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"Integrated Science 3002A: Big Bike Giveaway: Changing London's environment, health, and economy one bike at a time"

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**CHANGING
LONDON'S
ENVIRONMENT,
HEALTH, & ECONOMY**

ONE BIKE AT A TIME

prepared by D. Shukla, J. Joseph, K. Melo,
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Big Bike Giveaway:

Changing London's environment, health and economy one bike at a time

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Western Integrated Science 3002A: Science in the Community

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Big Bike Giveaway: Changing London’s environment, health and economy one bike at a time

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ONE SENTENCE SUMMARY

The numerous benefits of cycling should incentivize London to invest in infrastructure to promote safe, convenient cycling.

ABSTRACT

There are significant benefits that manifest when an individual chooses to ride a bicycle as their primary mode of transportation (*1*). To investigate these benefits, the environmental, health, economic, and social impacts of biking were evaluated through research and data analyses. This revealed that numerous advantages can be obtained at an individual and local scale through citizens choosing to adopt a biking lifestyle. However, it was found that many Londoners are deterred from biking due to poor biking infrastructure. This paper calls into question the current cycling framework in London and it’s limitations on achieving the numerous benefits that biking offers. Therefore, to promote frequent cycling among all London citizens, investing in the required infrastructure for biking and promoting its safety would have everlasting impacts.

MAIN TEXT

The Big Bike Giveaway (BBG) is a London, Ontario-based organization that was founded by Monica and Shayne Hodgson in 2014 to provide individuals with a free bike. At an annual community event, donated bikes were distributed to a targeted lower-middle class income demographic. Their goal was not only to encourage frequent cycling within the city, but also to alleviate any socio-economic restrictions citizens may have in obtaining a bike. Although there was no doubt that BBG had significant impacts on recipients’ lives, we wanted to identify as well as quantify these various impacts. While there is extensive data outlining the effects of biking, it is limited to major metropolitan cities (*2*). Therefore, the focus of this paper is to examine these effects on an individual level and specific to London.



Fig. 1. Canadians’ preferred method of commuting to work in 2016 (3).

With an understanding that adopting a biking lifestyle has the potential to address numerous concerns, we were curious as to why only 7% of Canadians chose to bike to work in 2016 (Figure 1). We concentrated on recognizing the positive outcomes of Londoners switching to bicycles as their primary mode of transportation.

An obvious advantage of biking is its effect on an individual's carbon footprint. Accordingly, we sought to precisely determine the environmental sustainability of a cycling-oriented lifestyle in comparison to a motor-vehicle one. Additionally, an important concern in London is the declining health of its citizens, with more than half of its adult population being classified as overweight or obese (4). We examined a number of local and foreign resources in order to quantify the effectiveness of biking on a citizens' well-being. Furthermore, we recognized that there is a significant concern regarding poverty within London (5). We found it essential to analyze the economic incentives that citizens have to bike that would mitigate the impact of poverty within the city. As such, it was an interest of our investigation to evaluate how cycling accessibility in London effectively enables the achievement of the many benefits associated with biking.

Environmental Impacts of Cycling

We conducted research to quantify the significant environmental impact both an individual and a population can have by choosing to bike rather than to drive as a main mode of transportation. We discovered that in 2015, cycling would have prevented the emission of 1 050 000 tonnes of greenhouse gasses in London from gasoline combustion (6). Furthermore, we discovered that other Canadian cities with a similar population to London, such as Halifax, Nova Scotia or St. Catharines, Ontario, emitted 20% and 10% fewer greenhouse gases per capita than London, respectively. These two cities are amongst the top five most bikeable cities in Canada, as they invested significantly in developing cycling infrastructure and promoting cycling safety (7). This identified a major shortcoming in the City of London's attempts to be environmentally sustainable.

We investigated the impact an individual can have on the environment in a relatable manner to London citizens (Figure 2). We selected three commonly travelled routes within the city and used Google Maps to calculate the distance between major locations. Our research from the European Cyclists Federation revealed that personal vehicles emit 271g of CO₂/km and city transit buses emit 107g CO₂/km, while bicycles only emit 22g CO₂/km (8). This data was used to generate Figure 2 to explicitly illustrate the significant difference in emissions between these three modes of transportation.

These Canada- and London-specific statistics regarding the carbon emissions released from various modes of transportation illustrated the need for improved bike infrastructure and safety within the city. It follows that a minor change in lifestyle with regards to an individual's choice of transportation has major impacts on the environment. These seemingly insignificant changes, such as choosing to bike to work compared to driving, can cumulatively have a remarkable impact on one's overall carbon footprint and contribute to mitigating climate change.

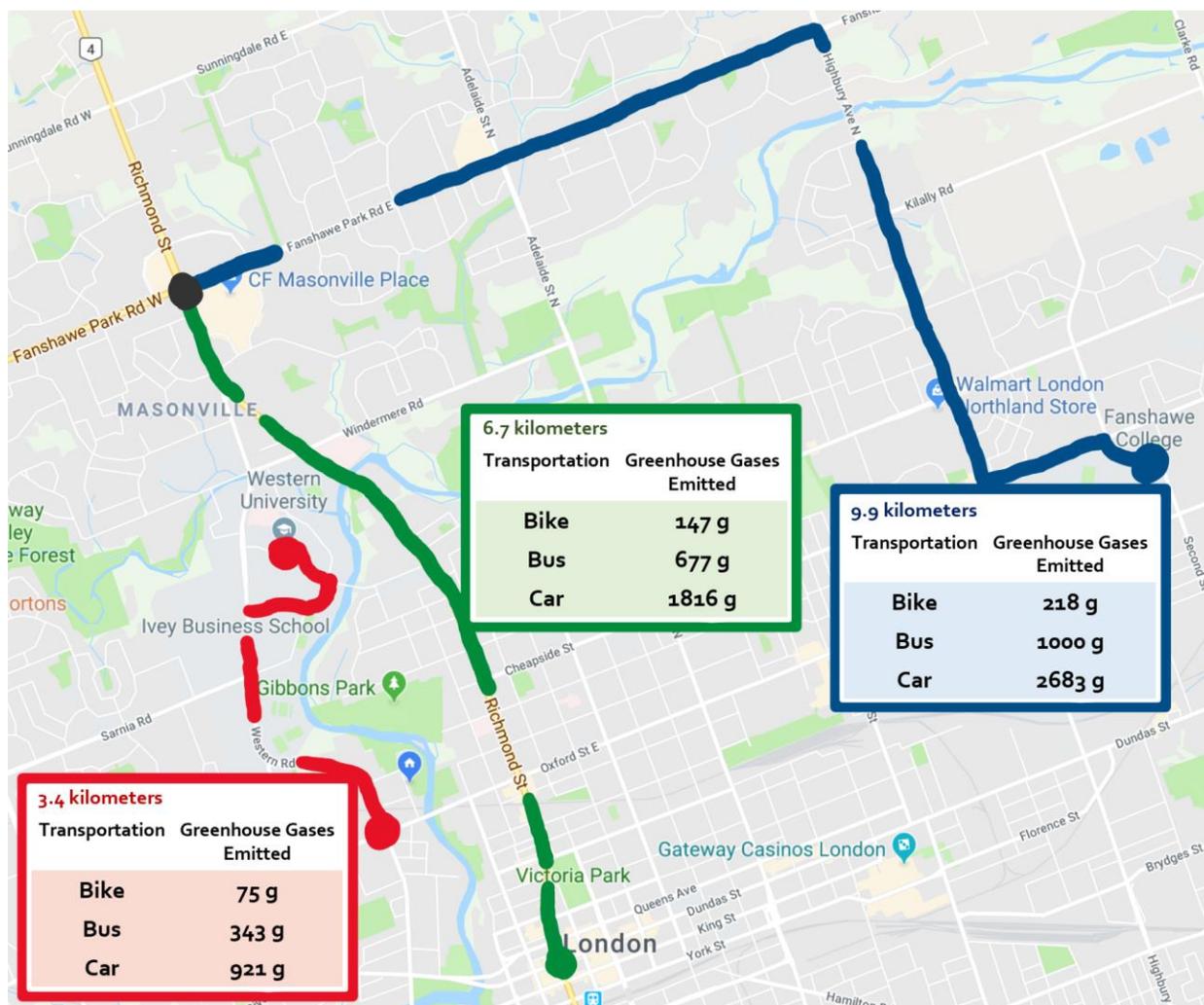


Fig. 2. Carbon dioxide emitted from commuting common distances within London by biking, by using city transit, or by driving personally.

Health Benefits of Cycling on the Individual

It is widely acknowledged that consistent, moderate exercise is necessary for a healthy and long life (9). More than half of the Londoners surveyed at the BBG event mentioned that major incentives for seeking a bike were to become more active and to spend time outdoors. To quantify the health effects of cycling, and specifically BBG’s effect on the health of London citizens, a collection of resources were used to evaluate and interpret the data available.

Cardiovascular disease, followed by respiratory illness, are the leading causes of death in London (4). Interestingly, many research papers cite cycling as one of the best exercises for improving cardiovascular health and developing a greater lung capacity (10). Furthermore, studies have shown that 1 in 5 teens in London suffer from mental illnesses (11). Cycling has been proven to help with mental health issues as it reduces anxiety and helps with stress

management, while also increasing levels of the neurotransmitters, such as serotonin and dopamine, which are responsible for happiness (12).

In several physical activity studies, metabolic equivalent of task (MET) is used as an indicator of physical activity; the minimum goal should be in the range of 500–1,000 MET min/week. Cycling 5 days per week for a distance greater than 7km (600 MET) would fulfill this goal (12). It was found that through cycling alone, 12% of Londoners fulfill the minimum physical activity requirement (13).

In these ways, increasing cycling in London would directly impact the health of its citizens. Thus, it is imperative to improve the city’s biking infrastructure, which would promote a healthier London.

Economic Impacts of Cycling

The economics of transportation were quantified using extrapolation of limited available data. Given that only 1.2% of Londoners commute to work by biking (13), we analyzed and contrasted the expenses associated with biking or driving for a typical commute to work. For consistent comparisons, the distances of 3km, 5km, and 7km were used to simplify the calculations (13). These distances were chosen because the daily commuting distance travelled by personal vehicle is generally significantly greater than that expected of cycling. To calculate their respective expenses, we found the average cost of biking and private transportation per kilometre to be \$0.06/km and \$0.37/km, respectively (14). These price rates include, but are not limited to, maintenance costs, insurance, gas prices, and depreciation. We used the average cost per kilometre of both bicycling and private transportation, the distances, and the number of working days in a year to contrast the annual expenses of each mode of transportation.

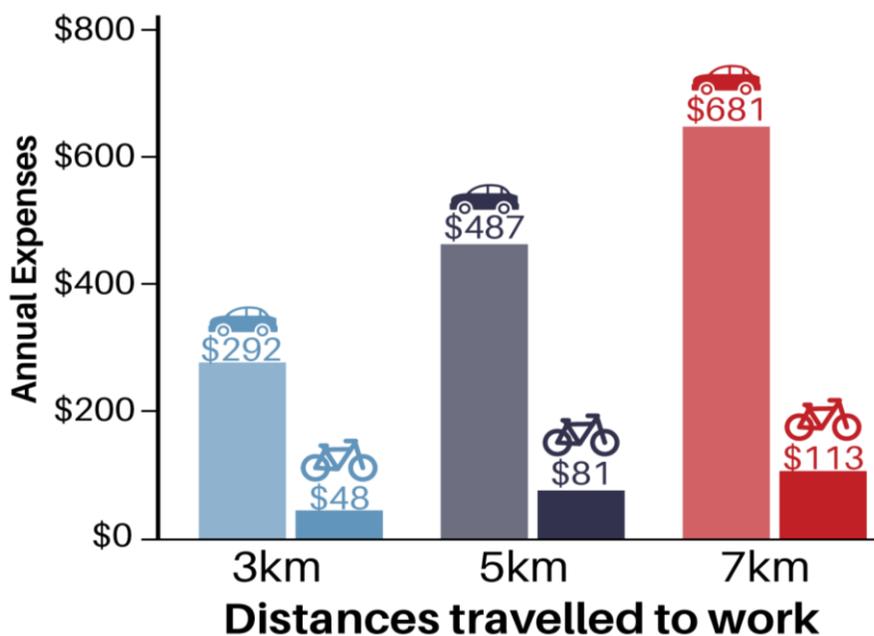


Fig. 3. The annual expenses of both driving to work (left) and biking to work (right). These expenses were calculated using the rate of cost for each mode of transportation, the number of working days (261 days), and their respective distances.

It was resolved that the annual transportation cost of biking for the daily commute was 83% less than the cost of driving (Figure 3). It is evident that Londoners who currently choose to cycle to work have a significant economic benefit compared to those that drive the same distances. Other communities, such as those in South-East Minnesota, USA, found that the money individuals saved by cycling instead of driving was more likely to be spent at businesses along their route (15). By investing in more bike-friendly infrastructure, the city of London could mirror these American communities and stabilize London’s own local economy.

Community Perspective on Cycling in London

We surveyed the attendees of the 2018 BBG event to obtain a personal perspective on a cycling lifestyle and to quantify the demand for bicycles in the community. The majority of bike recipients indicated that the primary purpose for their bike would be either transportation or recreation (Figure 4). Moreover, we discovered that exercise would be another common use of the bike, which indicates that people are conscious of their physical fitness and overall health. While they were aware of the numerous benefits, they were concerned for their safety when cycling in the city.

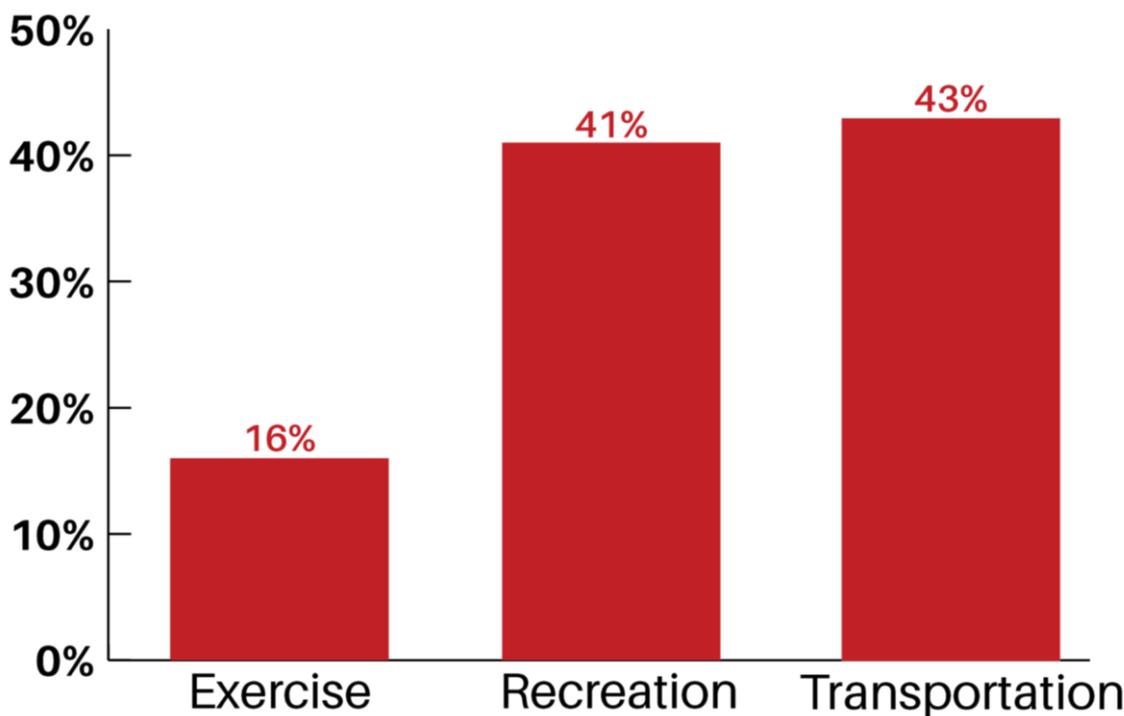


Fig. 4. Distribution of how recipients declared they will utilize their bikes.

Of the study population, 68% of recipients wanted London to develop more bike lanes, which illustrated that there is a significant demand in the community for an improvement in the city’s biking infrastructure. This finding sheds light on ways to improve London’s accessibility for cyclists to maximize the numerous potential benefits outlined above.

DISCUSSION

While London has the potential to be a cycling-centric city, it lacks the necessary infrastructure and safety for its citizens to capitalize on the significant potential of bicycles. Studies have revealed that poorly planned infrastructure can result in bicycles becoming an ‘endangered species’ within a city (16). Policies that couple cycling promotion efforts with appropriate urban-planning strategies increase the magnitude of the beneficial impacts of cycling than simply the policies alone (12).

Thus, Londoners must be informed of the benefits of bicycling to advocate for the development of the appropriate cycling infrastructure. Citizens can inspire political initiatives within London by communicating their concerns about cycling safety and accessibility in the city. This advocacy can result in the necessary investments from City Council to implement changes in the infrastructure and cycling culture.

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AUTHOR CONTRIBUTIONS:

D.S, J.J, K.M, K.T and T.N conceptualized research goals and aims, performed data acquisition, wrote the original draft, reviewed and edited.

COMPETING INTERESTS:

The authors have no competing interests to declare.