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The impact of implementing a public bicycle share program on the likelihood of collisions and near misses in Montreal, Canada

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ABSTRACT

Objective. This study aimed to estimate the impact of implementing a public bicycle share program (PBSP) on the likelihood of self-reported collisions and near misses between cyclists and motor vehicles among cyclists living in Montreal.

Methods. A repeated cross sectional design was used. Surveys were conducted at the launch of the PBSP, at the end of the first and second seasons of implementation. Logistic regression estimated changes in the likelihood of reporting collisions or near misses.

Results. There was no evidence of a change in likelihood of reporting a collision or near miss after implementing the PBSP. PBSP users were not at a greater risk of reporting a collision (OR = 1.53, 95% CI: 0.77–3.02) or near miss (OR = 1.37, 95% CI: 0.94–1.98), although confidence intervals were wide. The number of days of cycling per week was associated with collisions (OR = 1.27, 95% CI: 1.17–1.39) and near misses (OR = 1.34, 95% CI: 1.26–1.42).

Conclusions. There was no evidence of a change in the likelihood of reporting collisions or near misses in Montreal between the implementation of the PBSP and the end of the second season. Time spent cycling was associated with reporting a collision or near miss.

Public health researchers are increasingly interested in the relationship between transportation and health (Saelens et al., 2003; Sallis et al., 2006). One of the objectives of public health intervention in transportation is to promote safe and sustainable increases in cycling for transportation in the population. Although many might suggest that an increase in the number of cyclists will likely result in a commensurate increase in the number of collisions, the safety in numbers (SIN) hypothesis has made an important contribution to thinking about this relationship. The SIN hypothesis suggests an inverse though non-linear relationship between the prevalence of cycling and the cyclist's risk of injury due to collisions with motor vehicles (Dill and Carr, 2003; Elvik, 2009; Jacobsen, 2003; Robinson, 2005). Jacobsen (2003) shows that the safety in numbers relationship as a power curve of 0.4 and provides the example that a doubling of the prevalence of walking or cycling in a community would result in a 32% increase in the number of injuries ($2^{0.4} = 1.32$), rather than a doubling of injuries and would thus result in a 66% reduction in the individual risk of injury, for each cyclist ($2^{0.4}/2 = 2^{-0.6} = 0.66$).

Despite the appeal of the safety in numbers hypothesis in cycling advocacy and policy making circles, there is no scientific consensus regarding the validity of the hypothesis (Bhatia and Wier, 2011). Of relevance in the present study are the temporal sequence with which changes in prevalence of cycling and likelihood of injuries occur and the potential mechanisms that underlie the SIN hypothesis. Jacobsen (2003) suggests that “it is improbable that the roadway design, traffic laws or social mores, all of which change relatively slowly, can explain the relationship between exposure [to motor vehicles] and injury rates” (p. 208). Natural experiments, which can occur quickly, can provide insight into whether environmental changes could explain the safety in numbers hypothesis.

Public bicycle share programs (PBSP) offer such a natural experiment. Widely implemented in Western Europe and China and increasingly popular in North America, PBSPs increase population access to cycling by making bicycles available at docking stations throughout an area within a city for a fee (Pucher et al., 2009; Shaheen et al., 2010). For example, Montreal's bicycle-taxi (BIXI) program, North America's largest in 2011, launched in May 2009 makes available 5050 bicycles at 405 docking stations. Bicycles are available for a check out fee of $7 for 24 h or $78 for the season. After paying the checkout fee, the first 45 min of usage is free. Users extending their usage beyond 45 min pay a usage fee of approximately $1.50 per 45 min.

The implementation of a PBSP allows for the evaluation of whether implementation and use of the program are associated with increases

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in cycling and subsequent changes in the likelihood of collisions between cyclists and motor vehicle users. Our past work has shown a 2.8 times greater odds of cycling for those exposed to the PBSP compared to those not exposed after the second year of implementation in Montreal (Fuller et al., 2013). Local commentators suggest that this increase has been accompanied by an increased risk of collisions because PBSP users are less likely to be experienced cyclists or may be tourists who are not familiar with their environment (Spurr, 2012). Our past research showed that one of the strongest correlates of bicycle share use was cycling as your primary mode of transportation to work prior to the implementation of the PBSP (Fuller et al., 2011). However, the question of whether the implementation of a PBSP results in an increase in the likelihood of collisions between cyclists and motor vehicle users, and whether PBSP use is an independent risk factor when cycling frequency, is controlled have not been examined.

The objective of this study was to estimate the impact of implementing a public bicycle share program (PBSP) on the likelihood of self-reported collisions and near misses among cyclists in the population of Montreal, Canada—where the implementation of the PBSP was associated with a statistically significant increase in the likelihood of cycling (Fuller et al., 2013). We attempted to reject the null hypothesis that the implementation of the PBSP would not change the likelihood of a collision or near miss for those exposed. We also examined whether PBSP use was associated with an increased risk of collisions once the number of days of cycling per week was controlled. We again used the null hypothesis that PBSP use would not change the risk of a collision.

Methods

Design

Three cross-sectional population-based samples of adults participated in telephone surveys. Surveys were conducted at the launch of the PBSP (May 4–June 10, 2009), at the end of the first season of implementation (October 8–December 12, 2009) and at the end of the second season of implementation (November 8–December 12, 2010). The PBSP is implemented between May and November and removed in the winter because of snow.

The sampling frame for each survey was individuals residing on the Island of Montreal with a landline telephone. In contacted households, the available individual to next celebrate a birthday and aged 18 years or older could respond. To recruit sufficient numbers of respondents exposed to the PBSP, the sampling frame was stratified by the presence or absence of PBSP docking stations in the residential neighborhood. In the first stratum, those residing on the Island of Montreal were contacted via random digit dialing to landlines. In the second stratum, landlines with Montreal postal codes matched to neighborhoods where PBSP stations were available were oversampled. The sampling fraction was 0.002 for each survey and there was no respondent overlap between surveys.

Procedures

The human research ethics committee of the Centre de Recherche du Centre Hospitalier de l'Université de Montréal granted ethical approval. A polling firm recruited respondents who gave verbal informed consent prior to participation. Surveys could be completed in French or English. The research team trained telephone interviewers and performed quality surveillance during each survey period.

Measures

Respondents who had cycled in the previous year reported if they had been involved in a collision or near miss in the previous year. The outcome variables were dichotomous indicators of self-reported collisions and near misses. Near misses were measured by asking, "In the previous 12 months, have you been involved in a 'near collision' (close call) with a motor vehicle while cycling?"

The independent variables were survey period, exposure to PBSP docking stations, use of the PBSP during the season and the number of days that a respondent cycled for at least 10 min per day in one week. A dichotomous variable distinguished the pre-intervention from season 1 and season 2 survey periods. Exposure to PBSP docking stations was operationalized as residing within a 500-m road network buffer of a PBSP docking station. Road network buffers of 500 m were calculated using geographic information systems and represented a walkable distance (Fuller et al., 2011; McCormack et al., 2008). PBSP use was operationalized by asking respondents if they had used the PBSP at least once during the past season. Days of cycling per week were measured using the long form of the International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003). The IPAQ data were used to calculate the number of days per week that a respondent cycled for at least 10 min.

Covariates were helmet use, density of destinations, street connectivity and individual level sociodemographic characteristics. Respondents reported their usual helmet use as always, often, sometimes or never. A count of parks, grocery stores, banks, pharmacies and medical services within a 500-m road network buffer of respondent's home operationalized density of destinations. The number of intersections within a 500-m road network buffer of respondent's home operationalized street connectivity. Density of destinations and street connectivity are common measures of urban form (Riva et al., 2008, 2009). Sociodemographic variables of age, sex, education, employment status and income were obtained using questions from the 2006 Canadian Census (Statistics Canada, 2006) or with other standard questions (Table 1).

Data analysis

Post-stratification weighting by age and sex using the 2006 Canadian census data was applied to all analyses. Difference in differences (DD) estimation using logistic regression was used. DD estimation is commonly used for evaluating non-randomized interventions (Card and Krueger, 1994; Meyer, 1995).

Separate logistic regression models examined associations between survey period, residential exposure to PBSP docking stations, PBSP use and days of cycling per week with reported collisions and near misses adjusting for covariates. The main effect of survey period examined the association between the implementation of the PBSP and the likelihood of collisions and near misses throughout Montreal. The main effect of exposure examined the association between exposure to PBSP docking stations and likelihood of collisions and near misses pooled across time periods. The interaction term between survey period and exposure tested the hypothesis that the likelihood of a reported collision or near miss was different for respondents exposed to the PBSP following its implementation in comparison to respondents not exposed following implementation. The interaction term controls for confounders that do not change over time and for common time trends in exposed and non-exposed groups (Meyer, 1995). Additionally, the number of collisions and near misses per 100 days of cycling in each survey period was calculated.

Results

Analysis showed that 45.3% ($n = 906$), 47.92% ($n = 1199$) and 57.9% ($n = 1202$) of respondents had cycled in the past year at the pre-intervention, season 1 and season 2 survey periods, respectively. The analysis sample consisted of respondents with no missing data during each survey period. The analysis samples were $n = 847$ (6.5% missing) for the pre-intervention period, $n = 1100$ (8.3% missing) for season 1 and $n = 1190$ (1.0% missing) for season 2. Of respondents reporting cycling, 6.6% ($n = 56$), 3.7% ($n = 41$) and 1.8% ($n = 21$) reported being involved in a collision whereas 12.2% ($n = 103$), 12.4% ($n = 136$) and 11.7% ($n = 139$) of respondents reported a near miss, respectively, in each time period (Table 2).

Collisions

Table 3 and Fig. 1 present the results of logistic regression analyses examining collisions and near misses. Results for collisions showed that there was no evidence of a change in the likelihood of reporting a collision at season 1 (OR = 1.07, 95% CI: 0.51–2.25) and a significant reduction in the likelihood of a collision at season 2 (OR = 0.35; 95% CI: 0.15–0.78) compared to pre-intervention. Exposure to PBSP docking stations (OR = 1.34, 95% CI: 0.57–3.11) did not appear to be associated with the likelihood of reporting a collision. The interaction term (survey period × exposure to PBSP docking stations) showed evidence of

Table 1
Unweighted and weighted sociodemographic characteristics of those reporting cycling at least one in the past year surveyed prior to (n = 847), at the end of the first season (n = 1100) and second season (n = 1190) of implementation of the BIXI public bicycle share program in Montreal, Canada.

	% Pre-implementation (n)	% Weighted pre-implementation	% Season 1 (n)	% Weighted season 1	% Season 2 (n)	% Weighted season 2
Collision						
No collision	93.39 (n = 791)	93.85	96.27 (n = 1,059)	94.97	98.24 (n = 1169)	98.13
Collision	6.61 (n = 56)	6.15	3.73 (n = 41)	5.03	1.76 (n = 21)	1.87
Quasi-collision						
No quasi-collision	87.84 (n = 744)	86.94	87.64 (n = 964)	87.12	88.32 (n = 1051)	88.57
Quasi-collision	12.16 (n = 103)	13.06	12.36 (n = 136)	12.88	11.68 (n = 139)	11.43
BIXI use						
No BIXI use	98.94 (n = 838)	98.74	86.09 (n = 947)	84.87	81.43 (n = 81)	79.56
BIXI use	1.06 (n = 9)	1.26	13.91 (n = 153)	15.13	18.57 (n = 221)	20.44
Days of cycling per week, mean (SD)	1.28 (2.09)	1.35	0.82 (1.84)	0.82	0.68 (1.71)	0.69
PBSP docking station exposure						
No exposed	53.72 (n = 455)	54.34	62.27 (n = 685)	62.82	62.27 (n = 741)	60.36
Exposed	46.28 (n = 392)	45.66	37.73 (n = 415)	37.18	37.73 (n = 449)	39.64
Count of intersections, mean (SD)	48.66 (17.63)	48.14	47.58 (16.31)	47.31	48.43 (18.21)	48.71
Helmet use						
Always	40.97 (n = 347)	37.23	37.82 (n = 416)	34.02	39.50 (n = 470)	35.40
Often	9.92 (n = 84)	10.51	9.27 (n = 102)	10.28	9.08 (n = 108)	9.30
Rarely	8.97 (n = 76)	9.96	9.00 (n = 99)	8.52	8.82 (n = 105)	9.10
Never	40.14 (n = 340)	42.30	43.91 (n = 483)	47.18	42.61 (n = 507)	46.21
Density of destinations, mean (SD)	6.84 (5.14)	6.82	7.12 (5.37)	7.10	7.38 (5.28)	7.41
Street connectivity, mean (SD)	37.49 (16.62)	37.34	35.92 (15.44)	35.52	37.04 (17.55)	37.19
Age						
18–29 years	20.54 (n = 174)	34.53	23.91 (n = 263)	40.57	21.09 (n = 251)	36.04
30–59 years	66.59 (n = 564)	56.01	65.45 (n = 720)	50.85	65.97 (n = 785)	54.58
60 + years	14.99 (n = 127)	9.46	12.64 (n = 139)	8.58	16.81 (n = 200)	9.39
Sex						
Male	52.07 (n = 441)	44.80	42.82 (n = 471)	48.76	51.76 (n = 616)	45.06
Female	47.93 (n = 406)	55.20	57.18 (n = 629)	51.24	48.24 (n = 574)	54.94
Education						
High school or less	18.77 (n = 159)	22.93	19.45 (n = 214)	24.99	14.62 (n = 174)	19.03
Trade school	9.92 (n = 84)	10.25	5.00 (n = 55)	5.29	5.80 (n = 69)	6.31
College degree	9.21 (n = 78)	9.70	17.09 (n = 188)	17.74	16.22 (n = 193)	16.63
University degree	62.10 (n = 526)	57.12	58.40 (n = 643)	51.98	61.76 (n = 735)	57.25
Employment						
Full time	6.97 (n = 59)	6.19	7.45 (n = 82)	8.16	9.58 (n = 114)	8.99
Part time	63.05 (n = 534)	57.91	61.58 (n = 678)	54.17	55.71 (n = 663)	53.30
Student	11.10 (n = 94)	20.88	12.90 (n = 142)	22.93	11.09 (n = 132)	20.08
Retired	9.68 (n = 82)	6.57	9.36 (n = 103)	7.04	10.76 (n = 128)	6.84
Other	9.21 (n = 78)	8.45	8.72 (n = 96)	7.70	10.76 (n = 128)	9.27
Household income						
<$20,000	9.45 (n = 80)	10.90	9.91 (n = 109)	10.73	10.00 (n = 119)	11.55
$20,000–$49,000	26.45 (n = 224)	26.43	27.91 (n = 307)	27.33	27.14 (n = 323)	25.94
$50,000–$99,999	29.40 (n = 249)	27.99	28.09 (n = 309)	26.53	27.73 (n = 330)	27.19
>$100,000	16.77 (n = 142)	14.94	16.36 (n = 180)	15.80	17.48 (n = 208)	17.34
Missing	17.95 (n = 152)	19.74	17.73 (n = 195)	19.61	17.65 (n = 210)	17.97

no difference in the likelihood of reporting a collision at season 1 (OR = 0.65, 95% CI: 0.22–1.89) and at season 2 (OR = 0.83, 95% CI: 0.25–2.71) between exposed and non-exposed respondents. PBSP use was not significantly related to likelihood of a collision (OR = 1.53, 95% CI: 0.77–3.02). Due to low power, confidence intervals were wide for both the interaction term (survey period × exposure to PBSP docking stations) and PBSP use. Greater number of days of cycling per week was significantly related to greater likelihood of a collision (OR = 1.27, 95% CI: 1.17–1.39). No covariates were associated with a greater or lesser risk of reporting a collision.

Table 2
Unweighted collision and near misses of those reporting cycling at least one in the past year surveyed prior to (n = 847) and at the end of the first season (n = 1100) and second season (n = 1190) of implementation of the BIXI public bicycle share program in Montreal, Canada.

	Pre-implementation	Season 1	Season 2
Sample size	847.00	1100.00	1190.00
Average days of cycling per week	1.28	0.83	0.68
No. of person-days cycled	1084.16	913.00	809.20
Reported collisions	56.00	41.00	21.00
Reported quasi collisions	103.00	136.00	139.00

Near misses

There was no evidence of a change in the likelihood of reporting a near miss at season 1 (OR = 1.24, 95% CI: 0.73–2.11) or season 2 (OR = 1.11; 95% CI: 0.64–1.91) compared to pre-intervention. Exposure to PBSP docking stations (OR = 1.48, 95% CI: 0.83–2.65) did not appear to be associated with the likelihood of reporting a near miss compared to no exposure regardless of time of measurement. The interaction term (survey period × exposure to PBSP docking stations) showed no evidence of difference in near misses at season 1 (OR = 1.05, 95% CI: 0.52–2.11) and exposure at season 2 (OR = 1.04, 95% CI: 0.52–2.09) compared to those not exposed at pre-intervention. There was limited evidence of a change in the likelihood of reporting a near miss (OR = 1.37, 95% CI: 0.94–1.98) when comparing PBSP users and non-users. Due to low power, confidence intervals were wide for both the interaction term (survey period × exposure to PBSP docking stations) and PBSP use. A greater number of days of cycling per week was related to a greater likelihood of reporting a near miss (OR = 1.34, 95% CI: 1.26–1.42). Those reporting always wearing a helmet (OR = 1.70, 95% CI: 1.24–2.33) were more likely to report a near miss compared to those never wearing a helmet. Males (OR = 1.51, 95% CI: 1.14–2.00) and those with a university degree

Table 3
Associations between reported collisions and near misses, survey period, exposure to docking stations and their interactions controlling for built environment and sociodemographic characteristics among respondents sampled at prior to ($n = 847$), at the end of the first season ($n = 1100$) and second season ($n = 1190$) of implementation of the BIXI public bicycle share program in Montreal, Canada.

	Collisions	Quasi-collisions
	Odds ratio (95% CI)	Odds ratio (95% CI)
Season 1	1.07 (0.51–2.25)	1.24 (0.73–2.11)
Season 2	0.35 (0.15–0.78)	1.11 (0.64–1.91)
Exposure to PBSP	1.34 (0.57–3.11)	1.48 (0.83–2.65)
Exposure × Season 1	0.65 (0.22–1.89)	1.05 (0.52–2.11)
Exposure × Season 2	0.83 (0.25–2.71)	1.04 (0.52–2.09)
BIXI use	1.53 (0.77–3.02)	1.37 (0.94–1.98)
Days of cycling per week	**1.27 (1.17–1.39)**	**1.34 (1.26–1.42)**
Density of destinations	1.03 (0.99–1.08)	0.98 (0.96–1.01)
Street connectivity	0.99 (0.98–1.01)	1.00 (1.00–1.01)
Helmet use		
Always	1.73 (0.94–3.19)	**1.70 (1.24–2.33)**
Often	1.21 (0.42–3.48)	1.39 (0.91–2.14)
Rarely	1.53 (0.61–3.80)	0.93 (0.51–1.68)
Age		
30–59 years	0.84 (0.49–1.45)	0.90 (0.65–1.24)
60 + years	0.57 (0.26–1.26)	0.63 (0.39–1.02)
Sex		
Male	1.11 (0.65–1.89)	**1.51 (1.14–2.00)**
Education		
Trade school	0.61 (0.21–1.74)	1.46 (0.78–2.74)
College degree	0.77 (0.34–1.76)	1.69 (1.08–2.66)
University degree	0.77 (0.28–2.15)	1.23 (0.70–2.15)
Household income		
\$20,000–\$49,000	0.54 (0.24–1.18)	1.25 (0.72–2.16)
\$50,000–\$99,999	0.52 (0.25–1.07)	1.57 (0.89–2.76)
> \$100,000	0.60 (0.20–1.79)	0.99 (0.55–1.78)

Note. OR = odds ratio; CI = confidence interval. Values in bold, $p < 0.05$. Reference categories are pre-intervention, not exposed, no PBSP use, never use a helmet, age 18–29 years, female, high school education or less, income less than $20,000.

(OR = 1.69, 95% CI: 1.08–2.66) were significantly more likely to report a near miss.

Table 3 and Fig. 1 show the results from the number of collisions and near misses per 100 person-days of cycling. Between pre-implementation and season 2, there was an approximate 50% reduction in the number of collisions per 100 person-days of cycling. There was an approximate doubling in the number of near misses per 100 person-days of cycling.

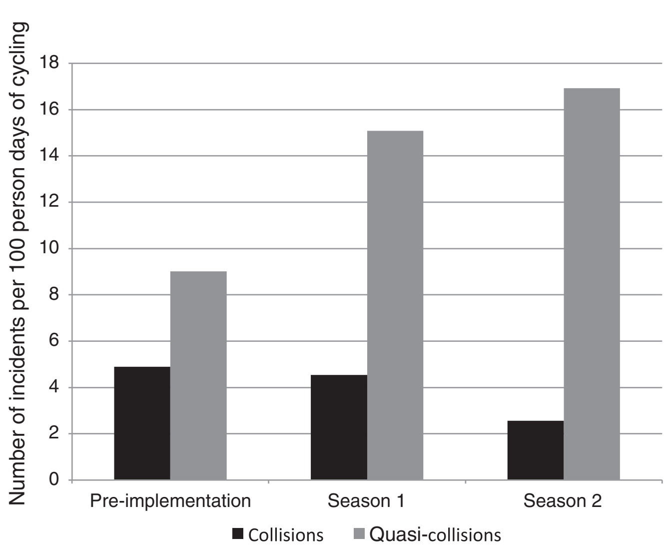

Fig. 1. Number of collisions or near misses for 100 person-days of cycling prior to, at the end of the first season and second season of implementation of the BIXI public bicycle share program in Montreal, Canada.

Discussion

This study estimated the impact of implementing a public bicycle share program on the likelihood of self-reported collisions and near misses among cyclists living in Montreal, Canada. The results show that over time those exposed to the PBSP did not appear to be more or less likely to report a collision or near miss compared to those not exposed, although the confidence intervals around many of the point estimates were large. The primary variable associated with reporting a collision or near miss was the number of days of cycling per week. This result appears consistent with research showing that increased cyclist exposure to motor vehicles increases the risk of collisions between users of these two transportation modes (Miranda-Moreno et al., 2011; Reynolds et al., 2009; Teschke et al., 2012; Turner et al., 2011). In Montreal, separated cycle tracks are not fully implemented and many cycling trips require use of the road network and thus exposure to motor vehicles. The average daily traffic at intersections is estimated at 4748 vehicles/day (Morency et al., 2012). Urban form and sociodemographic variables were not associated with a greater likelihood of collisions.

Related to the safety in numbers hypothesis, the results show an estimated, non-significant, 17% decrease (OR = 0.83, 95% CI: 0.25–2.71) in collisions after the second season of implementation for those exposed to the PBSP. Based on our past research showing a 2.86 time increase in likelihood of cycling for those exposed to the PBSB (Fuller et al., 2013), the SIN hypothesis would predict a 53% ($2.86^{-0.6} = 0.53$) decrease in the risk of a collision in this population. The predicted reduction in risk hypothesized by SIN is, not completely, but potentially consistent with the result of the present study as the 0.53 is included in the confidence interval of the estimate. However, as discussed in past research (Bhatia and Wier, 2011), the mechanisms explaining the hypothesized effect of SIN are unclear and do not offer intervention levers. Known potential intervention strategies – including reducing cyclist exposure to motor vehicles for example by implementing separated cycling infrastructure – would be a more effective and proactive strategy to increasing cyclist safety compared to simply waiting for the prevalence of cycling to increase (Chen et al., 2012; Harris et al., 2013; Siman-Tov et al., 2012).

The results for near misses showed that those always wearing helmets were more likely to report a near miss compared to those never wearing helmets. Perceptions clearly play a role in reporting near misses. We propose that helmet wearing is related to differential reporting of near misses or reverse causality. Helmet wearing cyclists, a group with higher income and education (Teschke et al., 2012), who also tend to have better compliance with traffic regulations (Farris et al., 1997; Lardelli-Claret et al., 2003), may overreport near misses, or alternately, non-helmet wearers may under report near misses. In the case of reverse causality, a near miss may frighten a cyclist into wearing a helmet.

The likelihood of reporting a near miss was significantly associated with traditional demographic factors related to risk taking, particularly, being male (Klein, 2005). However, sociodemographic factors associated with near misses were not associated with reporting a collision in our data. This result is inconsistent with objective collision studies demonstrating more collisions occur among young males (Persaud et al., 2012; Teschke et al., 2012) and may reflect differential reporting of collisions and near misses between different ages and sexes.

Future research should continue to examine the potential individual and population level risks associated with PBSP implementation and use. A retrospective case–control study could answer questions about collisions and near misses among cyclists who use the bicycle share program compared to cyclists who do not. An ecological assessment of changes in collisions around PBSP stations before and after implementation could provide insight into population level changes in collisions due to station implementation.

Limitations

Limitations include lack of power, selection bias and exposure misclassification. We estimated using the Stata powerlog program (Ender, 2002) that assuming a hypothetical odds ratio of 1.5, a sample of 139 collisions would be required for a power of 0.60, while a sample of 322 collisions would be required for a power of 0.90. This analysis suggests that the analysis, with 56, 41 and 21 collisions reported at pre-intervention, season 1 and season 2 respectively, is underpowered, which explains the width of the confidence intervals. The analysis of near misses was powered above 60%.

Weighting and including control variables were used to control for potential selection bias (Korn and Graubard, 1999). Respondents were asked to recall their most recent collision or near miss in the past year. Comparing the results of the present sample to those obtained from the Montreal ambulance service suggests that respondents were over-estimating collisions and near misses (Morency et al., 2012). We used reported collisions and near misses as outcome measures—instead of hospital, ambulance or police reports. The actual location of the collisions and near misses were not available. Thus, the exposure and urban form variables were related to respondent's home address. Another study design using the precise crash location and describing/measuring the surrounding proximal environment could take into account traffic volume, road geometry and the presence or type of bike facility (Harris et al., 2013; Strauss et al., 2013). As well, behavioral factors, such as alcohol consumption by the cyclist and cycling at night were not measured.

Conclusions

There was no evidence of a change in the likelihood of reporting collisions or near misses in Montreal in the first 2 years of implementing a public bicycle share program despite the observed increase in the likelihood of cycling. The risk of reporting a collision or near miss for PBSP users did not appear greater than non-PBSP users, and the primary risk factor for a collision or near miss was the volume of cycling in an urban setting and thus most likely exposure to motor vehicles. These conclusions should be interpreted with caution, as the power for the current study was limited.

Conflict of interest statement

The authors of this article do not disclose any conflicts of interest regarding funding sources for consultancies, studies of products or any other possible conflict.

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