

Safe Routes to School:
Providing Better and Safer Transportation Choices for Students

Erin MacGregor

Paper prepared for presentation
at the Road Safety Strategies for Vulnerable Road Users Session

Of the 2013 Conference of the
Transportation Association of Canada
Winnipeg, Manitoba

Abstract

This study investigates the school commuting behaviour of children at three elementary schools in the District of North Vancouver, British Columbia. The intent of this research is to gain an understanding of the barriers to active commuting in these neighbourhoods and make design response recommendations that could be implemented by the District of North Vancouver and North Vancouver School District.

The District of North Vancouver (DNV) and North Vancouver School District (NVSD) originally jointly conducted a school safety review and developed a Safe Routes to School plan for these three elementary schools. The purpose of this study was:

- to identify transportation issues and opportunities around each school;
- to develop recommendations to improve the safety and access to each school; and
- to promote healthy and active modes of transportation to school such as walking and cycling.

Following the DNV and NVSD study, the topic was used as the basis for a Master's Degree Thesis, which used a mixed-method research approach that included the use of the survey data and site analysis.

Distance was found to be the most significant barrier to active commuting for children at these schools. Other barriers found include traffic safety (intersections, speed and traffic volume), age of child, lack of adult supervision, before and after school activities and the condition of sidewalks.

This study makes recommendations that are intended to help the District of North Vancouver and North Vancouver School District address the barriers to active commuting for the study area schools and prioritize sustainable transportation choices.

Introduction

Children's school commuting has become a topic of concern in recent years as children's walking and cycling to school is on the decline in most westernized countries (McDonald, 2007; Yeung et al., 2008; van der Ploeg et al., 2008; Schlossberg et al., 2006). Safe Routes to School is an approach to increasing children's use of active commuting that has become in international movement with a National Safe Routes to School program in the United States and it is gaining popularity in Canada, Australia, New Zealand and other westernized countries. Safe Routes to School focuses on improving safety for school commuting and is structured around five principles known as the "5 E's": Engineering, Education, Encouragement, Enforcement, and Evaluation.

This study investigates the school commuting behaviour of children at three elementary schools in the District of North Vancouver, British Columbia. The schools studied include Braemar, Cleveland and Ross Road Elementary schools, three of the 25 public elementary schools currently operating in the North Vancouver School District.

This study attempts to answer the following research questions:

- What are the barriers/constraints and concerns with children's active commuting in the study area?
- Based on the study findings, what recommendations can be made to increase walking and cycling, and prioritize sustainable transportation options for these communities?

The intent of this research is to gain an understanding of the barriers to active commuting in these neighbourhoods and make design response recommendations that could be implemented by the District of North Vancouver and North Vancouver School District.

Background

North Vancouver is part of Metro Vancouver's North Shore area and consists of two separate municipalities: the District of North Vancouver and City of North Vancouver. The three schools in this study are located in the District of North Vancouver (DNV).

The DNV is primarily a residential community with large areas of park space, forest, an industrial waterfront and mountain backdrop. Commercial activity is almost entirely limited to major arterial corridors.

All three schools are located in low-density neighbourhoods, characterized by single-family detached homes. Braemar's catchment area serves the Delbrook, Upper Delbrook and Norwood-Queens neighbourhoods. Cleveland is located in the Capilano-Highlands area and serves the Capilano and Handsworth neighbourhoods. Ross Road is located in Lynn Valley and serves the West Lynn Terrace, Upper West Lynn and Lynn Canyon neighbourhoods.

Lynn Valley is the District of North Vancouver's Municipal Town Centre. This area has become a hub for higher density residential development, as well as commercial, recreational and civic uses, and in the years to come Lynn Valley is envisioned to become a "more vibrant, pedestrian oriented, mixed use centre with housing choices and inviting street level shopping along a High Street with sidewalk cafes and community spaces" (DNV, 2011). Ross Road Elementary is located in a residential neighbourhood in Lynn Valley that borders the Town Centre area, but is not located in the Town Centre itself.

Methodology

This study uses a sequential explanatory strategy mixed-methods research approach. The methods used in this study include survey and site analysis. A literature review was also an essential element of this research that

was used to establish the key barriers to active commuting to be analyzed in this study.

The survey used in this study was designed by the District of North Vancouver and North Vancouver School District #44, along with consulting firm Urban Systems Inc., which was responsible for the collection of data, originally for the purpose of the 2011 School Transportation and Safety Review. Survey questionnaires were sent via email to all parents of students at Braemar, Cleveland and Ross Road by the school principals. The email to parents included a link to the online survey, which was hosted at www.surveymonkey.com/s/SchoolSafetyReview, and was available from June 10-24, 2011.

The survey questionnaire was sent to 100% of parents with children attending the three schools. Overall, 160 surveys were received, representing 252 students, out of 1,518 students enrolled at the three schools. This was a response rate of approximately 17%, which is low but not uncommon for survey research. Cleveland had the highest participation rate at 21%, followed by Braemar at 18% and Ross Road with 11%.

Site analysis of the study area included assessments of demographics, zoning, landscape, road classification, sidewalks, and traffic movement for each catchment area. The demographic, zoning and landscape information provided an overview of the existing conditions and character of these neighbourhoods. Investigation of road classification and sidewalk conditions provided detailed information on the transportation infrastructure. Lastly, a study of traffic movement patterns provided insight into traffic congestion and travel characteristics.

Findings

This study found several barriers to children's active commuting in the three catchment areas. Findings were made on eight of the thirteen barriers

investigated: distance, age, school choice, urban design, traffic around schools, major roads, household interactions, and perceptions. The most significant barriers to active commuting found in this study were commute distance, followed by traffic safety concerns (intersections, speed, traffic volume), age of children and whether there is adult supervision, before and after school activities, and the condition of sidewalks. A summary table of Barriers and Findings is provided in Figure 1.

Figure 1: Summary Table of Barriers and Findings

Barrier	Findings
Distance	<ul style="list-style-type: none"> distance was the top concern of drivers and all respondents living beyond 1600m walking steadily decreased with distance while driving increased
Age	<ul style="list-style-type: none"> Most parents allow children to walk at age 10 Survey results showed a slight increase in walking with age due to greater independence. Mode share by distance and grade shows distance may be a more significant than age alone.
School Choice	<ul style="list-style-type: none"> School choice is correlated to driving because many students travel from out of catchment. 56% of French Immersion students drive vs. only 28% of English students.
Urban Design	<ul style="list-style-type: none"> Post-War auto-oriented design makes active commuting difficult because of added distance by non-direct routes (curvilinear streets) and potentially dangerous interactions with vehicles where there are no sidewalks or crosswalks. Sidewalks only collector and arterial roads.
Traffic Around Schools	<ul style="list-style-type: none"> Dangerous pick up/drop off, traffic violations, speed and aggressive driving were concerns. These concerns are not always barriers but caused frustration among parents.
Major Roads	<ul style="list-style-type: none"> Parents identified major roads as barriers: Capilano, Queens, Lonsdale, Delbrook, Ross Rd.
Household Interactions	<ul style="list-style-type: none"> Survey found that 66% of children who walk do so with a parent or caregiver.
Perceptions	<ul style="list-style-type: none"> Little evidence of misperceptions. Distance and infrastructure issues were main concerns. Concern of crime was low, in line with low crime rates.
Activities	<ul style="list-style-type: none"> Ranked in the top 5 overall concerns of parents
Landscape/Natural Environment	<ul style="list-style-type: none"> Creeks, rivers and steep terrain create physical barriers to many direct routes. Weather ranked low as a concern and was shown to only impact those who regularly walk.
Bullying/Older Children	<ul style="list-style-type: none"> Comments in the open-ended section suggest that older students from nearby secondary schools may be a barrier to active commuting because of intimidation of younger children.

Distance was found to be the most critical factor determining mode choice for children at these three schools. The majority of students who live within their catchment area were reported to regularly actively commute to school. Of those respondents living closest to school – within 400m, 84% walk or bike to school. Of children living within 400-800m, 76% regularly actively commute. Driving was shown to begin increasing at the 800m distance, and driving became the

dominant mode choice for students living beyond 1600m from school, with 86% of those students being driven regularly.

One particular group that requires special attention are children who live within walking distance but are driven to school. The survey results showed walking began to decline in the 800-1200m range. While walking distance is subjective, for the purpose of this analysis, walking distance will be considered within 800m of the school. The following maps (Maps 1-3, below) show the locations of where respondents live (marked at the closest intersection), colour coded by typical mode choice on sunny days. Red dots indicate children who are driven to school, green are those who walk and blue are those who cycle to school.

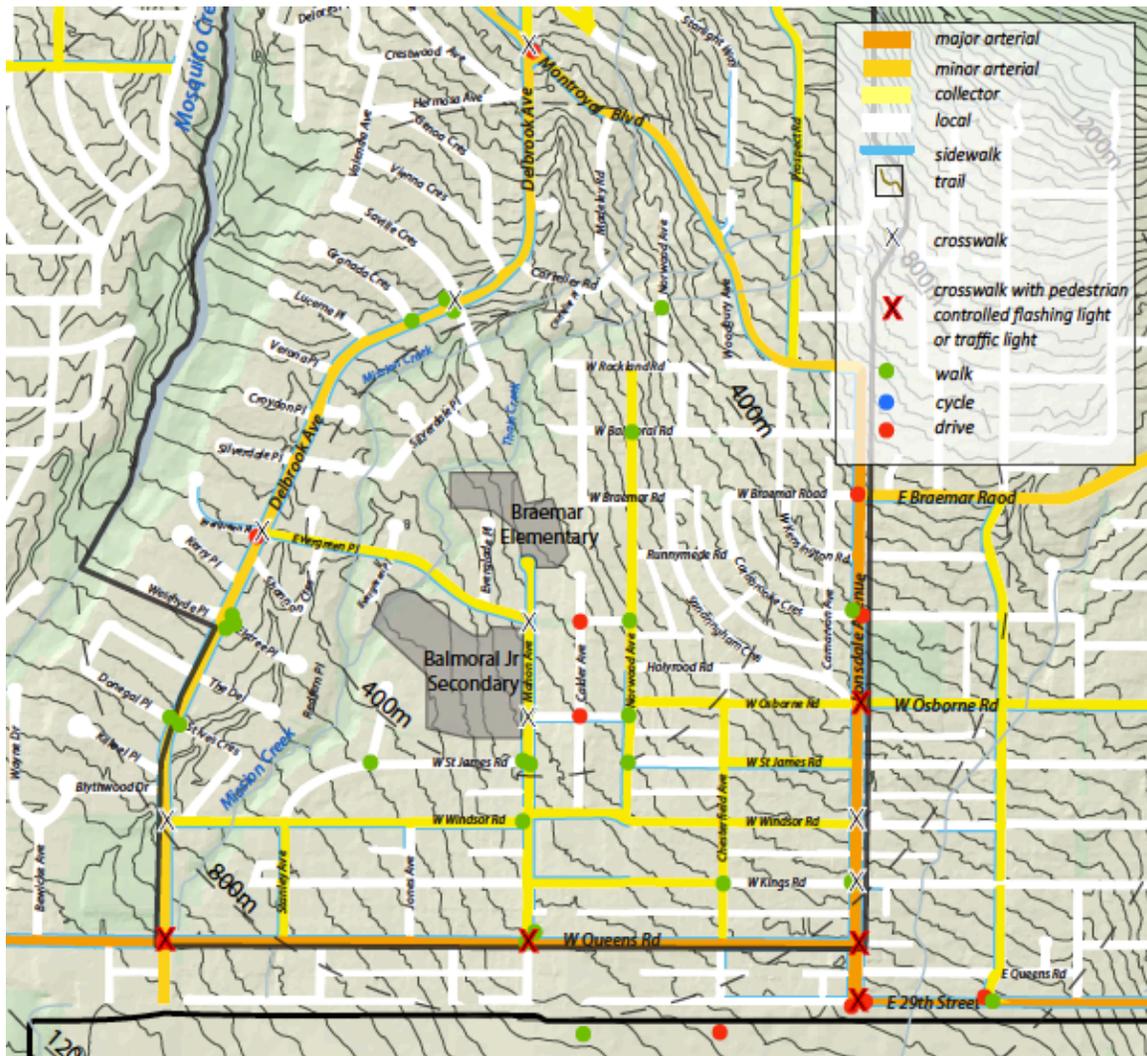
At Braemar, with the exception of the two red dots on Calder Avenue (within 400m of the school), all the other red dots within 800m are located along major and minor arterial streets – at the intersections of Delbrook and Evergreen, Lonsdale and Braemar, and Lonsdale and Carisbrooke, with a few more red dots just beyond the 800m distance at Delbrook and Montroyal, Delbrook and Queens, and along 29th Street.

Cleveland also shows several respondents who drive but live within close proximity of the school. In this area we see red dots at Capilano and Eldon (only 200m from the school) and Capilano and Edgewood. Capilano Road is a very busy major arterial corridor. At this school we also see clusters of red dots at the intersections of Edgemont and Sunset and Sunset and Ruby. Edgemont Blvd and Sunset Blvd are classified as collector roads but Edgemont in particular is an example of a road in which the traffic patterns do not match the road classification. Edgemont operates more as a minor arterial, with no stop signs between Capilano Rd and Edgewood Dr. Traffic along Edgemont typically travels at or above the speed limit and this is also a bus route. Sunset is more accurately classified as a collector road, however, the intersection of Sunset and Ruby has poor visibility due to curves in the road, no stop signs (allowing for free-flow of traffic), a steep hill north of Ruby that may increase speed of southbound traffic

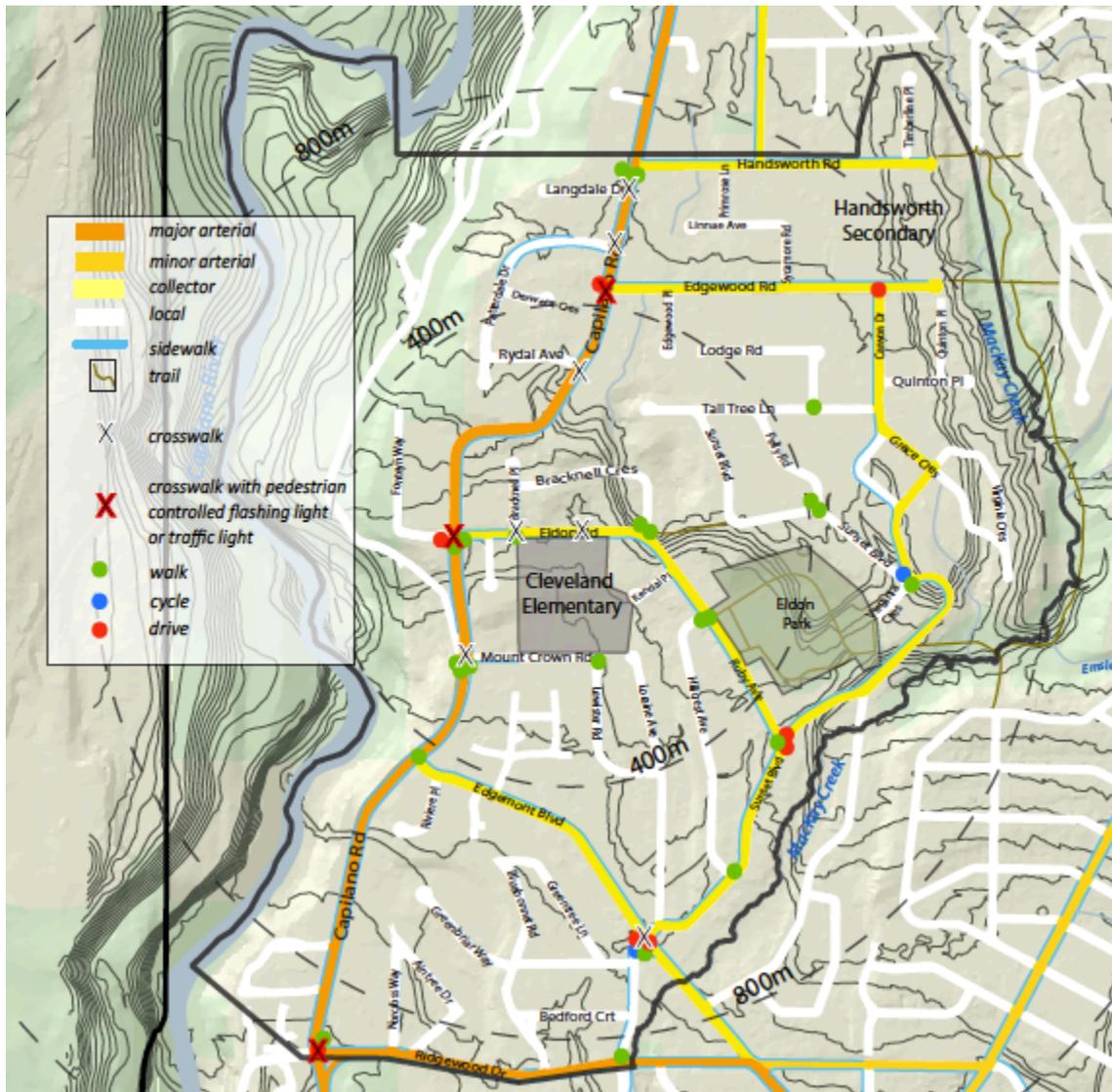
coming down the hill and also reduces ability to stop quickly, and no sidewalk on the east side, as well as no crosswalk at the intersection.

At Ross Road there were no respondents who are driven that live within 800m. The closet student reported as being driven regularly lives about 1100m from the school and along a major arterial (Mountain Hwy).

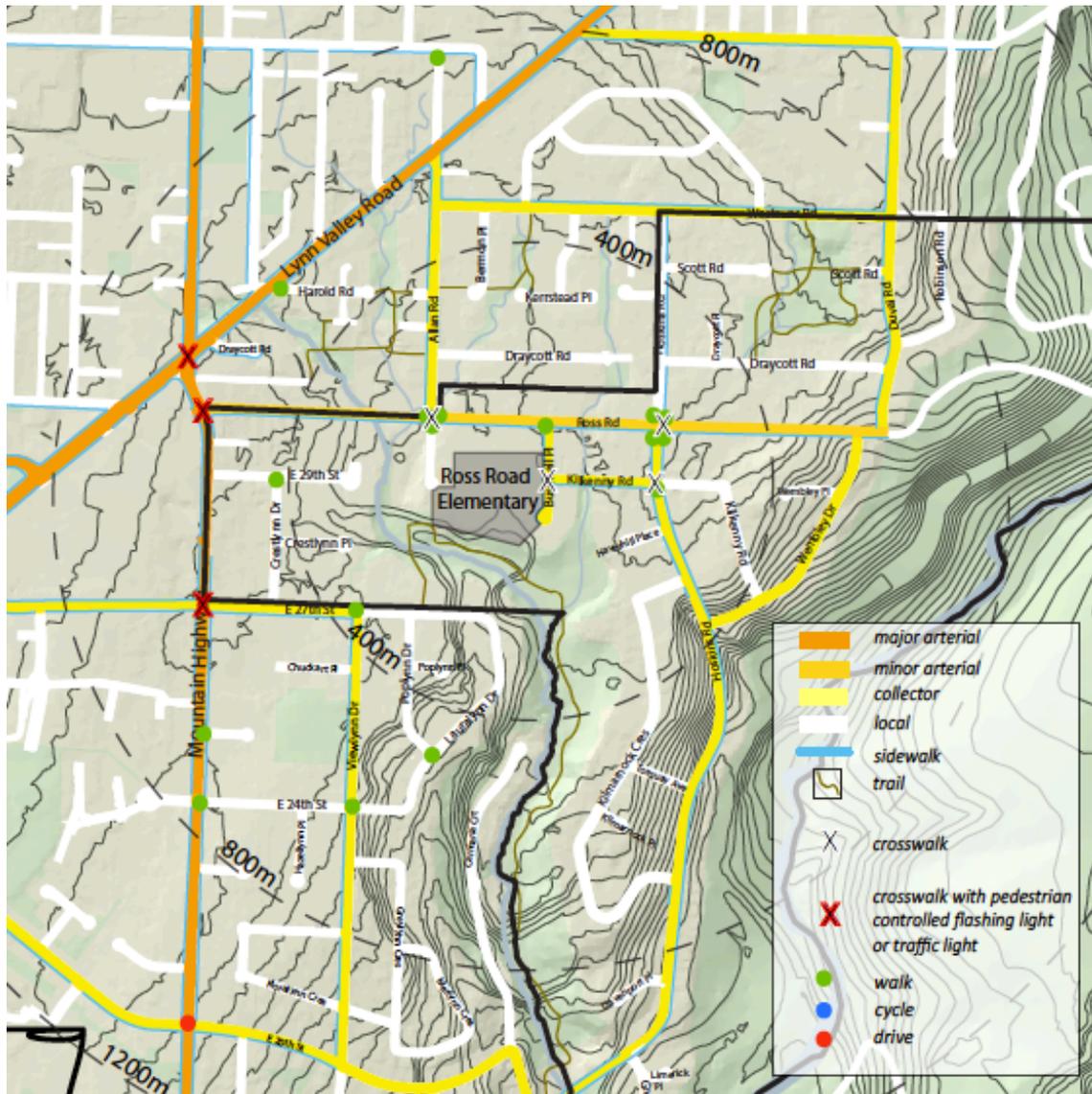
Map 1: Braemar – Respondents Living within 800m



Map 2: Cleveland – Respondents Living within 800m



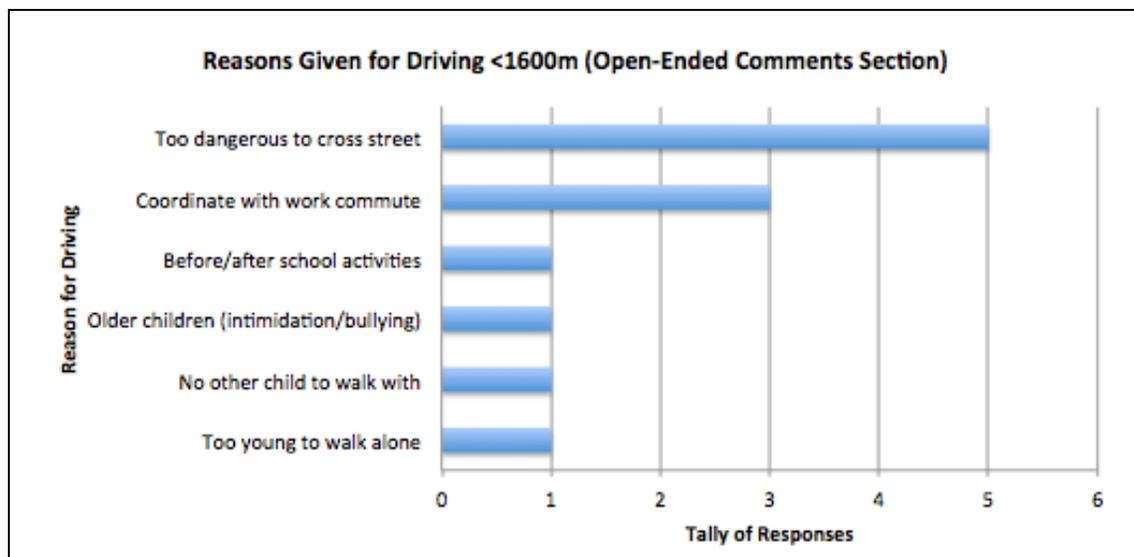
Map 3: Ross Road - Respondents Living within 800m



Investigating into this further, the open-ended responses from parents of students living within 1600m agree with the map assessment above. For this analysis 1600m was used because of a low number of open-ended responses on why parents drive their children to school. There were 19 parents with children living within 1600m of school who responded that they regularly drive, 14 of these parents left comments in an open-ended comments section, and of those who provided comments, 9 parents gave reasons for driving (some had multiple reasons). Figure 2, below, shows their responses. While the number of

respondents was very low, the largest group of parents said their reason for driving was because it is too dangerous to cross a street. Most of the parents who felt it was too dangerous to cross a street also live close to major intersections, which indicates this is a barrier to active commuting. Other reasons given for driving children who live within walking distance are trip chaining on work commutes, before and after school activities, older children (intimidation and bullying) and age of children/lack of adult supervision for active commuting.

Figure 2: Reasons Given for Driving Students Living Less Than 1600m From School



Bullying and older children were identified as issues in the open-ended survey responses from parents of Braemar students. This issue was confirmed by site visits in which students from the nearby Balmoral Junior Secondary School were observed to be obstructing the ability of other children and families to walk on the sidewalk near Balmoral, as well as walking in the street, stepping out in front of moving vehicles, and jaywalking, which may be seen as intimidating behaviours to younger children. As of this school year, Balmoral is no longer used as a junior secondary school and is now operating as a continuing education facility and alternative school. It is yet to be determined if this will have

a positive impact on reducing the number of families concerned about bullying and intimidation by older students.

Catchment Areas and Mode Share

This study found differences in active commuting mode share between the three schools that may be explained by the different characteristics and barriers around each school.

It was found that Ross Road had the highest walking and cycling mode share, followed by Cleveland and lastly Braemar. It is likely that Ross Road has the highest rates of walking and cycling because of a combination of environmental and urban design factors that increase the ability to walk and cycle to school – these being that the immediate area around Ross Road is relatively flat and there are no major arterial roads to cross within the catchment.

Cleveland also has relatively flat terrain, which may increase the likelihood of active commuting. However, major roads in the Cleveland catchment (Capilano Road and Edgemont Blvd) were proven to be barriers to active commuting and help to explain why Cleveland had several students who live within walking distance of the school that are regularly driven. Braemar had the lowest rate of active commuting but also features the steepest terrain and several arterial roads (Lonsdale, Queens, Delbrook and Montroyal) within the catchment boundaries. The size of the Braemar catchment (it is the largest of the three catchment areas in this study) may also explain why it had the highest rate of driving, as catchment size relates to distance. Large catchment areas can mean that some children live within their catchment but the distance is still too far for active commuting. At Braemar, students living within the catchment could live as far as 2.5km from the school, when you factor in the design of road network (curvilinear street design and indirect routes make actual commute distance much further than the 'crow flies' distance).

Some issues relating to landscape and the natural environment were also found. The survey did not ask any specific questions about the landscape or physical environment, however it became evident through site analysis that the

design of these neighbourhoods impacts the ability to actively commute because of added distance created by the road network design and physical obstacles such as creeks and rivers. Topography also likely impacts commute mode, as these neighbourhoods, particularly in the Braemar catchment, have areas of very steep terrain. Long commute distances in addition to steep terrain make these physical landscape issues an even greater concern and decrease the likelihood of active commuting.

Perceptions

It was important that this study test for parental perceptions, as a review of literature on barriers to children’s active commuting indicated that perceptions could play a major role in mode choice decision-making. In order to see if perceptions have a significant impact on mode choice in these schools, the survey asked parents to identify the issues that affect their decision to allow children to actively commute. Figure 3 ranks the responses from parents by the distance that they live from the school, as well as by the respondent’s typical mode choice (the ‘Walkers’ category includes those who bike to school).

Figure 2: Issues Affecting Decision to Allow Children to Walk/Bike to School

Rank	Overall	<400m	400-800m	800-1200m	1200-1600m	>1600	All Walkers	400-1600m Walkers	All Drivers	400-1600m Drivers
1	Intersections	Intersections	Intersections	Intersections	Intersections	Distance	Intersections	Intersections	Distance	Intersections
2	Speed/Traffic	Speed/Traffic	Activities	Activities	Amount/Traffic	Amount/Traffic	Speed/Traffic	Activities	Speed/Traffic	Speed/Traffic
3	Amount/Traffic	Amount/Traffic	Amount/Traffic	Speed/Traffic	Speed/Traffic	Speed/Traffic	Amount/Traffic	Speed/Traffic	Amount/Traffic	Amount/Traffic
4	Distance	Sidewalks	Speed/Traffic	Weather	Activities	Intersections	Sidewalks	Amount/Traffic	Intersections	Activities
5	Activities	Distance	Sidewalks	Amount/Traffic	Sidewalks	Time	Activities	Sidewalks	Activities	Time
6	Time	Activities	Time	Sidewalks	Time	Activities	Distance	Time	Time	Weather
7	Sidewalks	Supervision	Distance	Time	Convenience	Supervision	Time	Weather	Supervision	Supervision
8	Supervision	Crossing Guards	Supervision	Distance	Distance	Sidewalks	Supervision	Distance	Sidewalks	Sidewalks
9	Crossing Guards	Time	Crossing Guards	Crime	Supervision	Weather	Crossing Guards	Supervision	Weather	Crime
10	Weather	Crime	Weather	Supervision	Weather	Crossing Guards	Weather	Crossing Guards	Crossing Guards	Convenience
11	Crime	Weather	Crime	Crossing Guards	Crossing Guards	Crime	Crime	Crime	Convenience	Distance
12	Convenience	Convenience	Convenience	Convenience	Crime	Convenience	Convenience	Convenience	Crime	Crossing Guards

The above table shows that intersections and distance were the top issues for parents. Both the parents of children who walk and those who are driven were concerned with intersections, the amount of traffic and speed of traffic. The two major differences between parents of children who walk and those who are driven are that the driving group was most concerned about distance while the walking group was more concerned about sidewalks. Distance was the top issue for those who drive, likely because the majority of drivers live beyond a walkable distance. This indicates that parents do not have misperceptions of the distance to school, but rather it is fair to say that the distance is too far to walk.

The fact that crime ranked low as an issue indicates that parents do not have misperceptions about crime rates and criminal dangers in these neighbourhoods. The crime rate is very low in North Vancouver, with 43 offenses in 1,000 population, well below the Metro Vancouver average of 76 offenses in 1,000 population (Ministry of Public Safety and Solicitor General, 2011).

This study also found that not all concerns are barriers to active commuting. Barriers are those issues that prevent active commuting. This research found that although almost all parents had concerns about traffic safety, many still allowed their children to walk or cycle. Issues related to pick-up/drop-off areas were a common theme among respondents, but many of these concerns appear to be frustrations with the behaviour of other parents (illegal parking, u-turns, etc.) that were not demonstrated to be barriers to active commuting for the majority of people who lived within walking distance. That said, this finding demonstrates that while not all concerns prevent active commuting, broadening the scope of issues that should be addressed to include both the barriers and other common concerns may improve pedestrian and cycling conditions, as well as the perception of these conditions, helping to maintain existing active commuters and encouraging more people to actively commute.

Recommendations

In order to design effective strategies to increase active commuting, design principles should be established, which create a framework for recommendations. Based on the analysis and findings of this study, the following three design principles should be considered:

1. Enhance safety of walking and cycling
2. Reduce commute distances
3. Improve perceptions of walking and cycling

From these principles, the key design recommendations to come out of this study are as follows:

- **Infrastructure improvements** should be made that address the problem streets and intersections found through the survey and site analysis, particularly on major roads, as well as improving the conditions of the sidewalk network. Based on the findings of this study, it would be desirable to not only address the problems in the school pick-up/drop off areas, but also the issues related to crossing major roads and problem intersections that in many cases are located away from the schools but within the catchment areas. Sidewalks were also one of the top concerns of parents of children who walk to school. Site analysis showed that the sidewalk network is lacking or in need of improvement in many locations. It is recommended that gaps in the sidewalk network be completed and that sidewalks be added to both sides of the street on arterial and collector roads that are used to access the schools.
- **Crossing guards** should be better utilized. Crossing guards are currently used at Cleveland and Ross Road elementary schools but at present they are only used at the crosswalks closest to the main entrance to the schools. Schools should consider hiring professional crossing guards and/or locating crossing guards at the problem intersections that were identified as barriers

to active commuting, such as Capilano Road, Delbrook Ave, Mahon Ave, Lonsdale Ave and Ross Road. In addition to helping children to safely cross the street, crossing guards create a visible cue to drivers that they are in the proximity of a school and to exercise caution in and around the crossings. Crossing guards may also deter traffic violations by being a visible presence and could provide some enforcement of regulations around schools.

- **Walking School Bus and cycling groups** should be used to encourage active commuting, reduce the age at which parents allow children to actively commute, and as a means to reduce parental scheduling conflicts with work commutes and other activities. A walking/cycling school bus is an active transportation system that involves volunteer parents or caregivers taking turns walking or cycling with children as a group to get them to and from school (Go for Green, 2004). These programs usually share supervision responsibility among several volunteers who alternate days leading the group.
- **French Immersion catchment area** should be considered to reduce the distance travelled to school. Catchment boundaries are currently used for students in the English Program, but French Immersion students have no specific catchment area, therefore many French students travel from outside their school catchment area. At Cleveland and Ross Road, all students living beyond 1600m from school were in the French Immersion program. A word of caution on this is that the catchment system may not be desirable where enrollment is declining and the School District is encouraging French students to come from out of catchment to maintain and increase enrollment numbers. This raises other concerns about the challenges faced by the School Districts, but these are outside the bounds of this study.
- **Zoning and Land Use** designations should be amended to allow for higher density development that complements the character of the existing neighbourhoods. This strategy would bring more people into close proximity of existing schools, increasing enrolment numbers without expanding

catchment areas beyond walkable distances. Duplex, townhouses and row housing that are large enough for families with children and have amenities such as backyards would be the most desirable form of development and still keep with the general character of the existing neighbourhoods. This may also help overcome some of the barriers younger families face in moving into these neighbourhoods by providing options that are more affordable than the existing housing stock, where the District-wide average cost to own a home is over \$680,000 (Statistics Canada, 2006). This planning vision is also in line with the District of North Vancouver and Metro Vancouver Regional District's objectives of developing "complete communities" that meet the needs of residents of all ages, which should include children.

- **Landscape** barriers should be overcome by improving trails as a way to create shorter routes to school. This should include safe, child-friendly walking and cycling pathways, trails and other shortcuts, as strategies for reducing the friction of distance. There are currently many trails through forest and creek areas around all three schools that could be used to shorten road routes but some parents suggested that these trails are currently too dangerous for children to use alone or are in poor repair. With upgrades to the existing trails or the creation of new pathways, individual students and walking/cycling school bus groups could use these routes safely as ways to reduce commute distances while avoiding the hazards of vehicle traffic.
- **Education and promotion** should be used to improve perceptions of active commuting and to increase knowledge of traffic and safety. By educating parents and children on safe walking/cycling behaviour, parents can be encouraged to allow children to walk or cycle to school, and reduce the age at which parents allow children to walk without adult supervision. Empowering parents and children with knowledge about safety regarding roads, strangers, and the programs in place to help them in times of trouble, will hopefully encourage parents to allow active commuting, knowing their children have the skills and knowledge to deal with situations that could

possibly arise. Workshops for parents, and programs integrated into the school curriculum can disseminate knowledge of safe walking and cycling practices and establish the necessary skills in a collaborative way.

Conclusion

Encouraging children's active commuting will help better our communities by promoting health and wellness, improving traffic management, reducing the environmental impact of auto use, and could potentially improve the social wellbeing of school-aged children and their families.

The recommendations made in this study all work within the framework of the Safe Routes to School model being used by the District of North Vancouver and the general principles of Safe Routes to School known as the "5 E's": Engineering, Education, Encouragement, Enforcement, and Evaluation. The recommendations in this study focus on design interventions to increase active commuting that fall under the first four of the E's. The last E – Evaluation, comes later after the recommendations are in place and programs have had time to take root in the community. Evaluation is an important element of any project but falls outside the scope of this study. However, evaluation of the District of North Vancouver's Safe Routes initiatives would be an opportunity for future study and follow up.

The findings of this study have provided a better understanding of the barriers to active commuting in these neighbourhoods and will provide the District of North Vancouver and North Vancouver School District with recommendations that help to increase and sustain active commuting at these three schools. As we look ahead, it is hoped that increasing active commuting to school will in part help the District of North Vancouver to achieve its long-term goals of reduced automobile dependence, thereby creating a more sustainable future.

Works Cited

District of North Vancouver. (2012). *Transportation Plan*.

District of North Vancouver/North Vancouver School District #44. (2012). *2011 School Transportation and Safety Review*. Retrieved from <http://www.dnv.org/upload/pcdocsdocuments/12q9701!.pdf>

Go for Green. (2004). *How to Organize a Walking/Cycling School Bus, Second Edition*. Active and Safe Routes to School.

McDonald, N.C. (2007). Active Transportation to School Trends Among U.S. Schoolchildren, 1961-2001. *American Journal of Preventive Medicine*, 32 (6), 509-516.

Ministry of Public Safety and Solicitor General. (2011, October). *Crime Statistics in British Columbia, 2010*. Retrieved from <http://www.pssg.gov.bc.ca/policeservices/shareddocs/crime-statistics.pdf>

Schlossberg, M., Phillips, P.P., Johnson, B., & Parker, B. (2006). School Trips: Effects of Urban Form and Distance on Travel Mode. *Journal of the American Planning Association*, 72 (3), 337-346.

Statistics Canada. (2006). Census of Canada. (h. District of North Vancouver (Distributor), Compiler).

van der Ploeg, H.P., Merom, D., Corpuz, G., & Bauman, A.E. (2008). Trends in Australian children traveling to school 1971-2003: Burning petrol or carbohydrates?, *Preventive Medicine*, 46, 60-62.

Yeung, J., Wearing, S., & Hills, A.P. (2008). Child transport practices and perceived barriers in active commuting to school. *Transportation Research Part A*, 42, 895-900.