.e. walking or cycling. A review was undertaken using the ISI web of knowledge database with the objective to better understand personal exposure during commuting by different modes of transport, and to suggest potential strategies to minimise exposure. The air pollutants studied include particulate matter [PM], black carbon [BC] and particle number concentration. We focused only in European studies in order to have comparable situation in terms of vehicle fleet and policy regulations applied. Studies on personal exposure to air pollutants during car commuting are more numerous than those dealing with other types of transport, and typically conclude by emphasising that travelling by car involves exposure to relatively high particulate matter, PM exposure concentrations. Thus, **compared to other transport methods, travelling by car has been shown to involve exposure both to higher PM and BC as compared with cycling. Widespread dependence on private car transport has produced a significant daily health threat to the urban commuter.**

### Künn-Nelen, 2016

A Künn-Nelen (2016). "Does Commuting Affect Health?" *Health Economics*, Vol. 25, No. 8, pp. 984-1004; at <http://onlinelibrary.wiley.com/doi/10.1002/hec.3199/abstract>.

This paper analyzes the relation between commuting time and health in the UK. The study indicates that ... **subjective health measures are clearly lower for people who commute longer. A longer commuting time is, moreover, related to more visits to the general practitioner. Effects turn out to be more pronounced for women and for commuters driving a car. For women, commuting time is also negatively related to regular exercise and positively to calling in sick.**

### Lopez-Zetina et al., 2006

J. Lopez-Zetina, Lee H, Friis R (2006). "The link between obesity and the built environment. Evidence from an ecological analysis of obesity and vehicle miles of travel in California," *Health Place*, December 1, 2006; 12 (4); 656-64

Obesity and physical inactivity are known to be risk factors for many chronic diseases including hypertension, coronary artery disease, diabetes, and cancer. We sought to explore the association between an indicator of transportation data (Vehicle Miles of Travel, VMT) at the county level as it relates to obesity and physical inactivity in California.

Data from the California Health Interview Survey 2001 (CHIS 2001), the US 2000 Census, and the California Department of Transportation were merged to examine ecological correlations between vehicle miles of travel, population density, commute time, and county indicators of obesity and physical inactivity.

By rank bivariate correlation, obesity and physical inactivity were significantly associated ( $p < 0.01$ ). **By rank analysis of variance, the highest mean rank obesity was associated with the highest rank of VMT ( $p < 0.01$ ).** Similar rank patterns were observed between obesity and physical inactivity and commute time.

**This analysis adds to the growing evidence supporting the association between VMT (Vehicle Miles of Travel, a measure of automobile transportation) and obesity.**

### Mattisson et al., 2015

K Mattisson, Hakansson C, Jakobsson K (2015). "Relationships Between Commuting and Social Capital Among Men and Women in Southern Sweden" *Environmental Behavior*, 2015 Aug; 47(7);734-753 also cited as *BMC Public Health*, 11, Article 834. [<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4509867/>]

We investigated the relation between commuting time and mode, and social participation and general trust in other people as measures of social capital, using data from public health surveys conducted in 2004 and 2008 in Scania, Sweden: in all, 21,088 persons ages 18 to 65 and working at least 30 hr per week. **Commuting by car was significantly associated with a higher prevalence of low social participation and low general trust compared with active commuting, and the association increased with the duration of commuting time.** In contrast, public commuting was not significantly associated with decreased social capital measures except among long-duration commuters, who reported lower social participation. The overall pattern was similar for men and for women.



### Nomoto et al., 2015

M Nomoto, Hara A, Kikuchi K and Ergol JH (2015) "Effects Of Long-Time Commuting And Long-Hour Working On Lifestyle And Mental Health Among School Teachers In Tokyo, Japan," *Journal of Human Ergology*, Vol. 44, No. 1, pp. 1-9; at [www.ncbi.nlm.nih.gov/pubmed/27281916](http://www.ncbi.nlm.nih.gov/pubmed/27281916).

This study investigates the effects of long-time commuting and long-hour working on lifestyle including sleeping, physical exercise, breakfast, smoking, alcohol intake and mental health. In this cross-sectional study, data were collected from 146 school teachers in Tokyo. **The results indicated that longer commuting time was significantly associated with shorter working hours, less physical exercise and fewer sleeping hours.**

### Novaco et al., 1979

RW Novaco, Stokols D, Campbell J, Stokols J (1979). "Transportation, stress, and community psychology," *Am J Community Psychol*. 1979 Aug;7(4):361-80.

Conditions of transportation were investigated as sources of psychological stress as they affect the physiology, task performance, and mood of commuters. Participants in the study were 100 employees of industrial firms. In multiple regression analyses, the **distance and speed of the commute to work were found to account for significant proportions of variation in blood pressure.**

### Pohanka et al., 2004

M Pohanka, Fitzgerald S (2004). "Urban sprawl and you: how sprawl adversely affects worker health," *American Association of Occupational Health Nurses*, journal, June 1, 2004; 52 (6); 242-6

**Greater air pollution contributes to higher asthma and other lung disorder rates. An increased dependence on the automobile encourages a more sedentary lifestyle and can potentially contribute to obesity. The increased danger and stress of long commutes can lead to more accidents, anxiety, and social isolation.**

### Sacker et al., 2014

A Sacker, Flint E, Cummins S (2014). "Associations between active commuting, body fat, and body mass index: population based, cross sectional study in the United Kingdom," *The British Medical Journal*. 2014;349:g4887 [<http://www.bmj.com/content/349/bmj.g4887>]

Cross sectional study of data from the wave 2 Health Assessment subsample of Understanding Society, the UK Household Longitudinal Study (UKHLS). The exposure of interest, commuting mode, was self reported and categorised as three categories: private transport, public transport, and active transport. The analytic samples (7534 for body mass index (BMI) analysis, 7424 for percentage body fat analysis) were drawn from the representative subsample of wave 2 respondents of UKHLS who provided health assessment data (n=15 777).

Results from multivariate linear regression analyses suggest that, compared with using private transport, commuting by public or active transport modes was significantly and independently predictive of lower BMI for both men and women. Results for percentage body fat were similar in terms of magnitude, significance, and direction of effects.

Conclusions: **Men and women who commuted to work by active and public modes of transport had significantly lower BMI and percentage body fat than their counterparts who used private transport.** These associations were not attenuated by adjustment for a range of hypothesised confounding factors.

### Sandow, 2011

E Sandow (2011). *On the road — Social aspects of commuting long distance to work* (Doctoral thesis, Umeå University, Umeå, Sweden). Retrieved from <http://umu.diva-portal.org/smash/record.jsf?pid=diva2:415050>

The study covers more than two million Swedes who were married or cohabiting in 2000, and the results are based on Statistics Sweden's registry data for these individuals from 1995 and 2005.

Summary: commuting to work can be advantageous in terms of income and career opportunities, and it presents a good alternative to moving. But **long commuting times also entail less time for family and friends and can lead to stress and health problems. Pair relationships are also jeopardized, and the risk of separation is 40 percent higher among long-distance commuters than among other people.**

### Stutzer et al., 2008

A Stutzer, Frey BS (2008). "Stress the Doesn't Pay: The Commuting Paradox," *Scandinavian Journal of Economics*, Vol. 110, No. 2, pp. 339–366; at <http://onlinelibrary.wiley.com/doi/10.1111/j.1467-9442.2008.00542.x/abstract>.

We find that **people with longer commuting time report systematically lower subjective well-being**. This result is robust with regard to a number of alternative explanations.

### Shekarrizfard et al., 2016

M Shekarrizfard, Faghih-Imani A, Hatzopoulou M (2016). "An Examination of Population Exposure to Traffic Related Air Pollution: Comparing Spatially and Temporally Resolved Estimates Against Long-Term Average Exposures at the Home Location," *Environmental Research*, Vol 147, pp. 435-44; summary at [www.sciencedirect.com/science/article/pii/S0013935116300809](http://www.sciencedirect.com/science/article/pii/S0013935116300809).

This study applied integrated transportation, emissions and atmospheric dispersion models to evaluate individuals' air pollution exposure in Montreal, Canada. Results indicate that, **on average, individuals increased their exposure by 23-44% while commuting** and conducting activities out of home.

### Steinmetz et al., 2014

S Steinmetz, de Vries DH, Tijdens KG (2014). "Should I Stay or Should I Go? The Impact of Working Time and Wages on Retention in the Health Workforce," *Human Resources for Health*, Vol. 12, No. 23; summary at [www.ncbi.nlm.nih.gov/pubmed/24758705](http://www.ncbi.nlm.nih.gov/pubmed/24758705).

Using data from the Wage-Indicator web survey (N = 5,323), regression models were used to estimate healthcare employee's intention to stay for Belgium, Germany and the Netherlands. In particular, working part-time hours, overtime and **a long commuting time decrease the intention to stay with the same employer**. The analysis also shows that job dissatisfaction is a strong predictor for the intention to leave, next to being a woman, being moderately or well educated, and being promoted in the current organization. Attention to working and commuting times can complement attention to wages and wage satisfaction to increase employees' intention to stay. These results indicate that **it is important to consider workers' satisfaction with overtime hours, part-time work, and commute travel time, in addition to wage satisfaction, in order to manage health workforce retention.**

### Sugiyama et al., 2016

T Sugiyama, [Wijndaele K](#), [Koohsari MJ](#), [Tanamas SK](#), [Dunstan DW](#), [Owen N](#) (2016). "Adverse Associations of Car Time with Markers of Cardio-Metabolic Risk," *Preventive Medicine*, Vol. 83, pp. 26-30; summary at [www.ncbi.nlm.nih.gov/pubmed/26656405](http://www.ncbi.nlm.nih.gov/pubmed/26656405).

This study examines associations of time spent sitting in cars with markers of cardio-metabolic risk in 2,800 Australian adults (age range: 34-65). Compared to spending 15 min/day or less in cars, **spending more than 1 hr/day in cars was significantly associated with higher BMI, waist circumference, fasting plasma glucose, and clustered cardio-metabolic risk**, after adjusting for socio-demographic attributes and potentially relevant behaviors including leisure-time physical activity and dietary intake. This indicates that **prolonged time spent sitting in cars, in particular over 1 hr/day, is particularly detrimental**.

**Car commuters have been shown to have higher odds of being overweight or obese, compared to non-car commuters** ([Laverty et al., 2013](#); [Lindstrom, 2008](#)). Frequent car use for commuting and errands has been associated with higher BMI ([Pendola and Gen, 2007](#)). A recent review has shown that longer car use (measured in time or in distance) was significantly associated with higher weight status in eight out of 10 studies ([McCormack and Virk, 2014](#)). Longitudinal studies have also found frequent and longer car use to be associated with greater weight gain and higher cardiovascular mortality ([Sugiyama et al., 2013](#); [Warren et al., 2010](#)). These studies, however, have used predominantly self-reported adiposity measures. One study reported distance between home and work to be associated with a metabolic syndrome risk score derived from objectively-assessed biomarkers ([Hoehner et al., 2012](#)).

### Tsuji et al., 2015

H Tsuji, Shiojima I (2015). "Commuting by Public Transportation is Associated With Lower Prevalence of Excess Body Weight, Hypertension, and Diabetes" *AHA Journal*, 2015;132:A15214. [http://circ.ahajournals.org/content/132/Suppl\\_3/A15214](http://circ.ahajournals.org/content/132/Suppl_3/A15214)

Researchers studied 5,908 commuting workers in Osaka, Japan. The use of public transportation (compared to car driving) was associated with lower prevalence of excess body weight, hypertension and diabetes mellitus.

### UK Office for National Statistics, 2014

United Kingdom Office for National Statistics (2014). "Commuting and well being 2014" (No. 12 Feb 2014) Retrieved from [http://www.ons.gov.uk/ons/dcp171766\\_351954.pdf](http://www.ons.gov.uk/ons/dcp171766_351954.pdf)

## 1b. Selected further reading

### Brain, 2016

T Brain (2016). "Changing directions: rethinking working and commuting in the GTA." Deloitte. Retrieved from [https://www2.deloitte.com/content/dam/Deloitte/ca/Documents/public-sector/ca\\_en\\_public\\_sector\\_changing\\_directions.PDF](https://www2.deloitte.com/content/dam/Deloitte/ca/Documents/public-sector/ca_en_public_sector_changing_directions.PDF)

### Cassidy, 1992

T Cassidy (1992). "Commuting-related stress: Consequences and implications." *Employee Counselling Today*, 4(2), 15-21.

### Delmelle, 2013

EC Delmelle, Haslauer E, Prinz T (2013). "Social satisfaction, commuting and neighborhoods." *Journal of Transport Geography*, 330, 110-116.

### European Policy Brief, 2008

European Policy Brief (2008). *Chasing work: The mobility dilemma*. Retrieved from: [ftp://ftp.cordis.europa.eu/pub/fp7/ssh/docs/ssh\\_jobmob\\_famlives\\_en.pdf](ftp://ftp.cordis.europa.eu/pub/fp7/ssh/docs/ssh_jobmob_famlives_en.pdf)

### Evans et al., 2002

GW Evans, Wener RE, Phillips D (2002). "The morning rush hour: Predictability and commuter stress." *Environment & Behavior*, 34, 521-530.

### Fenz et al., 2013

Z Feng, Boyle P (2013). "Do long journeys to work have adverse effects on mental health?" *Environment & Behavior*. Advance online publication. doi:10.1177/0013916512472053 [Cross Ref]

### Flood et al., 2005

M Flood, Barbato C (2005). *Off to work: Commuting in Australia* (Discussion Paper No. 78). Canberra: Australian Institute; April.

### Gatersleben et al., 2007

B Gatersleben, Uzzell D (2007). "Affective appraisal of the daily commute: Comparing perceptions of drivers, cyclists, walkers, and users of public transport." *Environment & Behavior*, 39, 416-431.

### Kluger, 1998

AN Kluger A. (1998). "Commute variability and strain." *Journal of Organizational Behavior*, 19, 147-165.

### **Koslowsky et al., 1995**

M Koslowsky, Kluger AN, Reich M (1995). *Commuting stress: Causes, effects, and methods of coping*. New York, NY: Plenum Press.

### **Lyons et al., 2008**

G Lyons, Chatterjee K (2008). "A human perspective on the daily commute: Costs, benefits and trade-offs." *Transport Reviews*, 28, 181-198.

### **Newman et al., 2014**

BJ Newman, Johnson J, Lown P (2014). "The 'daily grind' — Work, commuting, and their impact on political participation." *American Politics Research*, 42, 141-170.

### **Novaco et al., 1990**

RW Novaco, Stokols D, Milanese L (1990). "Objective and subjective dimensions of travel impedance as determinants of commuting stress." *American Journal of Community Psychology*, 18, 231-257. [PubMed]

### **Sandow, 2013**

E Sandow (2013). "Til work do us part: The social fallacy of long-distance commuting." *Urban Studies*. Retrieved from <http://usj.sagepub.com/content/early/2013/08/06/0042098013498280.abstract>

### **Sandow et al., 2010**

E Sandow, Westin K (2010). "Preferences for commuting in sparsely populated areas — The case of Sweden." *Journal of Transport and Land Use*, 2, 87-107.



## 1c. Examples of popular media articles about the effects of long commutes

### Dirksen, 2001

Kirsten Dirksen (2011). "Happiness Research Ranks Commuting Low: One-Hour Commute Cuts Your Social Life By 10 Percent," *Huffington Post*; at [www.huffingtonpost.com/kirsten-dirksen/happiness-research-ranks-b\\_829591.html](http://www.huffingtonpost.com/kirsten-dirksen/happiness-research-ranks-b_829591.html).

**When asked to name the worst part of our day by happiness researchers, we consistently name commuting as at least one of our least favorite activities ... Swiss economists Bruno Frey and Alois Stutzer found that "people with longer commuting time report systematically lower subjective well-being."**

... The rewards associated with longer commutes — a bigger house, a higher salary or better schools — don't fully compensate for the sacrifices we end up making by working so far from home (e.g., **less time with family, and health issues like back pain, higher cholesterol, weight gain and anxiety**).

... **"You can't adapt to commuting, because it's entirely unpredictable," explains Harvard psychologist Daniel Gilbert. "Driving in traffic is a different kind of hell every day."**

... Frey and Stutzer found that **to be compensated for a one-hour commute — as opposed to none at all — you would need to make a 40-percent higher salary**. The extra income might help with overall happiness, especially if it helps to pay for more enjoyable experiences, but a longer commute can also affect those things that rank high in happiness studies: your relationships. Harvard political scientist Robert Putnam can even offer a calculation. "There's a simple rule of thumb: **Every 10 minutes of commuting results in 10 percent fewer social connections. Commuting is connected to social isolation, which causes unhappiness.**"

### Evangelista, 2014

Benny Evangelista (2014). "Mobile Workers Would Rather Work From Home Than Get a Pay Raise," *SF Gate Blog* (<http://blog.sfgate.com>); at <http://blog.sfgate.com/techchron/2014/01/21/study-mobile-workers-would-rather-work-from-home-than-get-a-pay-raise>.

A survey of about 5,000 knowledge workers in the U.S., Europe and the Middle East indicates that given the choice between a 10 percent wage raise or the ability to work from home two or three days a week, 53 percent would pick the work from home option.

### Ingraham, 2016

C Ingraham (2016). "The astonishing human potential wasted on commutes," *New York Times* (2016, 25 Feb) retrieved from <https://www.washingtonpost.com/news/wonk/wp/2016/02/25/how-much-of-your-life-youre-wasting-on-your-commute/>

Speaking more abstractly, there's a huge pool of more or less untapped human potential currently locked up in long commutes. Thought experiment: Let's say we could wave a magic wand and reduce the commute times of the most extreme commuters -- those commuting for 90 minutes or longer one way. And let's say we could reduce their typical commute from 90 minutes down to, say, 30 minutes -- closer to the national average.

Consider the transformational effect this would have at the individual level, giving these folks two hours of their day back. And then multiply that two-hour time savings by the 250 work days in a typical year -- that's 500 extra hours a year. **Multiply that by 3.6 million workers, and you**

**come out to about 1.8 billion man-hours of potential productivity released back into the economy. That's the time-equivalent of 900,000 full-time jobs.**

Now if you give a person two free hours, he's probably not going to spend that time working. He'll watch TV or play Candy Crush or drink beer with his friends, or do other things that are not necessarily productive. But over time, that person will have more time to be civically engaged. He'll have more time to take care of his kids or his health or his marriage. He'll be better-rested, and a better worker for it. The benefits are potentially limitless.

### **Lowrey, 2011**

Annie Lowrey (2011), "Your Commute Is Killing You: Long commutes cause obesity, neck pain, loneliness, divorce, stress, and insomnia," *Slate.com*; at [www.slate.com/articles/business/moneybox/2011/05/your\\_commute\\_is\\_killing\\_you.html](http://www.slate.com/articles/business/moneybox/2011/05/your_commute_is_killing_you.html).

Researchers at Umea University in Sweden reported that **couples in which one partner commutes for longer than 45 minutes are 40 percent likelier to divorce**, and that **people with long transit times suffer from disproportionate pain, stress, obesity, and dissatisfaction**.

First, the research proves the most obvious point: We dislike commuting itself, finding it unpleasant and stressful. In 2006, Nobel laureate Daniel Kahneman and Princeton economist Alan Krueger surveyed 900 Texan women, asking them how much they enjoyed a number of common activities. Having sex came in first. Socializing after work came second. Commuting came in dead last ... A survey conducted for the Gallup-Healthways Well-Being Index found that **40 percent of employees who spend more than 90 minutes getting home from work "experienced worry for much of the previous day."** ... **Workers with very long commutes feel less rested and experience less "enjoyment," as well.**

Long commutes also make us feel lonely. Robert Putnam, the famed Harvard political scientist and author of *Bowling Alone*, names long commuting times as one of the most robust predictors of social isolation ... **The Gallup survey, for instance, found that one in three workers with a 90-minute daily commute has recurrent neck or back problems ... When we spend more time commuting, we spend less time exercising and fixing ourselves meals at home.**

According to research from Thomas James Christian of Brown University, **long commutes also tend to increase the chance that a worker will make "non-grocery food purchases"—buying things like fast food—and will shift into "lower-intensity" exercise. It is commuting, not the total length of the workday, that matters, he found.** Take a worker with a negligible commute and a 12-hour workday and a worker with an hour-long commute and a 10-hour workday. The former will have healthier habits than the latter, even though total time spent on the relatively stressful, unpleasant tasks is equal.

... Researchers at the University of California, **looked at the relationship between obesity and a number of lifestyle factors, such as physical activity. Vehicle-miles traveled had a stronger correlation with obesity than any other factor.**

University of Zurich economists Bruno Frey and Alois Stutzer found that **for an extra hour of commuting time, you would need to be compensated with a massive 40 percent increase in salary to make it worthwhile.**

### **Morin, 2014**

Amy Morin (2014). "Want To Be Happier? Change Your Commute or Change Your Attitude," *Forbes Magazine*; at [www.forbes.com/sites/amymorin/2014/12/07/want-to-be-happier-change-your-commute-or-change-your-attitude](http://www.forbes.com/sites/amymorin/2014/12/07/want-to-be-happier-change-your-commute-or-change-your-attitude).

A University of Waterloo study published in *World Leisure Journal* discovered a direct link between commute time and well-being: **people with the longest commutes have the lowest overall satisfaction with life ... People who spend the most time on the road experience higher levels of stress because they constantly feel hurried. Many of them spend much of their time on**

the road worrying about all the activities they're missing. Traffic congestion tops the list for reasons why commuters experience increased stress. The lack of physical leisure time was a close second. People with rigid work hours and lower incomes were particularly susceptible to decreased life satisfaction associated with long commutes. Women and individuals with a partner also experienced a greater negative impact due to the stress associated with time away from family.

... A 2008 study published in the *American Journal of Preventative Medicine* found that people with longer commutes, particularly over 90 daily minutes, were less likely to spend time with friends, were more likely to miss children's school activities and less likely to eat dinner with friends and family. This tends to increase stress and decrease life satisfaction.

### Pinola, 2011

Melanie Pinola (2011). "The True Cost of Commuting: You Could Buy a House Priced \$15,900 More for Each Mile You Move Closer to Work," *LifeHacker.com*; at <http://lifehacker.com/5848665/the-true-cost-of-commuting>.

We all know that driving to and from work every day is costly, but exactly how much of a toll does each mile of commuting take on your finances? This True Cost of Commuting graphic breaks it down. Taking stats and calculations previously mentioned by Mr. Money Mustache, the infographic illustrates just how expensive commuting is. **Each mile you live from work costs \$795 in commuting expenses per year (assuming a driving cost of 34 cents per mile and factoring time lost with a salary of \$25 per hour).** \$795 a year for just one mile! You could buy a house worth \$15,900 more with that, as Mr. Money Mustache pointed out in his article, since \$795 would cover the interest on a 5% mortgage rate.

### Pinola, 2015

Melanie Pinola (2015). "Ditching Your Commute Is the Happiness Equivalent of a \$40,000 Raise," *LifeHacker.com*; at <http://lifehacker.com/1679698849>

We all know that spending hours commuting sucks—it's not only expensive, it can also take its toll on your health. A happiness researcher has quantified just **how much happier we could be if we cut our commutes: about \$40,000 happier.**

The number comes from National Geographic fellow and author of *Thrive: Finding Happiness the Blue Zones Way* Dan Buettner. In an interview with NPR, Buettner says: "When you look at Americans' day-to-day activity ... **the top two things we hate the most on a day-to-day basis is, No. 1: housework and No. 2: the daily commute in our cars. In fact, if you can cut an hour-long commute each way out of your life, it's the [happiness] equivalent of making up an extra \$40,000 a year if you're at the \$50- to \$60,000 level.** Huge ... [So] it's an easy way for us to get happier. Move closer to your place of work."

## 2. Calculating the costs of long commutes

Long-term long distance commuting particularly in a private vehicle (i.e. not public transit) has many significant effects, as shown in Part 1. The percentage of people using cars has been investigated by Sugiyama et al., 2016:

“The proportion of adults who use a car as the main form of transport to work or for other commuting purposes is high: 86% in the USA and 78% in Australia (Australian Bureau of Statistics, 2012; McKenzie and Rapino, 2011). Even in European countries, which can have more-compact urban environments and more accessible public transport, the majority of trips are made by cars. For example, cars are used for 64% of all instances of travel in the UK, and 53% in Sweden (Transport Analysis, 2012; UK Department of Transport, 2013). Car use is not only high in frequency, but can also be substantial in duration. Australian household travel surveys show that adults spend on average more than 50 min/day in a car (Ironmonger, 2008), with up to 18% of men and 12% of women spending more than 2 h/day (Sugiyama et al., 2012).”

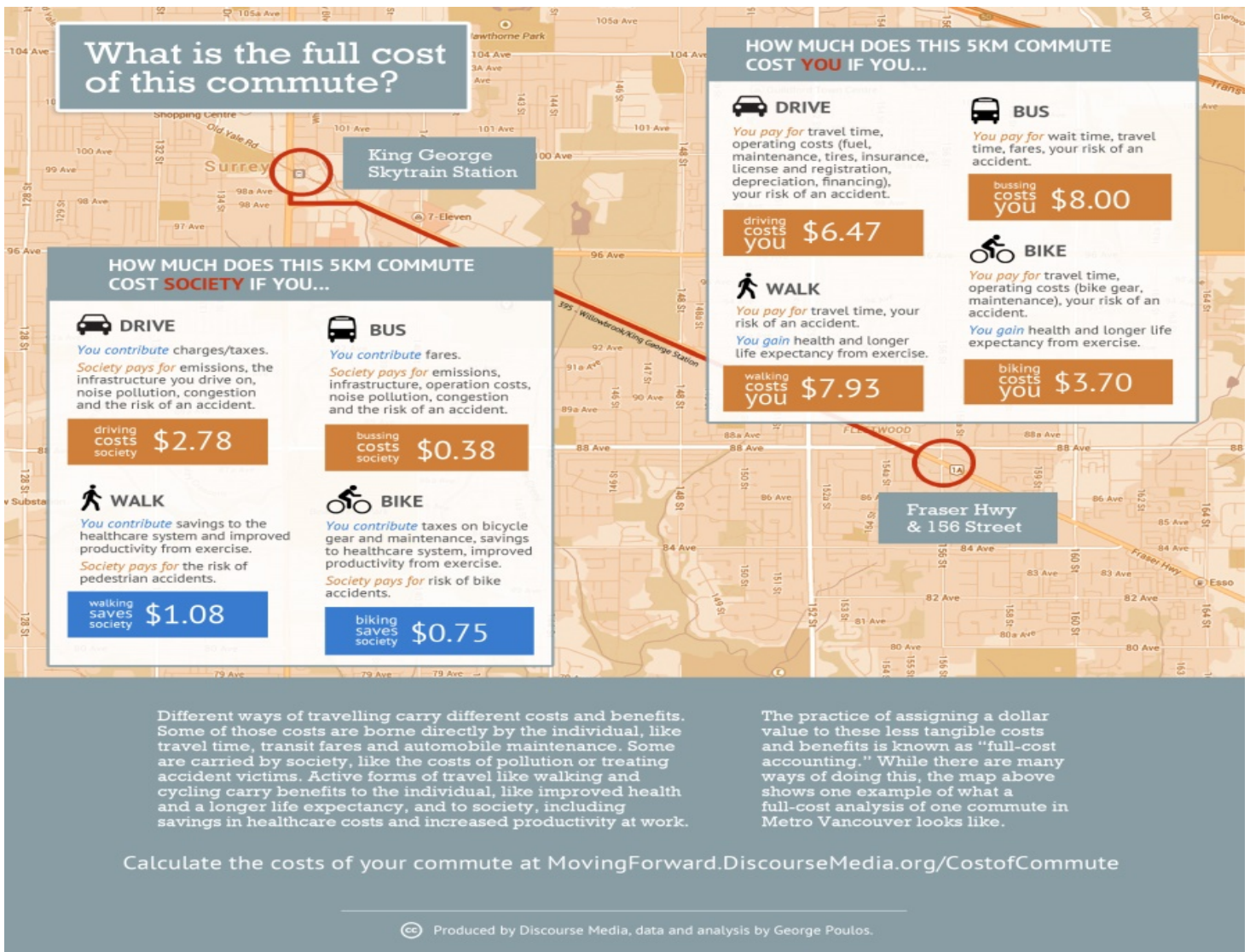
Across the Abbotsford-Mission, Vancouver and Victoria CMAs, 69% of commuters are travelling by car, truck or van, according to Statistics Canada’s 2011 National Census data.

In **Part 2a**, we present various mechanisms being used to measure the direct financial effects of commuting.

In **Part 2b**, we examine ways to measure external costs.

## 2a. Calculating the direct financial costs of commuting

Caitlin Millar (2015). *What is the Full Cost of Your Commute?*, Moving Forward, Discourse Media (<http://movingforward.discoursemedia.org>); at <http://movingforward.discoursemedia.org/costofcommute>. This journalism project about Metro Vancouver transportation includes estimates of commuting internal and external costs, as illustrated below. The study's sources are available at <http://movingforward.discoursemedia.org/cost-of-commute-calculator-data>. The website includes the following images.



*This figure indicates the estimated total costs (including internal and external costs) of a typical commute in Vancouver by walking, cycling, public transit and automobile travel.*



## How much does your commute cost (or save) society?

Every time you travel you put money into the system, but you also cost the system. Your contribution to and burden on the system differs depending on how you travel.

For example, when you ride the bus you pay a fare – money into the system. Your burden on the system includes the cost of operating the bus, and also less obvious impacts like emissions and noise pollution.

By looking at the ratio of what we put in versus what we cost the system, we see that different ways of travelling are more subsidized than others.

The practice of taking these less tangible costs and benefits into consideration and assigning them a dollar value is known as "full-cost accounting." While there are many ways of doing this, this infographic shows one example of how those costs and charges can be calculated.



Produced by Discourse Media, data by George Poulos. Calculate your commute at [MovingForward.DiscourseMedia.org/CostofCommute](http://MovingForward.DiscourseMedia.org/CostofCommute)

*This figure compares the internal and external costs of a typical commute in Vancouver by walking, cycling, public transit and automobile travel.*

Mr. Money Mustache (2011). *The True Cost of Commuting* (<http://lifehacker.com/5848665/the-true-cost-of-commuting>). This financial advisor estimates that direct commuting costs average at least 17¢ per automobile-mile, if using a “super thrifty paid-off economy car.” They also calculate that a working couple could afford a home that costs US\$954,000 more if they have a 19-mile-shorter commute. See *accompanying infographic*.



Commuter Solutions Commute Cost Calculator ([www.commutesolutions.com/commute-cost-calculator](http://www.commutesolutions.com/commute-cost-calculator)). This calculator uses standard U.S. data sources to calculate the costs of commuting by automobile.

## Commute Cost Calculator

**What is your daily round trip commute distance from home to work (in miles)?**

*Use [Mapquest](#) to help you calculate.*

**How many days a month do you normally work?**

**How many miles per gallon does your vehicle average?**

*Use the [Federal Fuel Economy Guide](#) to find your vehicle mpg.*

**How much do you normally pay per gallon for fuel?**

*See the [AAA Daily Fuel Gauge Report](#) or [Gasbuddy.com](#)*

**Select your vehicle type to get estimated cost per mile for repairs, registration, depreciation, insurance, maintenance and taxes**

*Based on [FHWA's Vehicle Ownership and Operating Cost info](#).*

**How much is your monthly car payment?**

**How much do you pay for monthly parking?**

**Calculate Total**

**Your estimated monthly cost of commuting:**

**Your estimated yearly cost of commuting:**

**Reset**

*This website calculator estimates a drivers' commuting costs taking into account commute frequency, distance, fuel type, vehicle depreciation and parking costs.*

The Canadian ([http://caa.ca/car\\_costs](http://caa.ca/car_costs)) and American Automobile Associations (<http://exchange.aaa.com/automobiles-travel/automobiles/driving-costs>) provide documents and calculators for estimating vehicle costs. Because they reflect relatively new vehicles (the types their members own) with high depreciation and comprehensive insurance coverage, their estimates tend to have relatively high fixed costs compared with the fleet average.

*Commuter Costs Calculator* ([www.tps.ucsb.edu/commuter-cost-calculator](http://www.tps.ucsb.edu/commuter-cost-calculator)) by the Transportation & Parking Services at the University of California, Santa Barbara. This calculator calculates various costs of automobile commuting (fuel and parking, vehicle ownership costs, and carbon emission costs), and compares them with the costs of other modes.

*Ottawa Ride Match Commuter Cost Calculator*

([www.ottawaridematch.com/Public/PublicPage.aspx?ItemName=CommuteCost&FileType=ASCX](http://www.ottawaridematch.com/Public/PublicPage.aspx?ItemName=CommuteCost&FileType=ASCX)).

This calculator estimates fuel, maintenance and tires, fixed vehicle costs, and carbon emissions for automobile commuting.

*BC Transit Calculate my Commuter Costs* (<https://bctransit.com/central-fraser-valley/about/sustainability/calculate-my-commuter-costs>).

This calculator estimates automobile commuting fuel, parking and vehicle depreciation costs, and potential savings from transit commuting.

*Walkscore Commute Cost Calculator* ([www.walkscore.com/commute-cost-calculator](http://www.walkscore.com/commute-cost-calculator))

estimates the time and money costs of commuting, and therefore the potential savings of reduced commute distances. It implies that these savings can be invested in a more valuable house.

The “Vehicle Costs” chapter of *Transportation Costs and Benefit Analysis*

([www.vtpi.org/tca/tca0501.pdf](http://www.vtpi.org/tca/tca0501.pdf)). This report discusses various types of vehicle costs. The table

below summarizes vehicle cost categories.

### Vehicle Costs Categories

Category	Description	Typical Values
Vehicle operating costs	Fuel, oil and tire wear.	15-20¢ per vehicle-mile. Higher under congested conditions.
Other distance-based costs	Distance-based maintenance and depreciation, mileage lease fees, additional crash and citation risk costs.	10-20¢ per vehicle-mile.
Special fees	Parking fees and road tolls.	Varies.
Vehicle ownership costs	Time-based depreciation, financing, insurance, registration fees and taxes.	\$3,000-5,000 per vehicle-year.
Residential parking	Residential parking costs, which are minimal for residents who can park free on the street, and costly for those who use a parking garage.	\$0-2,000 per vehicle-year.

*Automobiles involve various types of costs. Different types of analysis consider different types of costs.*

## Note on Part 2a

Various calculators estimate vehicle costs and therefore the savings from commuter travel reductions. Many estimates only consider fuel, which typically average about 10-20¢ per vehicle-mile, and some consider parking fees and road tolls, but few consider vehicle maintenance and mileage-based depreciation which typically average 20-40¢ per vehicle-mile. Few consider the higher fuel and maintenance costs for driving under congested, urban-peak conditions. Fixed costs are often ignored, although a few use automobile-association total average costs which range from 50-80¢ per mile. Some calculators estimate carbon emissions, and a few monetize these costs, but other external costs are generally ignored. As a result, most calculators underestimate the full costs of urban-peak driving, and therefore the full benefits of commute travel reductions, although a few (those that use automobile association average cost estimates) may somewhat overestimate marginal vehicle costs.



## 2b. Calculating the external (social) costs

External (also called social) impact refers to benefits and costs to other people. Automobile travel imposes various external costs, including traffic and parking congestion, uncompensated crash damages imposed on others, and pollution emissions (some of the previously cited commuter calculators include estimated costs of climate change emissions, but no other external costs). These costs tend to be particularly high under urban-peak conditions. As a result, reducing urban peak vehicle travel can provide increased external benefits. The following references include estimates of motor vehicle external costs.

### American Automobile Association infographic (undated), “Money that could stay in the local economy”

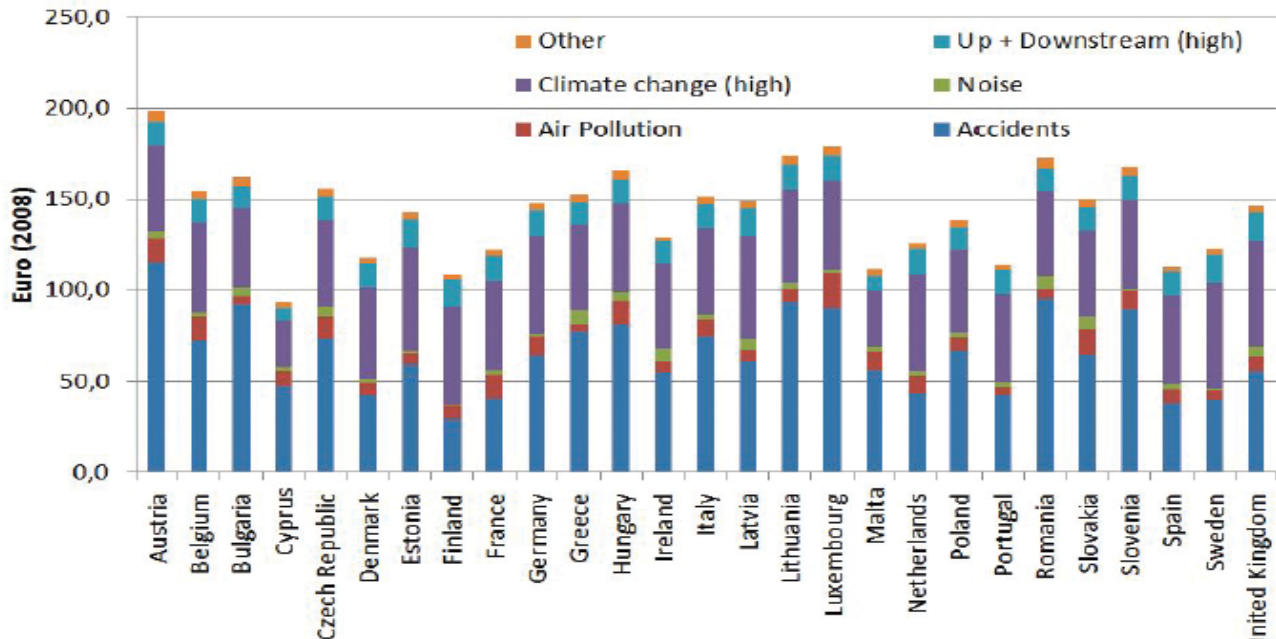


**Becker et al, 2012**

UJ Becker, Becker T, Gerlach J (2012). *“The True Costs of Automobility: External Costs of Cars Overview on Existing Estimates in EU-27,”* TU Dresden (<http://tu-dresden.de/en>); at [www.greens-efa.eu/fileadmin/dam/Documents/Studies/Costs\\_of\\_cars/The\\_true\\_costs\\_of\\_cars\\_EN.pdf](http://www.greens-efa.eu/fileadmin/dam/Documents/Studies/Costs_of_cars/The_true_costs_of_cars_EN.pdf).

This report estimates the external costs of automobile travel, including accidents, noise, air pollution and climate change emissions. It concludes that motor vehicle travel imposes significant net external costs, beyond user charges and taxes.

**Figure 2.2-1 Average External Costs From Cars Per 1,000 VKT By Country**



This graph illustrates estimated external automobile costs in various European countries.

**Dachis, 2015**

Ben Dachis, *“Tackling Traffic: The Economic Cost of Congestion in Metro Vancouver,”* C.D. Howe Institute, March 9, 2015.

“The hidden costs of congestion are between \$500 million and \$1.2 billion a year for the Metro Vancouver area... [W]hen congestion causes people not to travel it stifles the key benefits of living in a city, like learning face-to-face, finding better jobs, and sharing services and infrastructure. These are collectively called agglomeration benefits.”

**Gill and Lawson, 2016**

Vigay Gill and Lawson, John, *“Congestion Costs and Road Capacity: Implications for Policy-Makers,”* Ottawa: The Conference Board of Canada, 2016.

“Road congestion in many Canadian cities is high, adversely affecting our economy and quality of life.” The following table is in 2006 dollars and applies to the Greater Toronto Hamilton Area.

Table 3

**Estimate of Costs of Excess Congestion in the GTHA**

Component	Annual excess cost (\$ millions)	Annual per capita cost (\$)
Time cost—auto users	2,245	1,200.36
Time cost—transit users	328	54.13
Vehicle operating costs	479	39.50
Accident costs	256	42.30
Emission costs	30	4.90
<b>Total</b>	<b>3,338</b>	<b>1,341</b>

Source: HDR Decision Economics.]

**Gössling et al, 2019**

Stefan Gössling, Choi A, Dekker K, Metzler D (2019). *“The Social Cost of Automobility, Cycling and Walking in the European Union,”* Ecological Economics, volume 158, pp 65–74, 2019.

Cost-benefit-analyses (CBA) are widely used to assess transport projects. Comparing various CBA frameworks, this paper concludes that the range of parameters considered in EU transport CBA is limited. A comprehensive list of criteria is presented, and unit costs identified. These are used to calculate the external and private cost of automobility, cycling and walking in the European Union. Results suggest that each kilometer driven by car incurs an external cost of €0.11, while cycling and walking represent benefits of €0.18 and €0.37 per kilometer. Extrapolated to the total number of passenger kilometers driven, cycled or walked in the European Union, **the cost of automobility is about €500 billion per year. Due to positive health effects, cycling is an external benefit worth €24 billion per year and walking €66 billion per year.** CBA frameworks in the EU should be widened to better include the full range of externalities, and, where feasible, be used comparatively to better understand the consequences of different transport investment decisions.

**Metrolinx, 2008**

Metrolinx (2008). *“The Big Move: Transforming Transportation in the Greater Toronto and Hamilton Area,”* Metrolinx, an agency of the Government of Ontario, November 2008.

“According to a study commissioned by Metrolinx on the economic costs of congestion in the GTHA, in 2006 the annual cost of congestion to commuters was \$3.3 billion [including increased commuting costs, accidents, emissions, and delays] and the annual cost to the economy was \$2.7 billion [including reduced employment, increased operating expenses, and reduced industry revenues]. If nothing is done to improve the transportation system, this cost can be expected to increase significantly, with population growth bringing about an increase in daily traffic demand and thus exacerbating the level of congestion. **Under current trends, the cost of congestion experienced by GTHA residents is forecast to increase considerably by 2031, resulting in an increase in costs from \$3.3 billion per year to \$7.8 billion.** The cost to the economy would experience a similar increase, with a reduction in Gross Domestic Product (GDP) due to excess congestion rising from \$2.7 billion in 2006 to \$7.2 billion in 2031.” – from page 6

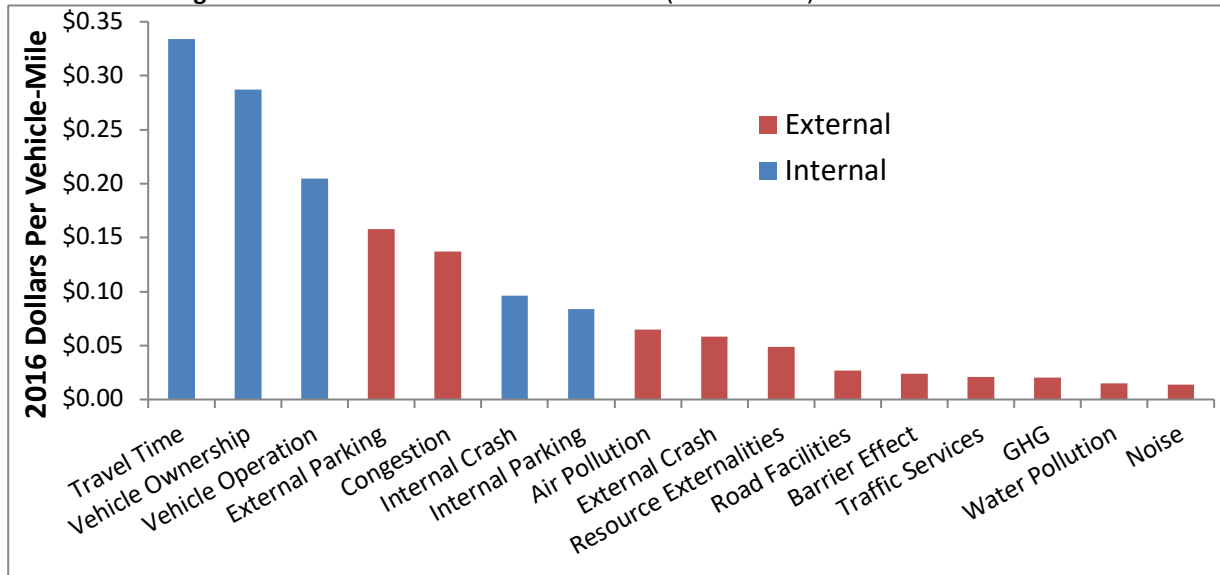
## Litman, 2009

T Litman (2009). *Transportation Cost and Benefit Analysis; Techniques, Estimates and Implications*, Victoria Transport Policy Institute ([www.vtppi.org/tca](http://www.vtppi.org/tca)).

This is a comprehensive study of transportation benefit and costing, and a guidebook for applying this information. It includes detailed analysis of various transport costs and benefits. These impacts are described in detail and categorized by various attributes: whether they are internal or external, fixed or variable, market or nonmarket. Using the best available data, it provides monetized estimates of twenty three costs for eleven travel modes under three travel conditions. **This study indicates that on average about a third of automobile costs are external and about a quarter are internal but fixed; the portion of costs that are external are much higher under urban-peak (e.g., commuting) conditions.**

The figure below illustrates Litman's estimate of various automobile costs under urban-peak conditions, including internal (blue) and external (red), 14¢ in congestion delay imposed on other motorists, 7¢ worth of air pollution damages, 6¢ in uncompensated traffic accident damages, 7¢ in resource (primarily fuel) production external costs, 3¢ in roadway subsidies, 2¢ in barrier effect (delay to pedestrians and cyclists), 2¢ worth of traffic services (traffic policing, emergency response and street lighting financed through general taxes), 2¢ of greenhouse gas emissions, and 1¢ each of water and noise pollution damages. These costs tend to increase with city size and density.

Average Costs Per Urban-Peak Automobile-Mile (Litman 2009)



This figure illustrates the estimated costs of average automobile travel under urban-peak conditions, including internal (user) and external (costs imposed on other people) costs.

## MASSPIRG, 2015

MASSPIRG (2015). "What's at Stake? How Decreasing Driving Miles in Massachusetts Will Save Lives, Money, Injuries, and the Environment" (<http://bit.ly/2gBA0HT>), MASSPIRG Education Fund, Boston, MA, November 2015.

This report describes and quantifies various economic, social and environmental benefits what could result from policies that reduce driving and improve other modes. It estimates that **each one percentage point reduction in vehicle travel below current state forecasts will provide \$20 billion worth of savings and benefits for the State's residents over a 15-year period, "a sum that is understated because it includes only those benefits that can be readily quantified in**

**dollar terms per mile driven and excludes benefits such as lower carbon emissions and public health benefits such as reduced obesity.”**

Starting with the state’s official driving forecasts, a one percentage point reduction in the growth rate of driving from 2015 to 2030 would bring major economic, environmental, and public health benefits, with annual savings increasing each successive year.

By 2030, the combined savings would reach \$2.3 billion annually, consisting of:

- \$857 million less spent at the pump
- \$785 million less spent on fewer automobile collisions and resulting consequences
- \$446 million less spent on vehicle repair
- \$224 million less spent on road repair.

***To make a comparison, Massachusetts has about 6.8 million residents. Metro Vancouver with its population of 36.4% of MA’s, could have savings of CAD \$1.12 billion per year, and Greater Victoria with its population of 5.3% of MA’s, could save CAD \$163,000,000 per year from a 1% reduction in vehicle travel.***

### **Ricardo-AEA, 2014**

Ricardo-AEA (2014). *Update of the Handbook on External Costs of Transport Final Report*, European Commission (<http://ec.europa.eu>); at <http://ec.europa.eu/transport/themes/sustainable/studies/doc/2014-handbook-external-costs-transport.pdf>.

This study for the European Commission provides a comprehensive overview of approaches for estimating the external costs of transport, and recommends a set of methods and default values for use when conceiving and implementing transport pricing policy and schemes. The study also provided technical support to the Commission services to carry out an impact assessment of strategies to internalise transport external costs. It covers external environmental, accident and congestion costs for various motorized transport modes. The focus was on the marginal external costs of transport activity as a basis for the definition of internalisation policies such as efficient pricing schemes. The Handbook does not include information on the existing taxes and charges and does not include information on infrastructure costs. It updates research by Maibach et al., (2008) as an output of the IMPACT study.

### **Smith et al., 2009**

NC Smith, Veryard DW and Kilvington RP (2009). *“Relative Costs And Benefits Of Modal Transport Solutions,”* Research Report 393, NZ Transport Agency ([www.nzta.govt.nz](http://www.nzta.govt.nz)); at [www.nzta.govt.nz/resources/research/reports/393/docs/393.pdf](http://www.nzta.govt.nz/resources/research/reports/393/docs/393.pdf).

This study by the NZ Transport Agency was to inform local authorities about the costs and benefits of transport modes. It provides estimates of various cost, including vehicle costs, infrastructure, operating, travel time, accident risk, health impacts, and pollution costs, which can then be applied to the number of vehicles and the distance they travel. This quantitative exercise is supplemented by contextual discussion of some important issues in urban transport including drivers of the transport mix, the relationship between land use and transport planning, and road space and traffic management.

### Swiss ARE, 2010

Swiss ARE (2010). *External Cost of Transport in Switzerland*, Swiss Federal Office of Spatial Development ([www.aren.admin.ch](http://www.aren.admin.ch)); at [www.aren.admin.ch/aren/en/home/medien-und-publikationen/publications/transport/externe-effekte-des-verkehrs-2010.html](http://www.aren.admin.ch/aren/en/home/medien-und-publikationen/publications/transport/externe-effekte-des-verkehrs-2010.html).

This Swiss government sponsored research program estimates various transportation costs, including accidents, noise, building damages, environmental damages (air pollution, climate, natural and landscape damages) and traffic congestion.

### Transport Canada, 2008

Transport Canada (2008). *Estimates of the Full Cost of Transportation in Canada*, Economic Analysis Directorate of Transport Canada ([www.tc.gc.ca](http://www.tc.gc.ca)); at [www.tc.gc.ca/media/documents/policy/report-final.pdf](http://www.tc.gc.ca/media/documents/policy/report-final.pdf).

This report summarizes the results of Transport Canada's Full Cost Investigation (FCI) project, which included a number of studies concerning various transportation costs, including costs of vehicle ownership and operations, infrastructure ownership and operations (including land opportunity costs), congestion, accidents and environmental costs. The table below summarizes these cost estimates. **Estimates that "congestion delay" costs the Canadian economy \$5.17 billion annually in inefficiencies.**

#### Social Cost Estimates by Major Mode (Billion of 2000CA\$)

Mode	Accidents	Congestion Delay	Air pollution	GHG	Noise	Total
Road	\$15.78	\$5.17	\$4.73	\$3.68	\$0.22	\$29.59
Rail	\$0.30	Not covered	\$0.44	\$0.19	\$0.00	\$0.93
Marine	\$0.06	Not covered	\$0.54	\$0.24	Not covered	\$0.84
Air	\$0.10	Not covered	\$0.03	\$0.47	\$0.03	\$0.64
Total	\$16.24	\$5.17	\$5.74	\$4.58	\$0.26	\$32.00

*This table summarizes estimated non-market costs of various modes in Canada.*

### Urban Transportation Task Force, 2012

Urban Transportation Task Force (2012). *The High Cost of Congestion in Canadian Cities*, Council of Ministers Responsible for Transportation and Highway Safety; at <http://www.comt.ca/english/utf-congestion-2012.pdf>

"Traffic congestion is a growing problem in Canada. It is becoming acute in our largest cities, which are seeing record commute times that compare poorly with equivalent-sized cities in other countries. It is a growing problem in medium-sized cities.

"Congestion reduces Canadians' quality of life and also has environmental costs. The waste of energy in gridlocked traffic and the production of greenhouse gases and other pollutants are harmful to the Canadian environment. Perhaps most importantly, congestion has substantial economic costs. Decisions on investments and jobs hinge on the quality of transportation infrastructure and the free flow of goods and people in and through our cities. Congestion increases current costs and discourages future investments."



**Table 1-1: Annual Congestion Costs (in \$ Millions) in Canadian Cities (2006)**

City	50% Congestion Threshold	60% Congestion Threshold	70% Congestion Threshold
Vancouver	\$518 M	\$652 M	\$755 M
Edmonton	\$85	\$103	\$120
Calgary	\$149	\$171	\$180
Winnipeg	\$73	\$100	\$125
Hamilton	\$13	\$24	\$37
Toronto	\$1,298	\$1,672	\$2,014
Ottawa-Gatineau	\$220	\$304	\$380
Montreal	\$697	\$811	\$910
Quebec	\$63	\$89	\$118
<b>Total</b>	<b>\$3,116 M</b>	<b>\$3,927 M</b>	<b>\$4,640 M</b>

Source: Transport Canada

### Note on Part 2b

Automobile commuting imposes various external costs (costs imposed on other people). Estimates of these costs vary depending on the scope of impacts considered (some estimates only consider congestion and pollution costs, others are more comprehensive), vehicle type (larger and older vehicles impose higher costs) and travel conditions (costs tend to increase with city size and density). Typical estimates range from about 20¢ per mile considering just congestion and pollution, to more than 60¢ per mile considering additional external costs including parking subsidies, uncompensated traffic accident damages, resource production externalities, roadway and traffic service subsidies, barrier effect (delay to pedestrians and cyclists), water and noise pollution.

### 3. Proximate Commuting: A transportation planning perspective

Within the transportation planning profession, *proximate commuting* refers to programs like CloserCommutes that allow employees of multi-worksite organizations to be assigned to worksites closer to their homes in order to reduce commuting costs and provide multiple other benefits to the employees, employers, society and environment. Proximate commuting is classified as a *commute trip reduction* (CTR) strategy, which is a type of *transportation demand management* (TDM).

### 3a. ProximateCommute<sup>sm</sup> – a lauded, but underused strategy, and proof-of-concept for CloserCommutes

Proximate commuting programs derive from ProximateCommute<sup>sm</sup>, a consulting business and program developed by Gene and Carolyn Mullins of Seattle. ProximateCommute<sup>sm</sup> was first field-tested by Mullins & Associates in Seattle in the mid-1990s. Recognized for its effectiveness, ProximateCommute<sup>sm</sup> won awards as diverse as the US Environmental Protection Agency's Innovative Use of Technology Award and the Goldwater Institute's Most Cost-Effective Traffic Reduction Measure. In 2007, *TIME* magazine cited the program as one of the 51 top ideas to slow global warming.

Despite the accolades, ProximateCommute<sup>sm</sup> was adopted by only two employers (Starbucks and Boeing) and neither fully embraced it. It was never promoted on an industry-wide basis nor across a metropolitan region. Its introduction (or not) by an employer was generally considered the purview of human resources managers. Several recent studies have examined its potential effectiveness, but these are not widely known, even within the transportation planning profession.

ProximateCommute<sup>sm</sup> proposed three ways a multi-worksite employer could orchestrate shorter commutes for its employees:

1. New Hire Placement – Assign new hires to sites near their homes.
2. New Job Placement – Include proximity as a criterion for filling job openings.
3. Job Swap – Allow qualified employees to swap job sites providing their commute distances and/or times are reduced.

**CloserCommutes is a modern re-working of that 1990s program. Key changes include the following:**

- **new technology** – a free web app and access to Google Maps' global GIS mapping database provides for free, highly accurate commuting calculations; peer-to-peer online swap match identification can be enabled; publicity to employees can be orchestrated through internal (closed, private) social media apps;
- **broader in scope** – will be promoted sector-wide and across entire metro regions (not limited to individual multi-worksite employers as before);
- **ease to implement at low cost** – DIY toolkit provided for employers to implement themselves, rather than the need for a consulting contract as in the 1990s (>\$100,000 in fees);
- **positioned as an occupational health and safety [OH&S] issue** – the extensive scientific research on the mental, physical and social effects of long commutes has been assembled in an annotated bibliography; employers' adoption of CloserCommutes and other TDM programs could be quickly mandated through a Cabinet Regulation to BC's *Workers Compensation Act*, for example;
- **research conducted to quantify the potential scope for change and the related financial numbers** – a survey was conducted of all Royal Bank employees in South Vancouver Island, a cross-tabulated dataset was commissioned from Statistics Canada, and impact calculation methodologies have been identified; and
- **promotion directly to politicians and to federal, provincial and municipal government ministries/ agencies with environmental, labour, transportation, education and economic mandates.**

Although some multi-worksite employers do offer their workers some input on worksite location, CloseCommute Systems' investigations over three years did not reveal any employer, in any sector, that was comprehensively addressing its employees' commuting problem or potential for improvement. To be truly effective, a program must command executive commitment, and implement route mapping software and worksite location policies, both to consider optimal locations for new hires and to help existing workers shift worksites. Generally such shifts for existing employees should be offered only to *volunteering* employees, and only occur if workers consider themselves better off. Collaboration with applicable unions and employee associations is necessary. CloseCommute Systems Inc. is building a consulting toolkit for human resources (HR) departments wanting to implement an integrated commute-reduction program.

In March 2017, CloseCommute Systems test-launched a web app (at [www.closecommute.com](http://www.closecommute.com)) for long commuters to identify closer worksite options themselves and to then petition their employer for a transfer. The app was designed to also pair up peers performing the same job who would mutually benefit from switching with the other employee (a "swap match") – so there needn't be a wait for an opening. As well, the app offered long commuters alternative closer worksites *with other employers*, thereby greatly expanding the potential for commute-reduction to a much wider swath of society, and not limiting opportunities to only those savvy employers who adopt the requisite policies and practices. The uptake of the web app by long commuters was quite low (attributed to our limited funds for publicity) so CCSI is focusing its resources on the toolkit and promoting the concept to regional agencies.

### 3b. Proximate commuting/CloserCommutes as a transportation agency planning solution

*Transportation demand management* (TDM) is a general term for various strategies that affect travel activity (when, how, where and how much people travel) in order to increase transport system efficiency. One major category of TDM strategies is *commute trip reduction* (CTR) programs that encourage commuters to reduce peak-period automobile travel. Proximate commuting is a CTR strategy.

*Commuter trip reduction* strategies that improve commuting options, such as **flextime, telework, transit and ridesharing benefits, and proximate commuting**, tend to reduce commuting costs and stress. As a result, employers implement these strategies to increase worker productivity and satisfaction. Studies described below indicate that workers sometimes prefer commute flexibility over wage increases.

In addition, TDM is increasingly used to reduce transportation problems including traffic and parking congestion, accident risk and pollution emissions, and to support strategic planning objectives such as improving mobility for non-drivers and supporting more compact urban development. Many transportation agencies manage or financially support TDM programs as an alternative to expanding roads and parking facilities. **Various documents and websites promote TDM and commute trip reduction programs, some of which include a reference to proximate commuting. Below are a few examples.**

#### FHWA, 2013

The Federal Highway Administration *Active Transportation and Demand Management* (<http://ops.fhwa.dot.gov/publications/fhwahop13042/appl.htm>) promotes various TDM strategies for improving highway efficiency, including a reference to proximate commuting.

#### FHWA, 2003

FHWA (2003). *Commuter Choice Primer: An Employer's Guide to Implementing Effective Commuter Choice Programs*, Federal Highway Administration ([www.fhwa.dot.gov](http://www.fhwa.dot.gov)); at [http://ntl.bts.gov/lib/jpodocs/repts\\_pr/13669/commuterchoiceprimer.pdf](http://ntl.bts.gov/lib/jpodocs/repts_pr/13669/commuterchoiceprimer.pdf).

This guide describes how employers can implement commute trip reduction strategies, including proximate commuting, but provides little detail.

#### Hendricks, 2011

SJ Hendricks and Seggerman K (2011). *Incorporating TDM into the Land Development Process*, University of South Florida for the Florida Department of Transportation ([www.fdot.gov](http://www.fdot.gov)); at [www.fdot.gov/research/Completed\\_Proj/Summary\\_PTO/FDOT\\_BD549\\_12\\_rpt.pdf](http://www.fdot.gov/research/Completed_Proj/Summary_PTO/FDOT_BD549_12_rpt.pdf).

This guidebook describes how transportation demand management strategies can be implemented through local land development processes. It includes several references to proximate commuting.

## **CRPTA, 2012**

The *Pace Commuter Toolkit*

([www.pacebus.com/pdf/vanpool/Pace\\_Commuter\\_Toolkit\\_for\\_Employers.pdf](http://www.pacebus.com/pdf/vanpool/Pace_Commuter_Toolkit_for_Employers.pdf)) by the Chicago Region Pace Transit Agency helps employers encourage commuters to walk, bike, rideshare and use public transit. It describes incentives such as transit benefits, free/preferred parking, proximate commutes, flexible work schedules and worksite amenities such as childcare, bike racks, showers and sidewalks.

## **Note**

These publications indicate that transportation agencies increasingly support TDM as a way to help increase transportation system efficiency and solve various problems. A few TDM initiatives mention Gene Mullins' proximate commuting strategy, but none provide detailed information about how to implement it.



### 3c. Impacts of commute trip reduction programs

*This section describes how proximate commuting, CloserCommutes and other commute trip reduction programs can affect travel activity.*

**Proximate commuting reduces commute distances, and therefore commuter travel time and expenses plus external costs such as the traffic congestion, accident risk and pollution emissions. Worksite location flexibility may also allow some commuters to shift from driving to other modes, for example, if they can choose locations that are more convenient to reach by walking, cycling or public transit.** The following publications describe case studies that measured or discussed these impacts.

#### **FHWA, no date**

*Live Near Your Work Programs*, Federal Highway Administration, Commuter Choice Decision Support System (<http://ops.fhwa.dot.gov/PrimerDSS/cc-options>); at <http://ops.fhwa.dot.gov/PrimerDSS/cc-options/live-near-work.htm>.

The Commuter Choice Decision Support System provides information on various CTR strategies, including *Live Near Your Work* and *Proximate Commute* programs. It describes various ways to support these program including housing down payment assistance, location-efficient mortgages and rent subsidies. It describes these programs as particularly applicable to banks, grocery stores, retail outlets, and other employers with many worksites.

#### **Giery, 2003**

M Giery, Catala M and Winters PL (2003), *Proximate Commuting: Potential Benefits and Obstacles*, Center for Urban Transportation Research ([www.cutr.usf.edu](http://www.cutr.usf.edu)); at [www3.cutr.usf.edu/tdm/pdf/Proximate%20Commuting.pdf](http://www3.cutr.usf.edu/tdm/pdf/Proximate%20Commuting.pdf).

This study investigated the benefits and obstacles to employers and the public for the development of proximate commuting programs. It describes the often-cited Key Bank case study (G Mullins and C Mullins (1995), *Proximate Commuting: A Demonstration Project of a Strategic Commute Trip Reduction Program*, WA-RD 400.1, Washington State Department of Transportation). The report also describes the Detroit, Michigan survey that explored the viability of proximate commuting by a commercial bank's employees (Rodriguez (2000) describes this study in more detail). A survey of 148 bank tellers at 29 branches with 117 useful responses found that **approximately 25% of employees were interested in taking advantage of the program.**

The report details a survey of Florida Bank of America employees concerning their interest in proximate commuting. Although the Bank already informally allows employees some worksite location flexibility, there are additional opportunities for reducing commute distances. It discussed various benefits of proximate commuting and obstacles, including matching employees with specific branch needs, and some workers' preferences for more distant work locations. It calculated the trip reduction potential at various bank branches, which typically range from 10–20%. The report also provides specific recommendations for proximate commuting program implementation.

#### **Mullins & Mullins, 1995**

G Mullins and Mullins C (1995), *Proximate Commuting: A Demonstration Project of a Strategic Commute Reduction Program*, WA-RD 400.1, Washington State Department of Transportation ([www.wsdot.wa.gov](http://www.wsdot.wa.gov)); at [www.wsdot.wa.gov/research/reports/fullreports/400.1.pdf](http://www.wsdot.wa.gov/research/reports/fullreports/400.1.pdf).

This seminal report describes the Key Bank of Washington proximate commuting demonstration project. During the 15-month demonstration project, nearly 500 non-exempt employees at thirty Key Bank of Washington branches in King, Snohomish and Pierce counties were given the opportunity to enroll in a proximate commuting demonstration program and be considered for voluntary reassignment to branches closer to their homes.

Results showed;

- 17% (1 in 6) of eligible employees enrolled in the program
- 65% reduction in commute miles for transferred participants
- 33% reduction in the longest commute per branch
- 17% reduction in average commute miles for all branch employees (includes non-participants)

Additional savings per participant:

- \$2,626 in commute expense savings (1995 dollars)
- 216 commute hours saved (five 40-hour weeks)
- 6,566 commute miles eliminated
- 313 gallons of gas saved
- 387 pounds of pollution reduced
- 5,940 pounds of carbon dioxide eliminated

**These results indicate that proximate commuting is a viable, low-cost method for significantly reducing employee commute time, distance, expense and stress, and can increase work force productivity.**

#### **Mullins & Associates, 1994**

[www.proximatecommute.com](http://www.proximatecommute.com) is the website for Mullins & Associates, Inc. *ProximateCommute Mapper* was a software program developed in 1994 by Mullins & Associates, Inc. designed to help multi-site employers identify more proximate (closer) commute options. The software used Euclidean distance calculations, as it predated easily accessible spatial mapping technology (such as Google Maps) by over a decade.

Mullins & Associates/ProximateCommute<sup>sm</sup> studies reported:

**“From a 300-employee survey at a Washington state employer:**

- **96% said the company would benefit by employees having shorter commutes**
- **92% support or strongly support a company test of proximate commuting**
- **87% are very/somewhat interested in having their same job at a closer site**
- **76% are very/somewhat likely to participate in a proximate commuting program**
- **90% would benefit from working closer to their homes.”**

**“City of Seattle (selected departments), percentage of employees *not* working at site nearest their homes:**

- **75% – Community centers employees**
- **89% – Library employees**
- **96% – Fire department employees.”**

**“Other Washington and California employee commutes analyzed, percentage of employees *not* working at site nearest their homes:**

- 73% – Starbucks (limited sample size)
- 83% – Key Bank
- 84% – Washington State Liquor Stores
- 89% – Bank of America, Los Angeles (limited sample size).”

**“Studies of multi-site employers have found that on average about 80% of their branch employees could work at an employer site nearer their homes. A national survey by *CareerBuilder* found that nearly half of the workers surveyed considered their commute**

**unsatisfying or stressful, and that 36% would take a 10% or greater pay cut to work closer to home.”**

**“An analysis conducted in Seattle found that over 50% of regional employees work for multi-site employers ...** Both public and private employers benefit by having employees who are likely to stay with the employer longer, arrive at work on time more often and be more productive while they are on the job. The workers experience less risk of being in an auto accident, are exposed to less auto emissions and suffer less commute-related stress.

“Employees who have “converted” from long commutes to short commutes expressed a definite improvement in their job satisfaction and an overall improvement in their day-to-day quality of life.”

“The Environmental Protection Agency reports that 46% of the U.S. population regularly breathes polluted air and that 55% of air pollution-caused cancer cases are attributed to motor vehicles. The potential environmental impact in reducing auto emissions via ProximateCommute<sup>sm</sup> is significant and the cost is minimal compared to other alternatives.”

“The ProximateCommute<sup>sm</sup> program allows more people to work in or near their own neighborhoods. It increases the time available for parents to spend with their children at the beginning and end of each workday. It improves community air quality and employer operational efficiency, while reducing a daily burden for individuals. It enhances the quality of life for employees, employers and the community.”

**“From a ProximateCommute<sup>sm</sup> project involving 30 Seattle bank branches and 500+ employees: average annual participant savings: \$2,626 in commute expense, 216 commute hours (equivalent to five 40-hour weeks), 6,566 commute miles, 313 gallons of gas, 387 pounds of auto emissions, and 5,940 pounds of carbon dioxide.”**

## **Pryne, 2002**

E Pryne (2002), “Putting Shorter Commute on the Map,” *Seattle Times*; at <http://community.seattletimes.nwsources.com/archive/?date=20020318&slug=proximate18m>.

This newspaper article by Eric Pryne summarizes the Key Bank case study.

## **Rodriguez, 2000 & 2001 & 2002**

D Rodriguez (2000), *Unwanted Excess Commuting: Proximate Commuting, Transportation Demand Management and the Transportation-Land Use Connection (Michigan, Colombia)*, PhD Dissertation, University of Michigan (<https://trid.trb.org/view.aspx?id=854368>); <https://deepblue.lib.umich.edu/handle/2027.42/132671>.

Daniel Rodriguez (2001), “Proximate Commuting: Hype or Potential? An Evaluation,” *Transportation Research Record 1765*, Transportation Research Board ([www.trb.org](http://www.trb.org)), pp. 34-42; summary at <http://trjournalonline.trb.org/doi/10.3141/1765-06>.

Daniel Rodriguez (2002), “Examining Individuals' Desire for Shorter Commute: The Case of Proximate Commuting,” *Environment and Planning B*, Vol. 29, No. 6, pp. 867-881; abstract at <http://epb.sagepub.com/content/29/6/867.abstract>.

Daniel Rodriguez’s dissertation examined the theoretical and planning implications of a proximate commuting program, which reduces commuting through voluntary employee relocations to different job sites. Data from case studies of bank employees in Bogotá, Colombia and Southeastern Michigan were used to evaluate these employees’ willingness to participate.

The study categorizes commute travel into wanted and unwanted excess components. Wanted excess commuting is commuting that people have accepted as a tradeoff for having access to other desired destinations or activities. Unwanted excess commuting is not desired and so is amenable to reduction if workers are allowed to relocate. The analysis suggests that 18% of Bogotá and 5% of Southeastern Michigan tellers' commuting is excess. The study develops a

model for estimating potential vehicle travel and emissions reductions from proximate commuting.

### Scigliano, 1997, 2002 & 2015

Eric Scigliano (1997), "Trading Places," *Seattle Times* (<http://archive.seattleweekly.com/2002-11-13/news/trading-places>) and *M.I.T. Technology Review* ([www.technologyreview.com/s/400081/trading-places](http://www.technologyreview.com/s/400081/trading-places)).

Eric Scigliano (2002), "Expand Mass Transit? No, Try Mass Transfers," *The Washington Post* ([https://www.washingtonpost.com/archive/opinions/2002/10/13/expand-mass-transit-no-try-mass-transfers/fe2ae0a3-7594-452a-8fe9-506442291f0f/?utm\\_term=.e8871e80d2c5](https://www.washingtonpost.com/archive/opinions/2002/10/13/expand-mass-transit-no-try-mass-transfers/fe2ae0a3-7594-452a-8fe9-506442291f0f/?utm_term=.e8871e80d2c5))

Eric Scigliano (2015), "The Forgotten (and Surprisingly Simple) Solution to Long Commutes," *Crosscut* (<http://crosscut.com>); at <http://crosscut.com/2015/09/the-forgotten-and-surprisingly-simple-solution-to-long-commutes>.

These articles by Eric Scigliano describe various examples and studies of proximate commuting, development of Mullins & Associates Inc.'s ProximateCommute<sup>sm</sup> program and Key Bank demonstration project, potential benefits, and obstacles to its implementation. **"[Mullins] found that, on average, only 20 percent [of all workers studied] – 4 percent of firefighters in one big city – worked at the branch nearest their homes."**

### Summary

These studies and articles point to the need for and effectiveness of proximate commuting programs. Such programs tend to be popular with employees, and can provide significant vehicle travel reductions. In some cases, a switch may also allow the commuter to shift from driving to alternative modes such as walking, cycling, ridesharing and public transit, which can provide additional benefits, such as reduced parking and vehicle ownership costs.

## 4. Implementing CloserCommutes – the process, costs/benefits & what to expect

Implementing a proximate commuting program need not be onerous nor expensive, and the investment to modernize HR policies and procedures could be recouped within a year through reduced absenteeism, higher morale and productivity, and other improvements.

### Implementation process

Here is a recommended basic implementation process for the employer:

- A baseline analysis is undertaken to establish the current commuting situation (“burden”) and reveal the potential for improvement. That analysis would also identify existing policies and any internal barriers to address.
- CloserCommutes.org expects to provide a toolkit to assist human resources professionals to introduce appropriate policies and practices related to hiring, internal transfers and swap matching.
- Where employees are members of a union, buy-in by their union will be essential. In particular the impacts on seniority rights must be clarified, and re-negotiated where necessary.
- Clear communication from the executive level to all staff is necessary to emphasize full corporate commitment. It can be stated that reducing commutes is a win-win-win situation for employee, employer, the community and the environment. A sample memo to staff is included in the toolkit.
- Some fields will need to be defined in the employer’s HR software (PeopleSoft, Ariel, etc.) to store commuting distances and durations. The values can be calculated individually using Google Maps or a similar free app, or this can be automated through an API. The toolkit has an application that will generate commuting information for dozens of applicants and locations instantly.
- Ongoing program costs consist primarily of the additional administrative effort required by HR managers to be aware of and improve their workers’ commute situations. Simply by considering proximity for new hires and internal transfers, significant improvement can result (potentially in the range of 15% of overall burden within 18 months, depending on the rate of turnover).
- Identifying and offering 1-to-1 peer swap matches will create more immediate and extensive positive impact. Swaps could be timed to minimize disruption to operations (teachers would swap schools during the summer months, for example, and retail workers during quieter sales periods). An exchange program could be transformative for an organization’s morale and productivity.
- An annual tally of employee commuting burden is generated to inform the organization’s annual reporting of social and environmental impact.

## Costs/benefits

Following the ProximateCommute<sup>sm</sup> demonstration project for Key Bank, Gene Mullins noted that, “Human Resources representatives reported that **the placement of new employees closer to their homes ... required little to no additional effort on their part.** Branch managers recognized that they were now getting more new employee candidates who had shorter commutes than before and expressed great appreciation for the improvement. Several commented that this would **benefit their operations through reduced tardiness as well as reduced turnover.**” (Mullins & Mullins, 1995)

**CloseCommute Systems expects that all program implementation costs will be recovered by the employer within a year.** In light of the thoroughly documented adverse effects of long commutes (see *Part 1*), CCSI posits that a commute reduction program should trigger improvement from previous expense levels for hiring, retention, training, absenteeism, tardiness, extended health benefits and low productivity, while also dramatically improving corporate environmental and social responsibility indicators.

## Risk management

There are **risk management considerations** related to both *implementing* and *not implementing* a CloserCommutes program. Interviews with HR and union executives found many wondering if there could potentially be some pushback about seniority from employees who do not swap locations. Most interviewees thought having the seniority procedures resolved, and having any swaps being voluntary should reduce the risk around implementation to being “minimal”.

By *not* implementing commute reduction measures, firstly a corporation or agency may become at a competitive disadvantage with respect to recruitment and retention, and to brand image. Secondly, as more jurisdictions introduce or increase carbon taxes (and/or cap-and-trade) and other emissions disincentives, employers may find themselves subjected to financial ramifications for not addressing “excess” or “unnecessary” employee commuting – however that may be defined. Thirdly, an employer not taking reasonable steps to mitigate the adverse health and safety risks associated with long commutes for its employees could potentially face lawsuits from employees whose health has been compromised. It could be seen as a prudent decision therefore to act now to reduce future financial liability.

The risk of not implementing would become moot if/when all large multi-worksite employers are required – by an Occupational Health & Safety regulation, for example – to assess and take reasonable steps to shorten/green employees’ commutes. Employers then would be considering not only CloserCommutes, but also carpooling, transit pass subsidies, secure bike storage, flexible scheduling, telecommuting, remote offices, and other transportation demand management strategies.

( end )



# Closer Commutes – An initiative that benefits everyone



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## Employers WIN

- BENEFITS +
- better staff retention
  - less sick time off
  - better morale
  - reduced hiring costs
  - more productivity

## Workers WIN

- BENEFITS +
- better mental & physical health
  - less transportation expenses
  - more quality time
  - option for biking, walking, local bus

## Environment WIN

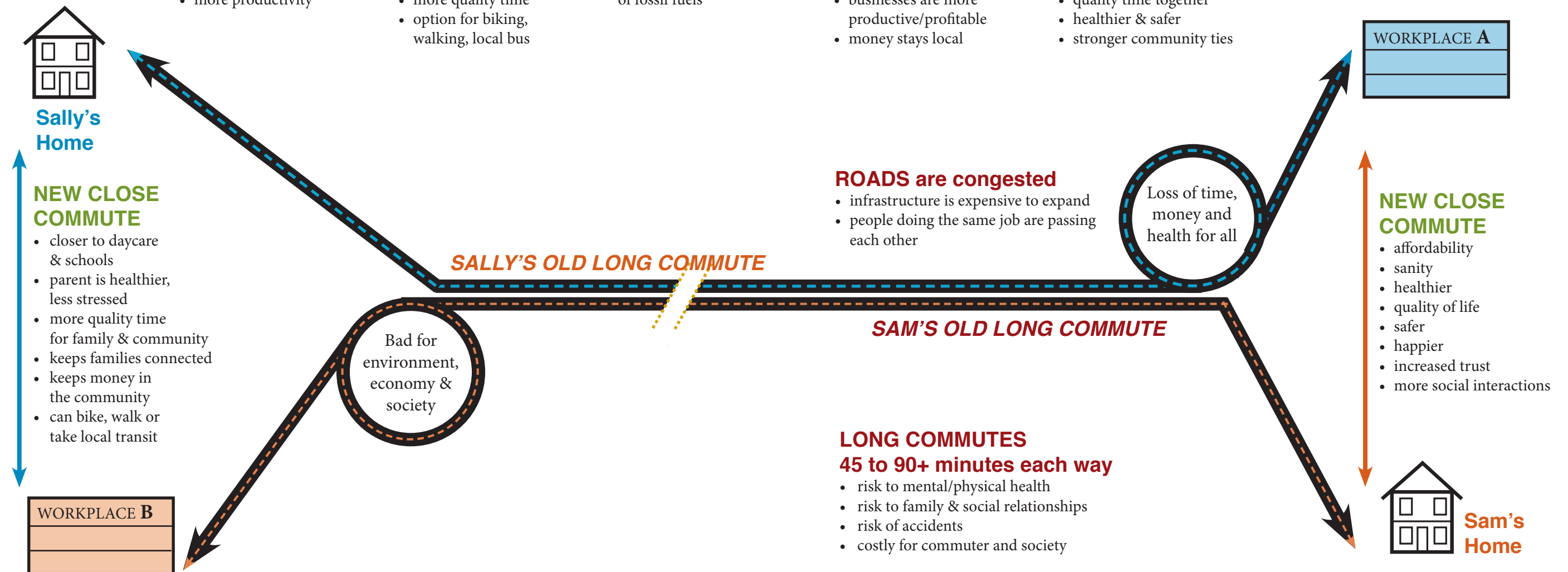
- BENEFITS +
- better air quality
  - fewer GHG/carbon emissions
  - lower consumption of fossil fuels

## Economy WIN

- BENEFITS +
- more use of transit
  - less impact on roads & infrastructure
  - reduced healthcare costs
  - businesses are more productive/profitable
  - money stays local

## Families WIN

- BENEFITS +
- more affordable – especially important for low-income and part-time earners
  - closer to daycare & schools
  - quality time together
  - healthier & safer
  - stronger community ties



- The science is clear – see annotated bibliography of peer-reviewed studies.
- StatsCan commuting flow dataset shows extensive unnecessary commuting.
- CloserCommutes's confidential audit of employee commuting burden for RBC Royal Bank confirms potential for work swaps.
- Greater than 5% reduction of total commuting traffic is projected; could boost

regional economy by over \$100 million p.a.

- Toolkit and training for employers being developed. Not onerous to implement, many benefits including reduced costs and higher productivity.
- Recommend Provincial priority action coordinated across all ministries and agencies. Start with demo projects with school districts and banks *asap*.