Study Details

METHOD

Design - Modes of transportation by school-aged children can be easily measured and monitored using BikeWalkRoll (BWR) in classroom hands-up survey. Children are asked sequentially if they biked, walked, rolled (roller blade, skateboard, scooter), travelled in a car, or travelled by bus. The average proportion of all children surveyed who either biked, walked, or rolled is used as the BWR score for the classroom, as well as the BWR score for the school. As part of a province wide initiative led by the Green Action Centre, schools were invited to conduct BWR surveys for an entire week on three separate occasions in 2015-2017 (February, May, and October) to provide an estimate of the proportion of children who bike, walk, or roll to school in Manitoba. This study provides the descriptive statistics for the BWR surveys completed in schools during those weeks and examines the factors that may be associated with BWR scores.

Data Sources - The BWR database and WRHA school database were used for this study. The BWR database contains information from all BWR surveys completed in Manitoba school classrooms. Relevant fields in the BWR database used for this study included the school name, school division, grade, survey completion date and BWR score. The WRHA school database contained Winnipeg school information such as school name, school division, population size, and a walkability index score associated with each school. The BWR and WHRA databases were linked together by school name.

Analysis - Average BWR scores were calculated for each classroom, regardless of the number of days during the week that they completed surveys; therefore, only one BWR score was assigned to each class room. The overall average BWR score across Winnipeg for that week was then calculated. Average BWR scores were also calculated at the grade group, neighborhood walkability and school population size levels. Grade groupings were defined as early (kindergarten – grade 4), middle (grade 5 – grade 8), or senior (grade 9- grade 12) grades. Neighborhood walkability estimates were provided for each school using WalkScore, a previously validated measurement tool for estimating neighborhood walkability in multiple settings (Duncan, 2011). WalkScores for this study were derived from 3 inputs: (1) the 2011 residential population density (2) the density of amenities (store, restaurants, commercial establishments, and services), (3) the density of street intersections with 4 or more incoming roads. The inputs were calculated at the census dissemination block level (n=5500 in the Winnipeg Health Region) and were equally weighted and combined into a composite walkability score. The higher the score, the greater the estimated walkability of a neighborhood. The scores could take values from 0 -100, which were then categorized as either car-dependent (0-49 walkability score), somewhat walkable (50-69), very walkable (70-89), and walker's paradise (90-100). The walkability scores for the dissemination area that each school was a part of were used. Finally, we looked at whether the population size of the schools, which may impact the volume of vehicular traffic around the school, would affect the BWR scores. All schools in Winnipeg were categorized as small, medium or large schools based on all which third of schools their population fell in terms of ranking.

Multiple regression analysis was performed to identify any significant factors that were associated with BWR scores. For these results, every school is collapsed into a single data point (note: if a single school

has students across multiple levels of education, elementary, middle and senior schools are treated as 'separate' schools). Our variable of interest, degree of active transport, is measured by their BikeWalkRoll number, which is treated as a decimal, ranging from 0 to 1.

Other explanatory variables include the school's division, and the month when the survey was conducted. Six school divisions (Louis Riel, Pembina Trails, River East, Seven Oaks, St James and Winnipeg) conducted surveys. St. James had the lowest scores for active transport among the six divisions, so it was used as the control group in the regression. Thus, the effect of being in any other school division can be interpreted as the effect of being in another division compared to St. James. Similarly, surveys were conducted in three different months (October, February and May). October is chosen to be the control group, meaning the other two months are measured in relation to October. Significance level was set at 0.05 and all analysis was performed using Stata.

Sample - Winnipeg is the largest city in the province of Manitoba, with an estimated population of 778, 489 in 2016. There are approximately 113, 000 children attending the 305 public, institutional, funded and non-funded schools operating within 6 school divisions in Winnipeg. Of all schools, 34.9% are in car-dependent neighborhoods, 37.2% in somewhat walkable neighborhoods, 24.0% in very walkable neighborhoods, and 3.6% in walker's paradise neighborhoods. Based on school population rankings, small schools were considered those with less than 231 students, medium schools with 231 – 409 students, and large schools with more than 409 students.

There were 804 surveys completed in 199 classrooms from 40 schools during February; 1,323 surveys completed in 331 classrooms from 77 schools during the May; and 1,012 in 240 classrooms from 60 schools during the October. The proportion of classrooms that completed surveys were highest in early school (Feb 55.8%; May 53.5%; Oct 49.6%), followed by middle school (Feb 31.6%; May 35.6%; Oct 38.7%), and lowest in high school (Feb 12.6%; May 10.9%; Oct 11.7%) (Table 1).

Most of the classrooms that completed surveys in each week were in schools that were in car-dependent neighborhoods (Feb 53.8%; May 40.2%; Oct 48.3%) followed by somewhat walkable neighborhoods and then very walkable neighborhoods. Only two schools representing three classrooms in May were in a walker's paradise neighborhood.

In terms of school population size, there were 82 classrooms from large schools, 58 from medium schools and 59 from small schools in February. In May, there were 127 classrooms from both large and medium sized schools, and 77 from small schools. In October, there were 89 classrooms from large schools, 87 from medium sized schools, and 64 from small schools.

Table 1. Characteristics of classrooms that completed surveys

	Feb (n = 199)	May (n = 331)	Oct (n = 240)
Grade Group			
Early	111 (55.8%)	177 (53.5%)	119 (49.6%)
Middle	63 (31.6%)	118 (35.6%)	93 (38.7%)
High	25 (12.6%)	36 (10.9%)	28 (11.7%)

Walkability Category			
Car-dependent	107 (53.8%)	133 (40.2%)	116 (48.3%)
Somewhat Walkable	49 (24.6%)	119 (36.0%)	66 (27.5%)
Very Walkable	43 (21.6%)	76 (23.0%)	58 (24.2%)
Walker's Paradise	0 (0.0%)	3 (0.9%)	0 (0.0%)
School Size Category			
Small	59 (29.7%)	77 (23.3%)	64 (26.7%)
Medium	58 (29.2%)	127 (38.4%)	87 (36.3%)
Large	82 (41.2%)	127 (38.4%)	89 (37.1%)
Note. Reported as N (%) of classrooms			

Given that more than one classroom/grade from the same school completed surveys, the characteristics of only the schools are given in Table 2. The last column gives the values for all Winnipeg schools and illustrates that middle schools are under-represented and the schools in the car-dependent neighborhoods are over-represented in our samples. Also, only 13% of the schools surveyed in May had small population sizes.

Table 2. Characteristics of schools that completed surveys				
	Feb (n = 40)	May (n = 77)	Oct (n = 60)	Winnipeg (305)
Grade Group				
Early	31 (77.5%)	57 (74.0%)	41 (68.3)	226
Middle	3 (7.5%)	11 (14.3%)	12 (20.0%)	204
High	6 (15.0%)	9 (11.7%)	7 (11.7%)	86
Walkability Category				
Car-dependent	21 (52.5%)	31 (40.3%)	26 (43.3%)	106 (34.9%)
Somewhat Walkable	10 (25.0%)	28 (36.4%)	18 (30.0%)	113 (37.2%)
Very Walkable	9 (22.5%)	16 (20.8%)	16 (26.7%)	73 (24.0%)
Walker's Paradise	0 (0.0%)	2 (2.6%)	0 (0.0%)	11 (3.6%)
School Size Category				
Small	14 (35.0%)	10 (13.0%)	19 (31.7%)	102 (33.4%)
Medium	11 (27.5%)	30 (39.0%)	22 (36.7%)	102 (33.4%)
Large	15 (37.5%)	37 (48.1%)	19 (31.7%)	101 (33.1%)
Note. Reported as N (%) of schools. Percent is not provided for grade groupings for all Winnipeg schools because schools may be represented in more than one grouping				

RESULTS

BWR scores - Table 3 shows that the average BWR score was highest in the week in May with a score of 35.7%, followed by the week in October at 32.5%, and lowest during the week in February at 28.6%.

Table 3. Average BWR scores by week	
Grade Group	BWR
Feb (n = 199)	28.6
May (n = 331)	35.7
Oct (n = 240)	32.5

Grade Grouping - When the classrooms were stratified by their grade grouping, a similar pattern was shown during each week (Table 4). Classrooms in middle school had the highest average BWR scores in each of the three weeks, while the lowest scores were in early school classrooms.

Table 4. Average BWR scores by grade group			
Grade Group	Feb (n = 199)	May (n = 331)	Oct (n = 240)
Early	24.9%	30.1%	27.6%
Middle	36.7%	45.1%	39.1%
High	24.7%	32.5%	31.1%
Total	28.6%	35.7%	32.5%

Neighborhood Walkability - Average BWR scores according to neighborhood walkability are shown in Table 5. The highest average BWR scores were observed for somewhat walkable neighborhoods in all three weeks (36.8%, 37.0%, and 38.2%). Car-dependent neighborhoods had the lowest scores in February and May; however the very walkable neighborhoods had the lowest score in October (28.1%).

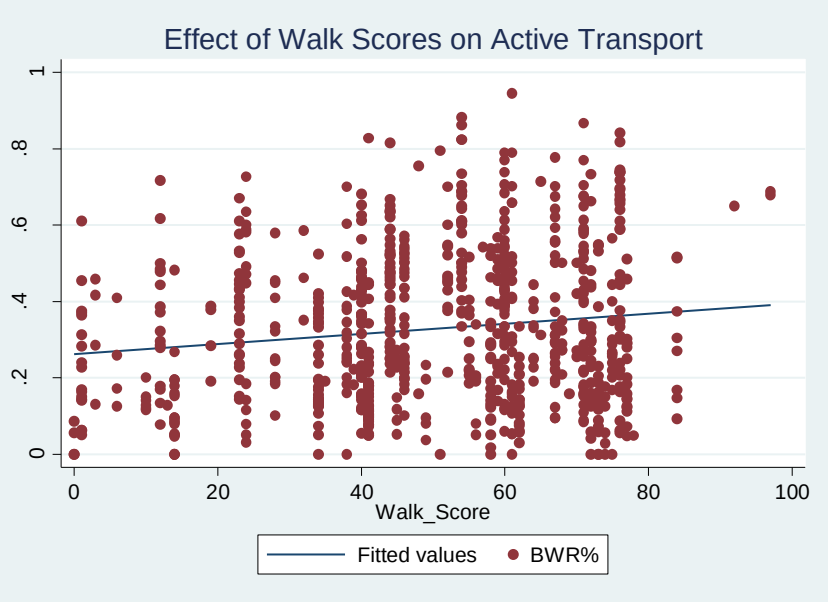
Table 5. Average BWR scores by Neighborhood Walkability			
Walkability Category	Feb (n = 199)	May (n = 331)	Oct (n = 240)
Car-dependent	24.6%	33.3%	31.3%
Somewhat Walkable	36.8%	37.0%	38.2%
Very Walkable	30.8%	36.5%	28.1%
Walker's Paradise	n/a	67.2%	n/a
Total	28.6%	35.7%	32.5%

School Population Size - The smaller schools had the highest BWR scores in each of the three weeks (Table 6). The medium and large schools were similar, except during the week in February, where the large schools BWR score was 9% points less than the medium sized schools.

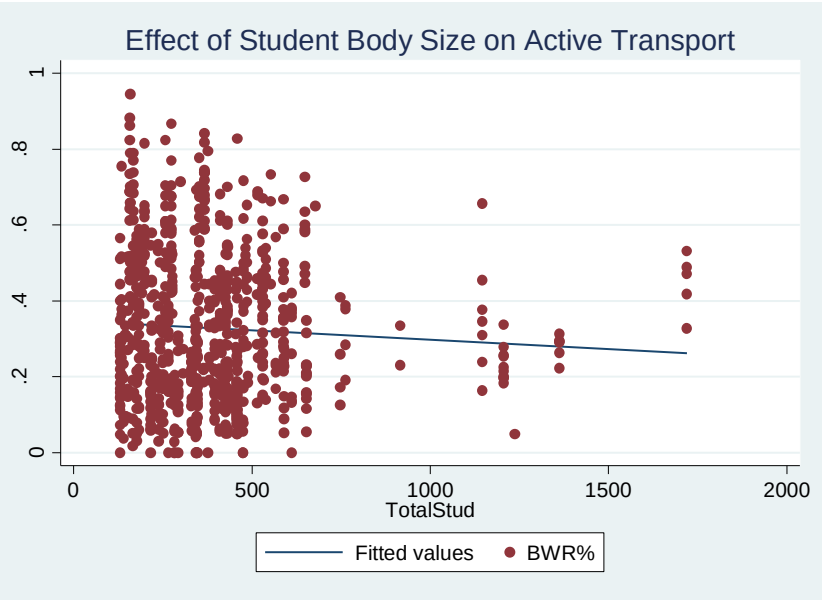
Table 6. BWR score by School population size			
School Size Category	Feb (n = 199)	May (n = 331)	Oct (n = 240)
Small	32.8%	37.9%	39.0%

Medium	32.1%	34.3%	28.4%
Large	23.1%	35.7%	31.6%
Total	28.6%	35.7%	32.5%

Regression Analysis - First, some relationships within the data are examined. Here, we see the BWR scores plotted against the neighbourhood WalkScores, where we see a small, but significant positive relationship.



On the other hand, the number of students in a school does not have a statistically significant effect on active school travel.



bwr	Coefficient (Std Err)	t	P-value	95% Confidence Interval
walk_score	0.00138 (0.000346)	3.99	0.000	(0.000701, 0.00206)
louisriel	0.174 (0.0455)	3.83	0.000	(0.0847, 0.263)
pembinatrails	0.0985 (0.0509)	1.94	0.053	(-0.00139, 0.198)
rivereast	0.165 (0.0598)	2.75	0.006	(0.0473, 0.282)
sevenoaks	0.0788 (0.0478)	1.65	0.100	(-0.0151, 0.173)
winnipeg	0.230 (0.0364)	3.74	0.000	(0.109, 0.351)
may	0.0364 (0.0179)	2.14	0.033	(0.00303, 0.0697)
feb	-0.0559 (0.0186)	-3.00	0.003	(-0.0924, -0.0193)
Constant	0.109 (0.0498)	2.19	0.029	(0.0112, 0.207)

Above are the overall regression results demonstrating the individual controlled effect of each variable. A p-value of less than 0.05 indicates that the variable in question has a significant effect on BWR scores (either positive or negative) with a 95% degree of confidence. The size and direction of that effect is given by the coefficient term.

WalkScores are a significant positive predictor of BWR scores. After controlling for the school division and time of year of the study, improving the walk score of a neighbourhood by 10 points would be expected to cause an additional 1.37% of students to use active transport to school in Winnipeg.

The time of year of the survey has the expected effect on active school travel. Overall, an extra 3% of student's BWR in May compared to October, and 5% fewer students BWR in February compared to October.