Norwest Cycle Club

Cycling Safety Issues in North and West Vancouver

Survey Results

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Ron and Barbara Howard Fund

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North Shore Cycling Safety Survey

Objective

The objective of this study is to gather data which will assist in the development of municipal strategies to make cycling safer on the roads of the North Shore.

Literature review

A review of the cycling safety literature was conducted to create the basis for the development of a questionnaire. A separate document contains the results of that selective literature review.

Sample selection

During June 2013 respondents were contacted in various ways and encouraged to go to a website (http://tinyurl.com/NWCcyclesurvey) and complete a twenty-nine question questionnaire. Sample members were obtained as follows: volunteers passed out promotional pieces at Community Day in West Vancouver, at the MEC Bike Fest, at the Mountain Equipment store in North Vancouver, at various locations including the on and off ramps to the Lions Gate Bridge and the Iron Workers' Memorial Bridge. Promotion literature was made available at the libraries on the North Shore and at a number of bicycle shops. As well members of the Norwest Cycle club, the HUB and other cycling groups were asked to complete the questionnaire. Three $50.00 MEC gift certificates were offered to encourage participation. In total 508 individuals completed the form.

The questionnaire

A copy of the questionnaire is found in the Appendix.

Data analysis

The data were collected using an online survey platform. Duplicate responses from the same participant were not included in the data analysis. More detail on the data analysis is contained in the Appendices.

Results

Section 1 – Demographics

Gender of sample members

More than 60% of sample members are male while 35% are female.

Table 1. Gender of sample members.

Gender	# of Respondents	% of Sample
Male	315	62.0
Female	180	35.4
No answer	13	2.6
N	508	100.0

Question 1. Gender: Male Female Prefer not to answer

Cycling safety literature: Gender and cycling

- "Most research concludes that men cycle more than women.[1] In countries with low cycling rates, men tend to cycle more, while in countries with high cycling rates, women cycle more.
- "Cycling is slightly less male dominated in Canada than in the USA: 29% vs. 24% female share of bike commuters for the countries as a whole".[2] In Vancouver, Montreal and Toronto women make up 35-37% of bike commuters. Canada Census only reports on work commutes, and excludes children, retired seniors, unemployed and for daily activities. [3]
- Cycling is gender neutral in the Netherlands, Denmark and Germany, is male dominated in the UK and the USA, where men are responsible for 72% and 76% of all bike trips.[4]

Age of sample members.

The median age of the sample is 40 to 49 years; the average age is 48.6 years. It seems likely that inclusion of members of the Norwest Cycle Club in the sample tilted the sample age in an upward direction.

Table 2. Age of sample members

Age	# of Respondents	% of Sample
Less than 20 years	9	1.8
20 to 29	51	10.0
30 to 39	87	17.1
40 to 49	112	22.0
50 to 59	109	21.5
60 to 69	89	17.5
70 and older	43	8.5
No answer	7	1.4
N	508	100.0

Question 2. Age

Cycling safety literature: Age and cycling

- In the Netherlands, Germany and Denmark cycling rates fall only slightly with age.[5]
- Children and adolescents have the highest cycling rates in almost every country. [6]
- In the USA cycling rates decline with age from 3.2% among children to 0.4% of trips for 40 and older.[7]

Possession of a drivers license

Over 96% of members of the sample reported having a driver's licence.

Table 3: Possesion of a Driver's Licence

Hold a driver's licence	# of Respondents	% of Sample
Yes	489	96.3
No	11	2.2
No answer	7	1.4
N	508	100.0

Question 4: Do you have a driver's licence?

Section 2 – Type and frequency of cycling on the North Shore

Cycling expertise of sample members

The largest group of sample members describes themselves as intermediate in cycling skill. A sizable proportion feel they are expert riders.

Table 4. Cycling expertise of sample members

Cycling Expertise	# of Respondents	% of Sample
Expert	199	39.2
Intermediate	276	54.3
Beginner	21	4.1
No answer	12	2.4
Total	508	100.0

Question 3. Would you describe yourself as having an expert, intermediate or beginner level of expertise cycling?

Cycling safety literature: Level of Experience and Cycling

- Less confident cyclists tend to prefer bike paths that have some type of barrier from vehicle traffic over bike lanes.[8] This includes separate bike paths, multi-use paths and cycle tracks.
- Cyclists with less experience were found to cycle on sidewalks more often, as they are generally less comfortable cycling on roads with heavy vehicle traffic.[9]
- Mostly the more confident cyclists are comfortable cycling in areas with high speed limits, cyclists who are less confident prefer to use local traffic-calmed residential streets. [10]

Cycling frequency of sample members

Members of the sample cycle quite frequently. A quarter cycle almost every day, an additional third are on their bikes two or three times a week. A total of 70% ride more than once a week. Those who describe themselves as more expert cyclists tend to ride more frequently.

Table 5. Cycling frequency of sample members.

Cycling frequency	# of Respondents	% of Sample
Every day or almost every day	127	25.0
2 to 3 times a week	166	32.7
More than once a week	60	11.8
Once a week	46	9.1
A few times a month	60	11.8
Infrequently	43	8.5
No answer	6	1.1
N	508	100.0

Question 5. How frequently do you cycle on the roads of the North Shore?

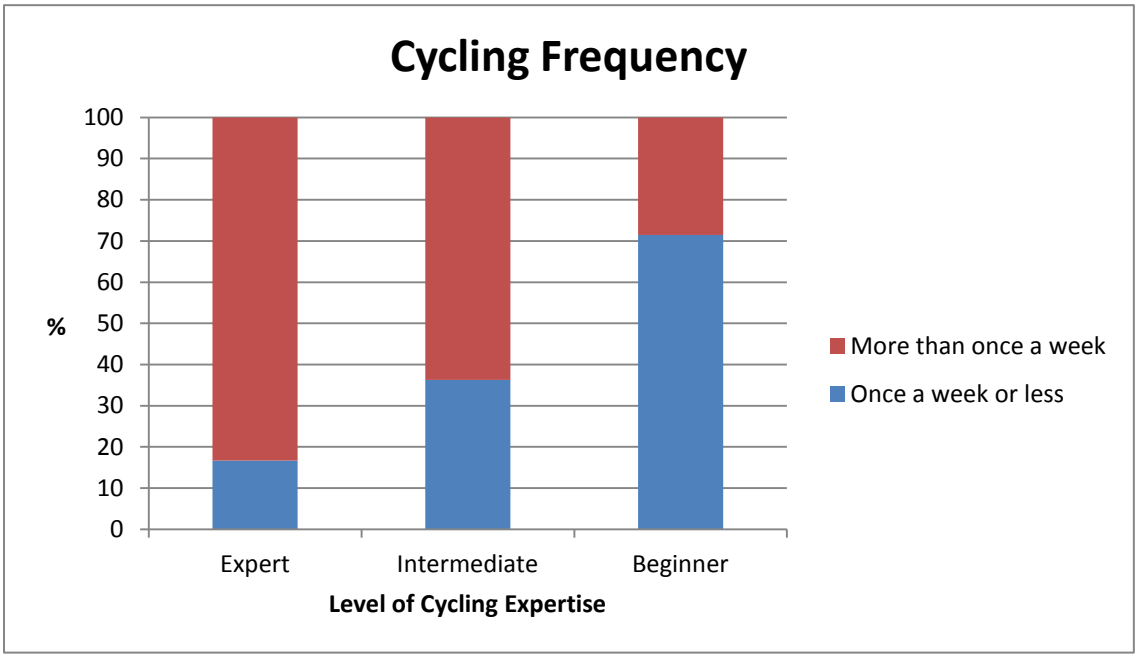


Figure 1: Cycling frequency by level of cycling expertise in percentage

Types of riding by sample members

The largest group of sample members described the type of cycling they do as "recreational". Commuting was second followed by training and group rides.

Table 6. Types of riding by sample members

Types of Riding	# of Respondents	% of Sample	% of Responses
Recreational cycling/just out for a ride	349	68.7	30.3
Commute to school or work	227	44.7	19.7
Training rides	217	41.9	18.9
Club/group cycling	206	40.6	17.9
Every day riding to library/shopping etc.	128	25.2	11.2
Other types of cycling	23	4.5	2.0
N	508*		100.0
Total responses	1150		

* multiple responses

Question 6. Please indicate which types of cycling you do. (check all that apply)

Section 3 – Perception of safety, accidents and near-misses

Perception of degree of safety while cycling

The majority of sample members view cycling on the North Shore as safe. However, almost 30% say it is unsafe to ride the roads of North and West Vancouver.

Table 7. Perception of degree of safety while cycling

Degree of safety	# of Respondents	% of Sample
Very safe	14	2.8
Somewhat safe	310	61.0
Not sure	30	5.9
Somewhat unsafe	126	24.8
Very unsafe	22	4.3
No answer	6	1.2
N	508	100.0

Question 7. How safe do you feel riding on the roads of the North Shore?

Incidence of collisions and accidents

One in five members of the sample reported having had an accident or collision on their bicycle. Males have experienced an accident or collision more often than females. Expert cyclists had the highest percentage of individuals who had had a collision or accident, followed by intermediate cyclists, then beginner cyclists. This result may sound counter-intuitive, as you might think that cyclists with less experience would have a higher chance of having a collision. However, cyclists with more experience are likely to cycle more frequently, putting them at greater risk.

Table 8. Incidence of bicycle collisions and accidents.

Collisions and accidents	# of Respondents	% of Sample
Yes	101	19.9
No	396	78.0
No answer	11	2.1
N	508	100.0

Question 8. Have you ever had a collision or accident on your bike on the roads of the North Shore?

Table 9: Incidence of bicycle collisions and accidents by gender

Experienced a collision or accidents	Male (%)	Female (%)
Yes	21.6	17.2
No	77.8	80.0
No Response	0.6	2.8
Total	100.0	100.0
N	315	180

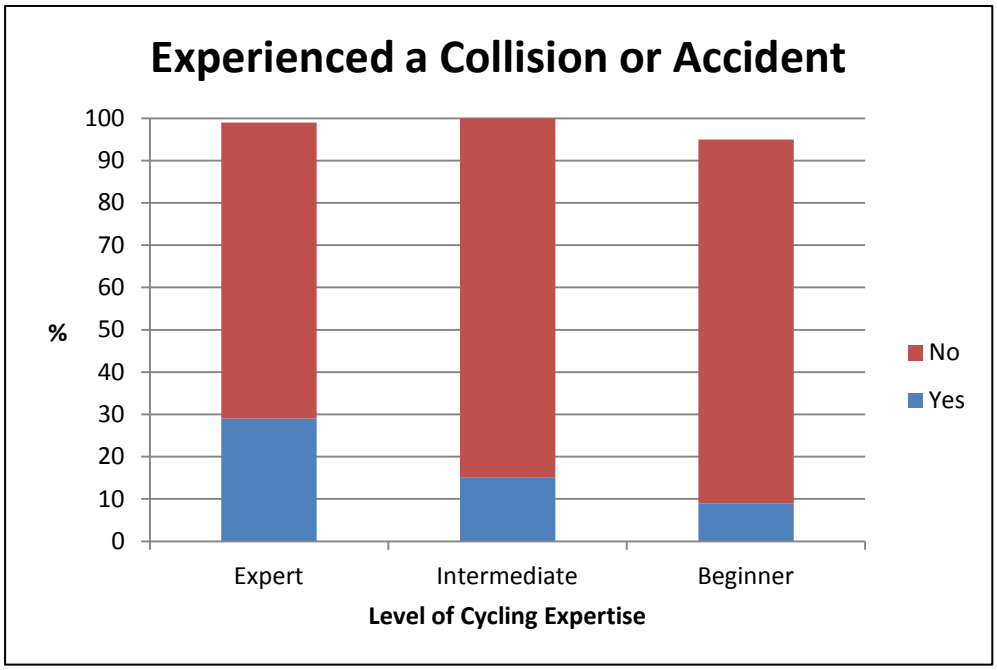


Figure 2: Collision history by level of cycling expertise

*Percentages do not add to equal 100 percent because participants who did not respond were not included in the graph

Object struck in bicycle collisions and accidents

The largest number of collisions and accidents were with moving vehicles. Second was running into an object such as a post, pot-hole or curb.

Table 10. Object struck by sample members in bicycle collisions and accidents

Causes	# of Respondents	% of Sample	% of Responses
A moving vehicle	52	10.2	40.3
An object	36	6.9	27.9
Another cyclist	16	3.1	12.4
A parked vehicle	9	1.8	7.0
A pedestrian	5	1.0	3.9
Slick surface	5	1.0	3.9
Animal	3	0.6	2.3
Uneven surface	3	0.6	2.3
N	508*		
Total responses	129		

* multiple responses

Question 9. If YES, with what did you collide? (check all that apply)

Severity of bicycle collisions and accidents.

Although most of the sample's bike accidents were minor, about a quarter could be described as serious.

Table 11. Outcomes of bicycle collisions and accidents

Severity	# of Respondents	% of Sample	% of Responses
Minor (cuts or bruises)	80	15.8	79.2
Major (sprains or broken bones)	17	3.3	16.8
Extreme (surgery required)	4	0.8	4.0
No answer	407	80.1	100.0
N	508	100.0	

Question 10. How severe was the collision?

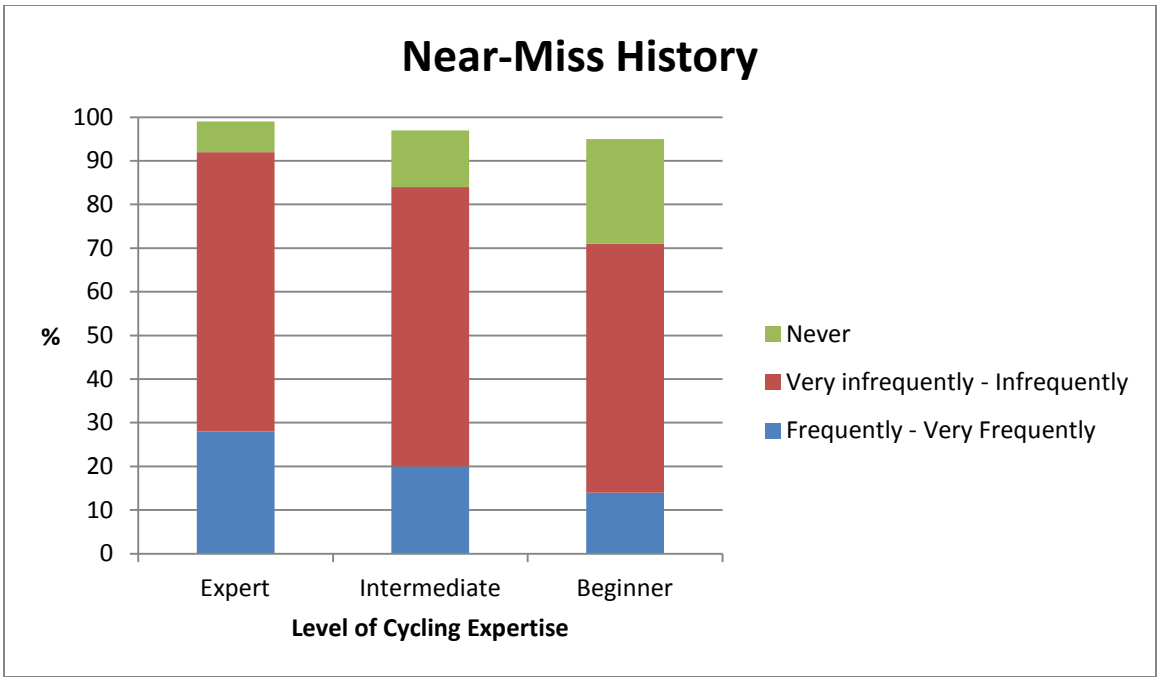
Frequency of near-miss experiences

Almost one quarter of the sample have frequently experienced near- misses on their bikes which could have resulted in accidents. Only eleven percent of respondents have never had a near-miss on their bikes. As was found with collisions, more expert cyclists are more likely to report near-misses.

Table 12. Frequency of near-miss experiences

Frequency	# of Respondents	% of Sample
Very frequently	15	3.0
Frequently	101	19.9
Infrequently	230	45.3
Very infrequently	90	17.7
Never	56	11.0
No Answer	16	3.1
N	508	100.0

Question 11. How many times have you had near misses (narrowly avoided collisions) on North Shore roads?



*Percentages do not add to equal 100 percent because participants who did not respond were not included in the graph

Near-miss collision objects

Most near-misses have to do with moving vehicles. Various objects like posts and pot-holes are second followed by pedestrians.

Table 13: Near-miss collision objects

Near miss with	#	% of Sample	% of Responses
A moving vehicle	302	59.4	66.1
An object (post, pot hole, curb, etc.)	67	13.1	14.7
A Pedestrian	34	6.7	7.4
A parked vehicle	27	5.3	6.0
Another cyclist	22	4.3	4.8
An animal	5	0.9	1.0
N=508		100%	100%
Total Responses			457

Question 12. If you have had a near miss, with what did you almost collide

Section 4 – Factors affecting cycling safety on the North Shore

Most Dangerous Intersections

The most frequently mentioned dangerous intersection is the corner at which 3rd Street, Keith Road, Marine Drive and Bewicke come together in North Vancouver City. The second most frequently mentioned dangerous intersection is Taylor Way and Marine Drive in West Vancouver, followed by Capilano Road and Marine Drive on the border of the Districts of North Vancouver and West Vancouver and Main St and Mountain Highway in the District of North Vancouver. There were 248 mentions of other dangerous intersections on the North Shore.

Table 14. Most dangerous intersections in the North Shore

Intersection	# of Respondents	% of Sample	% of Responses
3rd St W and Keith Rd and Marine Dr and Bewicke	61	12.0	8.3
Marine Dr and Taylor Way	53	10.4	7.2
Marine Dr and Capilano Rd	51	10.0	6.9
Main St and Mountain Hwy	41	8.1	5.5
Multiple intersections along Marine Drive	30	5.9	4.1
3rd St W and Forbes Ave	29	5.7	3.9
Multiple intersections near Iron Workers Bridge	27	5.3	3.7
Bridge Rd and Taylor Way	24	4.7	3.2
Lynn Valley Rd and Hwy 1	19	3.7	2.6
Bridge Rd and the bike path to LGB	19	2.7	2.6
3rd St E and Lower Level Rd	18	3.5	2.4
Dollarton Hwy and Main St	16	3.1	2.2
Marine Dr and 15th St	16	3.1	2.2
3rd St W and 2nd St W	15	3.0	2.0
Mt Seymour Pkwy and Lilooet Rd and Fern St	12	2.4	1.6
Lynn Valley Road and Mountain Highway	10	2.0	1.4
Not sure	14	2.8	1.9
None	11	2.2	1.5
Other intersections	248	48.8	33.6
Total Responses	739	100.0	100.0
N=508*			

* multiple responses per participant

Question 13. In your opinion, which is the most dangerous intersection? Identify all roads crossing, which Municipality and your travel direction (eg., Green Street and White Road, in West Vancouver, traveling east).

Most dangerous intersections by municipality

West Vancouver' most dangerous intersection is Taylor Way and Marine Drive. The multi-corner intersection of 3rd Street/Keith Road/Marne Drive/Bewicke Avenue is deemed the most dangerous in North Vancouver City. Marine Drive and Capilano Road is seen as the worst intersection in the District of North Vancouver.

Table 15. Most Dangerous Intersections in District of West Vancouver

Intersection	# of Respondents	% of Sample
Marine Dr and Taylor Way	53	10.4
Multiple intersections along Marine Dr	30	5.9
Bridge Rd and Taylor Way	24	4.7
Marine Dr and 15th St	16	3.1
N = 508		

The sample size in Table14 below does not match those in Table 13 because the data are only for the most dangerous intersection named and do not include the data on other dangerous intersections named by the same respondent

Table 16. Most Dangerous Intersections in City of North Vancouver

Intersection	# of Respondents	% of Sample
3rd St W/ Keith Rd/Marine Dr/Bewicke	61	12.0
3rd St W and Forbes Ave	29	5.7
Multiple intersections along Marine Dr	20	3.9
3rd St E and Low Level Rd	18	3.5
N = 508		

Table 17. Most Dangerous Intersections in District of North Vancouver

Intersection	# of Respondents	% of Sample
Marine Dr and Capilano Rd	51	10.0
Main St and Mountain Hwy	41	8.1
Main St and Hwy 1/Iron Workers Memorial Bridge	25	4.9
Lynn Valley Rd and Hwy 1 (on the border with NVC)	19	3.7
Intersections around Iron Workers Memorial Bridge	27	5.3
N=508		

Question 15. Please think about the intersections you cycle through on the North Shore What other intersections do you think are dangerous?

Factors affecting intersection danger

The top three danger factors for cyclists at intersection are: heavy vehicle traffic, turning vehicles and a lack of bike lanes. Sample members provided almost 1600 responses to this question, more than three per respondent.

Table 18. Intersection danger factors

Danger factors	# of Respondents	% of Sample	% of Responses
Heavy vehicle traffic	319	62.8	20.8
Vehicles turning	270	53.1	17.6
No bike lanes	255	50.2	16.6
No bike crossing signal	149	29.3	9.7
Vehicle speed	150	29.5	9.8
Vehicles running yellow/red lights	97	19.1	6.3
Poor sight lines	80	15.7	5.2
No bike box	72	14.2	4.7
Inadequate signage	48	9.4	3.1
Heavy pedestrian traffic	31	6.1	2.0
Heavy bike traffic	27	5.3	1.8
Vehicles running stop signs	24	4.7	1.6
Traffic circle/roundabout	6	1.2	0.4
Inadequate lighting	5	1.0	0.3
N	508*		100.0
Total responses	1592		

*multiple responses

Question 14. Please think about the intersections you cycle through on the North Shore. Why do you think this intersection is dangerous? (check all that apply)

Factors affecting intersection danger by municipality

Although there are unique situations at various intersections, generally, breaking down the danger factors by intersection gives similar results. Heavy traffic, turning vehicles and no bike lanes are the most important danger factors.

The sample sizes in Table18 are not the same as those in Table 16 because the data are only for the most dangerous intersection named and do not include the data on other dangerous intersections named by the same respondents.

Table 19. Intersection danger factors by intersection in each municipality

Municipality	Intersection	Factors	#
West Vancouver	Marine Dr and Taylor Way	Heavy vehicle traffic	35
		Vehicles turning	30
		No bike lanes	26
		Vehicles running yellow/red lights	15
	Multiple intersections along Marine Dr	Heavy vehicle traffic	16
		No bike lanes	15
		Vehicles turning	12
	Marine Dr and 15th St	Heavy vehicle traffic	5
		Heavy pedestrian traffic	2
		Vehicles turning	7
North Vancouver District	Marine Dr and Capilano Rd	Heavy Vehicle Traffic	20
		Vehicles turning	18
		No bike lanes	14
		Vehicles running yellow/red lights	10
	Main St and Mountain Hwy	Heavy Vehicle Traffic	21
		No bike lanes	16
		Vehicles turning	14
	Main St and Hwy 1/Iron Workers Memorial Bridge	Heavy Vehicle Traffic	11
		No bike lanes	8
		Vehicles turning	6
		Vehicle speed	6
	Multiple intersections around Iron Workers Memorial Bridge	Heavy vehicle traffic	15
		Vehicle speed	13
		Vehicles turning	12
	Lynn Valley Rd and Hwy 1	Heavy vehicle traffic	9
		Vehicle speed	4
		Vehicles turning	8
		Poor sight lines	3
City of North Vancouver	3rd St W/ Keith Rd/ Marine Dr/ Bewicke	Heavy Vehicle Traffic	29
		Vehicles turning	27
		No bike lanes	23
		Vehicles running yellow/red lights	10
		Vehicle speed	10
	3rd St W and Forbes Ave	Heavy Vehicle Traffic	18
		No bike lanes	18
		Vehicles turning	18

Most Dangerous Roads

Marine Drive is by far the most dangerous road for cyclists on the North Shore. Main Street, 3rd Street West and Capilano Road are also seen as bad for cyclists.

No doubt because of the uniqueness of their personal travel routes, many other roads are mentioned by sample members.

Table 20. Most dangerous roads on the North Shore

Most Dangerous Roads	#	% of Sample	Most Dangerous Roads	#	% of Sample
Marine Dr	276	23.7	23rd St	2	0.2
Main St	59	5.1	3rd St E	2	0.2
3rd St W	50	4.3	Fell Ave	2	0.2
Capilano Rd	49	4.2	Forbes Ave	2	0.2
Lynn Valley Rd	34	2.9	Larson Ave	2	0.2
Low Level Rd	33	2.8	Lions Gate Bridge	2	0.2
Keith Rd	33	2.8	15th St	2	0.2
Mountain Hwy	27	2.3	Mathers Ave	2	0.2
Dollarton Hwy	25	2.1	1st St W	1	0.1
Lonsdale Ave	18	1.5	Argyle Ave	1	0.1
Taylor Way	14	1.2	Lower Lonsdale	1	0.1
Hwy 1	13	1.1	None	1	0.1
Lonsdale Ave	11	0.9	Burley Dr	1	0.1
My Seymour Pkwy	11	0.9	Cotton Dr	1	0.1
All Roads	10	0.9	Deep Cove Dr	1	0.1
Ironworkers Memorial Bridge	10	0.9	Ross Rd	1	0.1
Bellevue Ave	9	0.8	St Georges	1	0.1
Bridge Rd	7	0.6	Westmount Road	1	0.1
W Esplanade Ave	7	0.6	Westport Rd	1	0.1
13th St	5	0.4	Westview Dr	1	0.1
Cypress Bowl Rd	4	0.3	Not sure	3	0.3
Chesterfield Ave	3	0.3	N=508*		
21st St	3	0.3	Total Responses		743

*multiple responses

Question 16. Please think about the roads that you cycle on the North Shore.
In your opinion, which road is the most dangerous? Identify the road, the Municipality and your travel direction. (eg., Blue Road from 1st to 3rd Avenue, in North Vancouver District, travelling south).

Question18. What other roads do you think are dangerous?

Most dangerous roads by municipality

As show above, Marine Drive, in all three municipalities, is seen as the worst road for cyclists. 3rd Street West in the City of North Vancouver, and Main Street and Capilano Road in the District stand out as dangerous roads.

The sample size in Table 20, 21 and 22 below are not the same as those in Table 19 because the data are only for the most dangerous intersection named and do not include the data on other dangerous intersections named by the same respondent.

Table 21. West Vancouver Most Dangerous Roads

Road	# of Responses	% of Sample
Marine Drive	240	47.2
Taylor Way	15	3.0
Upper Levels Hwy	12	2.4
Total Responses	301	59.3
N=508		

Table 22. City of North Vancouver Most Dangerous Roads

Road	# of Responses	% of Sample
Marine Drive	110	21.7
3rd Street West	45	8.9
Low Level Road	33	6.5
Keith Road	19	3.7
Total Responses	288	56.7
N=508		

Table 23. District of North Vancouver Most Dangerous Roads

Road	# of Responses	% of Sample
Marine Drive	92	18.1
Main Street	55	10.8
Capilano Road	51	10.0
Lynn Valley Road	32	6.3
Mountain Highway	26	5.1
Lonsdale Avenue	25	4.9
Total Responses	387	76.2
N=508		

Factors affecting road danger

For cyclists, the three road danger factors most frequently mentioned were heavy traffic, narrow road, and no bike lane markings. Least likely to be mentioned were inadequate lighting, speed bumps and train tracks. Sample members gave almost 1900 responses to factors that affect road danger.

Table 24. Road Danger Factors

Danger factors	# of Respondents	% of Sample	% of Responses
Heavy traffic	309	60.8	16.5
Narrow road, vehicles too close	281	55.3	15.0
No bike lane markings	278	54.7	14.9
Vehicles travelling too fast	206	40.6	11.0
No or narrow shoulders	169	33.3	9.0
Heavy truck/bus traffic	124	24.4	6.6
Poor road surface, pot holes, gravel	95	18.7	5.1
Parked cars	85	16.7	4.5
Drivers opening doors of parked vehicles	87	17.1	4.6
Heavy cyclist traffic	59	11.6	3.2
Blind corners	55	10.8	2.9
Rock face, ditches on side of road	38	7.5	2.0
Bushes growing on side of road	29	5.7	1.5
Heavy pedestrian traffic	25	4.9	1.3
Drivers' attitude/awareness	10	2.0	0.5
Cyclists required to merge/change lanes	5	1.0	0.3
Other (inadequate lighting, speed bumps/traffic calming measures, train tracks, speed of cyclists, inadequate barriers)	17	3.3	0.9
N	508*		100%
Total responses			1872

* multiple responses

Question17. Why is this road the most dangerous? (check all that apply)

Factors affecting road danger by municipality

Marine Drive in West Vancouver is seen as narrow, lacking bike lanes and carrying heavy traffic. As well as the above, in North Vancouver District, Marine drive is portrayed as having speedy traffic and the danger of being doored. In North Vancouver City, the dangers of Marine Drive are similar to those in the other two municipalities.

Table 25. District of West Vancouver Road Danger Factors for Most Dangerous Roads

Road	Factors	# of Respondents	% of Sample
Marine Drive (768) N=156*	Narrow road	123	24.2
	No bike lane markings	110	21.7
	Heavy traffic	102	20.1
	No or narrow shoulders	84	16.5
Taylor Way (15) N=4	Poor road surface	3	0.6
	No bike lane markings	3	0.6
	Vehicles travelling too fast	3	0.6

*156 individuals gave reasons why they thought Marine Drive in West Vancouver was dangerous. These respondents gave a total of 768 reasons for the dangers of Marine Drive.

Table 26. District of North Vancouver Road Danger Factors for Most Dangerous Roads

Road	Factors	# of Respondents	% of Sample
Marine Drive (345 responses) (n=70)	No bike lane markings	44	8.7
	Heavy traffic	35	6.9
	Vehicles travelling too fast	35	6.9
	Drivers opening parked car doors	32	6.3
	Narrow road	22	4.3
Main Street (124 responses) N=33	Heavy traffic	26	5.1
	Narrow road	21	4.1
	Heavy truck traffic	21	4.1
Capilano Road (81 responses) N=23	Heavy traffic	20	3.9
	No bike lane markings	19	3.7
	Narrow road	16	3.1
	Vehicles travelling too fast	13	2.6
	No or narrow shoulders	11	2.2
Lynn Valley Road (62 responses) N=17	Heavy traffic	16	3.1
	Road too narrow	14	2.8
	No bike lane markings	11	2.2

Table 27. City of North Vancouver Road Danger Factors for the Most Dangerous Roads

Road	Factors	# of Respondents	% of Sample
Marine Drive (361 responses) (n=72)	Heavy traffic	59	11.6
	Narrow road	52	10.2
	No bike lane markings	48	9.4
	Vehicles travelling too fast	35	6.9
3rd Street West (145 responses) n=31	Heavy traffic	30	5.9
	No bike lane markings	24	4.7
	Narrow road	22	4.3
	Heavy truck traffic	20	3.9
Low Level Road (76 responses) N=18	Narrow Road	14	2.8
	Heavy truck traffic	13	2.6
	Heavy traffic	12	2.4
	Poor road surface	10	2.0

Most dangerous bike lanes

Cyclists see the bike lanes on Marine Drive as being the most dangerous. The Low Level Road is second followed by the Spirit Trail and Main Street.

Table 28. Most dangerous bike lanes in the North Shore

Dangerous bike lanes	#	% of Sample	Dangerous bike lanes	#	% of Sample
Marine Dr	65	5.6	W Esplanade to Dollarton Hwy	3	03
Low Level Rd	35	3.0	Bellevue Ave	2	0.2
Spirit Trail	25	2.1	Bridge Rd/Spirit Trail	2	0.2
Main St	21	1.8	16th St	1	0.1
Lynn Valley Rd	16	1.4	16th St W/Larson	1	0.1
Mt Seymour Pkwy	15	1.3	2nd St W/3rd St W	1	0.1
Lions gate bridge	13	1.1	4th St W	1	0.1
1st St W	13	1.1	Argyle	1	0.1
Capilano Rd	13	1.1	Deep Cove Rd	1	0.1
Dollarton Hwy	13	1.1	Fell St	1	0.1
W Esplanade Ave	11	0.9	Grand Blvd	1	0.1
Main St/Dollarton Hwy	8	0.7	Hwy 1	1	0.1
Welch St	7	0.6	KcKeen Ave	1	0.1
Cotton Rd	6	0.5	29th St E	1	0.1
Cotton Rd/Main St	6	0.5	Kirkstone	1	0.1
Keith Rd	6	0.5	All bike lanes	1	0.1
Mountain Hwy	6	0.5	None	2	0.2
Chesterfield Ave	5	0.4	Not sure	14	1.2
3rd St W	5	0.4	Total	342	29.3
13th St W	5	0.4	N=508*		
Bridge Rd	4	0.3			

*multiple responses

Question 19. Please think about the marked bike lanes on roads that you cycle on the North Shore. In your opinion, which bike lane is the most dangerous? Identify the road/bike lane, the Municipality and your travel direction. (eg., bike lane on Red Street between C Street and F Street travelling north in North Vancouver City).

Question 21. What other bike lanes do you think are dangerous?

Most Dangerous Bike Lanes by Municipality

In all three municipalities, the bike lanes on Marine Drive are seen as the most dangerous.

Table 29. Most dangerous bike lanes in District of West Vancouver

Dangerous Bike Lane Location	# of Respondents	% of Sample	% of Responses
Marine Dr	43	8.5	51.8
Spirit Trail	28	5.5	33.7
Bridge Road	4	0.8	4.8
Total Responses	83		
N=508			

Table 30. Most dangerous bike lanes in City of North Vancouver

Dangerous Bike Lane Location	# of Respondents	% of Sample	% of Responses
Marine Drive	37	7.3	27.1
Low level Road	33	6.5	24.1
W Esplanade Ave	12	2.4	8.8
1st St W	10	2.0	7.3
Total responses	137		
N=508			

Table 31. Most Dangerous Bike Lanes in District of North Vancouver

Dangerous Bike Lane Location	# of Respondents	% of Sample	% of Responses
Marine Drive	36	7.1	20.9
Main Street	19	3.7	11.0
Lynn Valley Rd	16	3.1	9.3
Mt Seymour Pkwy	16	3.1	9.3
Capilano Rd	14	2.8	8.1
Total responses	172		
N=508			

Factors affecting bike lane danger

For cyclists, the three bike lane dangers most frequently mentioned were heavy traffic, vehicles driving too fast and narrow roads. Least likely to be mentioned were inadequate lighting and potholes and water in the bike lanes. Sample members gave over a 1000 responses to bike lane dangers.

Table 32. Bike Lane Danger Factors

Danger factors	# of Respondents	% of Sample	% of Responses
Heavy traffic	154	30.3	15.1
Vehicles travelling too fast	122	24.0	12.0
Narrow road, vehicles too close	104	20.5	10.2
Bike lane ends abruptly	83	16.3	8.1
Heavy truck + bus traffic	79	15.6	7.7
Vehicles travelling in bike lane	87	17.1	8.5
Poorly marked bike lane	64	12.6	6.3
Bike lane too narrow	62	12.2	6.1
Gravel, debris or obstacles in bike lane	46	9.1	4.5
Poor bike lane surface	32	6.3	3.1
Drivers opening doors of parked vehicles	31	6.1	3.0
Poor signage	31	6.1	3.0
Pedestrians walking in bike lane	29	5.7	2.8
Cars parked in bike lane	27	5.3	2.6
Standing water in bike lane	21	4.1	2.1
Potholes in bike lane	14	2.8	1.4
Inadequate lighting	10	2.0	1.0
Counterflow bike lane	2	0.4	0.2
Commercial entrances into bike lane	6	1.2	0.6
Cyclist required to cross/merge with traffic	4	0.8	0.4
Dogs in bike path	5	1.0	0.5
Drivers attitude	1	0.2	0.1
Poor bike crossing	1	0.2	0.1
Bike lane not separated from vehicle and pedestrian Traffic	4	0.8	0.4
Curved road	1	0.2	0.1
N	508*		100%
Total responses			1020

* multiple responses

Question 20. Please think about the marked bike lanes on roads that you cycle on the North Shore. Why is this bike lane the most dangerous? (check all that apply)

Factors affecting bike lane danger by municipality

The danger factors for the bike lanes in each municipality mirror the danger factors for the roads on which these bike lanes are located.

Table 33. West Vancouver bike lane danger factors for most dangerous bike lane locations

Bike lane	Factors	# of Respondents	% of Responses
Marine Dr	Heavy traffic	11	18.3
	Narrow Road	9	15.0
	Bike lane too narrow	7	11.7
	Poorly marked bike lane	7	11.7
	Total Responses	60	100.0
Spirit Trail	Pedestrian walking in bike lane	11	25.6
	Bike lane ends abruptly	6	14.0
	Poorly marked bike lane	6	14.0
	Heavy traffic	5	11.6
	Total Responses	43	100.0
Bridge Road	Narrow road	4	30.8
	Heavy traffic	2	15.4
	Poorly marked bike lane	2	15.4
	Total Responses	13	100.0

Table 34. District of North Vancouver bike lane danger factors for most dangerous bike lane locations

Bike Lane	Factors	# of Respondents	% of Responses
Marine Drive	Heavy Traffic	9	20.9
	Vehicles travelling too fast	8	18.6
	Heavy truck traffic	5	11.6
	Vehicles travelling in bike lane	5	11.6
	Total Responses	43	100.0
Capilano Rd	Heavy traffic	6	17.1
	Bike lane ends abruptly	3	8.6
	Heavy truck traffic	3	8.6
	Vehicles travelling too fast	3	8.6
	Total Responses	35	100.0
Main Street	Heavy traffic	15	18.5
	Heavy truck traffic	15	18.5
	Narrow Road	10	12.3
	Vehicles travelling too fast	9	11.1
	Total Responses	81	100.0
Lynn Valley Rd	Narrow Road	10	23.3
	Heavy traffic	9	20.9
	Vehicles travelling too fast	7	16.3
	Poorly marked bike path	5	11.6
	Total Responses	43	100.0
Mt Seymour Pkwy	Vehicles travelling too fast	8	29.6
	heavy traffic	6	22.2
	Gravel on bike lane	3	11.1
	Vehicles travelling in bike lane	3	11.1
	Total Responses	27	100.0

Table 35. City of North Vancouver bike lane danger factors for most dangerous bike lane locations

Bike Lane	Reasons	# of Respondents	% of Sample
Marine Drive	Heavy traffic	5	22.7
	Vehicles travelling too fast	4	18.2
	Bike lane too narrow	2	9.1
	Narrow road	2	9.1
	Cars parked in bike lane	2	9.1
	Vehicles travelling in bike lane	2	9.1
	Heavy truck traffic	2	9.1
	Vehicles parked in bike lane	2	9.1
	Total Responses	22	100.0
Low level Road	Vehicles travelling too fast	18	15.7
	Heavy traffic	15	13.0
	Heavy truck traffic	15	13.0
	Narrow road	13	11.3
	Total Responses	115	100.0
W Esplanade Ave	Heavy traffic	5	16.1
	Cars parked in bike lane	5	16.1
	Drivers opening doors of parked cars	5	16.1
	Total Responses	31	100.0

Section 5 – What needs to be done to improve cycling safety on the North Shore?

Perception that cyclists can do things to improve cycling safety

Almost nine in ten respondents felt that cyclists could do things to improve safety when cycling.

Table 36. Perception that cyclists can do things to improve cycling safety

Response	# of Respondents	% of Sample
Yes	453	89.2
No	12	2.4
Not sure	32	6.3
No answer	11	2.2
N	508	100.0

Question 22. Are there things that cyclists could do to make cycling safer?

Importance of things cyclist can do to improve their own safety

From the perspective of the respondents, the most important thing that cyclists can do to ensure their own safety is to obey the rules of the road. Second is to make themselves more visible followed by not riding side by side. Almost half the sample said cyclists need to improve their attitude towards vehicle drivers. Note, 96% of respondents hold driver's licences.

Table 37. Actions cyclists can take to improve their own safety by level of importance on a scale from 1 to 5, and percentage of total responses. 1 represents the least important action, and 5 represents the most important action.

Safety measures	Level of Importance (% of total responses) Least ← → Most					No Response	Response Average
	1	2	3	4	5		
Obey the rules of the road	3.5	4.3	13.2	19.9	52.2	6.9	4.21
Keep to the right	4.3	8.1	20.7	26.8	32.5	7.6	3.81
More visible	4.3	7.7	18.3	24.4	28.6	16.7	3.78
Don't ride side by side	5.9	9.4	16.9	23.2	27.8	16.8	3.69
Positive attitude towards vehicle drivers	9.8	10.6	24.8	23.6	23.8	7.4	3.44
N = 508							

Question 23. If YES, what are the most important things that cyclist can do? (Please rate these things on a scale from 1 to 5 with 1 meaning Least Important and 5 meaning Most Important.

Perception that vehicle drivers can do things to improve cycling safety.

Ninety-five percent of sample members indicated that vehicle drivers could do things to make it safer for cyclists.

Table 38. Perception that cyclists can do things to improve cycling safety

Response	# of Respondents	% of Sample
Yes	484	95.3
No	1	0.2
Not sure	8	1.6
No answer	15	3.0
N	508	100.0

Question 24. Are there things that vehicle drivers could do to make cycling safer?

Importance of things vehicle drivers can do to improve cycling safety

From the viewpoint of the cyclist respondents, the most important thing that drivers can do to increase cycling safety is to check before opening driver's side doors. Other top considerations are checking for bikes when turning, not driving in bike lanes and leaving lots of room when passing bikes. Note: 96% of sample members hold driver's licences.

Table 39. Importance of things vehicle drivers can do to improve cycling safety

Safety Measures	Level of Importance (% of total responses) Least ← → Most					No Response	Response Average
	1	2	3	4	5		
Watch when opening doors	0.2	1.2	6.7	17.9	71.1	2.9	4.64
Check for bikes when turning	0.6	1.8	5.7	21.9	65.4	4.8	4.57
Leave room when passing bikes	0.6	0.8	8.3	25.4	62.0	3.0	4.52
Don't drive in bike lanes	2.8	2.6	8.7	17.7	64.4	4.0	4.44
Positive attitude toward cyclists	1.4	2.8	12.8	21.7	56.5	4.9	4.36
Don't park in bike lanes	4.5	3.9	13.4	21.3	52.0	4.9	4.18
Slow down when bikes are on the road	4.1	6.7	17.1	26.8	40	5.3	3.97
N = 508							

Question 25. If YES, what are the most important things that drivers can do to make cycling safer? (Please rate these things on a scale from 1 to 5 with 1 meaning Least Important and 5 meaning Most Important.

Perception that municipalities can do things to improve cycling safety

Nine of ten respondents felt that municipalities can do things that can make cycling safer.

Table 40. Perception that municipalities can do things to improve cycling safety

Response	# of Respondents	% of Sample
Yes	457	90.0
No	4	0.8
Not sure	29	5.7
No answer	18	3.5
N	508	100.0

Question 26. Are there things that the North Shore Municipalities could do to make cycling safer?

Importance of things municipalities can do to improve cycling safety

Sample members rate the creation of more bike lanes and more off-road cycle paths as the two top ways that municipalities can make cycling safer. A media campaign to encourage a better driver/cyclist relationship is also viewed as important.

Table 41. Importance of things municipalities can do to improve cycling safety

Safety Measures	Level of Importance (% of total responses) Least ← → Most					No Response	Response Average
	1	2	3	4	5		
Create more on-road bike lanes	2.0	1.8	9.6	24.2	54.1	8.3	4.38
Build more off-road bike paths	4.1	7.7	14.6	20.1	44.3	9.2	4.02
Media campaign to encourage better driver/cyclist attitudes	5.5	7.7	20.9	23.2	32.5	10.2	3.77
More bike crossing signals	4.9	9.3	21.7	28.5	24.6	11.0	3.66
Better bike lane maintenance	3.1	8.9	28.1	26.2	22.1	11.6	3.63
Better signage	5.9	10.6	23.4	24	23.6	12.3	3.56
More adequate lighting	7.5	8.7	18.7	33.9	16.7	13.2	3.51
Better identify speed bumps	17.5	21.5	31.7	11.6	5.5	12.2	2.61
N = 508							

Question 27. If YES, what are the most important things that Municipalities can do? (Please rate these things on a scale from 1 to 5 with 1 meaning Least Important and 5 meaning Most Important.

Appendix 1
Questionnaire

Consent Form

The Norwest Cycling Club is conducting this study to help make it safer to cycle on the roads of the North Shore. This study is funded by a grant from the West Vancouver Community Foundation.

Because of your experience in cycling on North Shore roads, your participation is vital. You will not be identified in any study reports.
The study findings will be published in a written report and used for presentations to Municipal officials on the North Shore.

If you have any questions, please address them to <wyckham@sfu.ca>
For completing this questionnaire you will be entered in a draw for one of three $50 gift certificates from Mountain Equipment Co-op.

By submitting this questionnaire you are consenting to participate in this research study.
This questionnaire will take about 10 minutes.

North Shore Cycling Safety Survey

Section 1 – Demographics

1. Gender F • M • Prefer not to answer •
2. Age under 15 years • 16 to 19 • 20 to 29 • 30 to 39 • 40 to 49 •
50 to 59 • 60 to 69 • 70 + • Prefer not to answer •
3. Would you describe your self as an:
Expert cyclist • Intermediate cyclist • Beginner cyclist •
Prefer not to answer •
4. Do you have a Driver's Licence Yes • No • Prefer not to answer •

Section 2 – Type and frequency of cycling on the North Shore

5. About how frequently do you cycle <u>on the roads</u> of the North Shore?
Every day or almost every day • Two or three times a week

More than once a week • Once a week • A few times a month •
Infrequently •

6. Please indicate which types of cycling you do. (check all that apply)

Commute to work or school • Club/group cycling •
Recreational riding/Just out for a ride • Training rides •
Everyday riding to library/shopping/etc. •
Other – please specify [ ]

7. How safe do you feel riding on the roads of the North Shore?

Very safe • Somewhat safe • Not sure • Somewhat unsafe • Very unsafe •

8. Have you ever had a collision or accident on your bike on the roads of the North Shore?

Yes • No •

9. If YES, with what did you collide? (check all that apply)

A pedestrian • Another cyclist • A moving vehicle • A parked vehicle
An object (post, pot hole, curb) •
Other • please specify [ ]

10. How severe was the collision?

Minor (cuts and bruises) • Major (sprains, broken bones) •
Extreme (surgery required) •

11. How many times have you had ***near misses*** (narrowly avoided collisions) on North Shore roads?

Very frequently • Frequently • Infrequently • Very infrequently • Never •

12. If you have had a ***near miss***, with what did you almost collide?

A pedestrian • Another cyclist • A moving vehicle • A parked vehicle
An object (post, pot hole, curb) •
Other • please specify [ ]

Section 3 – Factors affecting cycling safety on the North Shore

Please think about the <u>intersections</u> you cycle through <u>on the North Shore</u>

13. In your opinion, which is the most dangerous *intersection*? Identify all roads crossing, which Municipality and your travel direction (eg., Green Street and White Road, in West Vancouver, traveling east).

[ ]

14. Why do you think this *intersection* is dangerous? (check all that apply)

Heavy vehicle traffic • Vehicles turning • Vehicles running yellow/red lights •
Vehicles running stop signs • Vehicle speed • No bike crossing signal •

No bike lanes • No bike box • Poor sight lines • Inadequate signage •
Heavy pedestrian traffic • Heavy bike traffic • Inadequate lighting •
Traffic circle/roundabout •
Other – please specify [ ]

15. What other *intersections* do you think are dangerous?

[ ] [ ]

Please think about the roads that you cycle on the North Shore.

16. In your opinion, which *road* is the most dangerous? Identify the road, the Municipality and your travel direction. (eg., Blue Road from 1st to 3rd Avenue, in North Vancouver District, travelling south).

[ ]

17. Why is this *road* the most dangerous? (check all that apply)

Narrow road, vehicles too close • Heavy traffic • Heavy truck traffic •
Vehicles travelling too fast • No bike lane markings •
Poor road surface/pot holes/gravel on road • Speed bumps • Parked cars •
Drivers opening doors of parked cars • Bushes growing on side of road •
Rock face on side of road • Blind corners • No or narrow shoulders •
Heavy cyclist traffic • Heavy pedestrian traffic • Inadequate lighting •
Train tracks • Other please specify [ ]

18. What other *roads* do you think are dangerous?

[ ] [ ]

Please think about the marked bike lanes on roads that you cycle on the North Shore.

19. In your opinion, which bike lane is the most dangerous? Identify the road/bike lane, the Municipality and your travel direction. (eg., bike lane on Red Street between C Street and F Street travelling north in North Vancouver City).

[ ]

20. Why is this *bike lane* the most dangerous? (check all that apply)

Heavy traffic • Heavy truck traffic •
Narrow road, vehicles too close • Vehicles travelling too fast •
Cars parked in bike lane • Drivers opening doors of parked cars •
Vehicles travelling in bike lane • Pedestrians walking in bike lane •
Poorly marked bike lane • Poor bike lane surface • Bike lane too narrow •
Pot holes in bike lane • Gravel on bike lane • Standing water on bike lane
Bike lane ends abruptly • Poor signage • Inadequate lighting •
Other please specify [ ]

21. What other *bike lanes* do you think are dangerous?

[ ] [ ]

Section 4 – What needs to be done to improve cycling safety on the North Shore?

22. Are there things that cyclists could do to make cycling safer?

Yes • No • Not sure •

23. If YES, what are the most important things that cyclist can do? (Please rate these things on a scale from 1 to 5 with 1 meaning Least Important and 5 meaning Most Important.

	Least important 1	2	3	4	5 Most important
Make themselves more visible (bright colours/lights/reflectors)	•	•	•	•	•
Keep to the right	•	•	•	•	•
Don't ride side by side	•	•	•	•	•
Obey the rules of the road (stop at lights and signs, signal)	•	•	•	•	•
Have a more positive attitude towards vehicle drivers	•	•	•	•	•

24. Are there things that vehicle drivers could do to make cycling safer?

Yes • No • Not sure •

25. If YES, what are the most important things that drivers can do? (Please rate these things on a scale from 1 to 5 with 1 meaning Least Important and 5 meaning Most Important)

	Least important 1	2	3	4	5 Most important
Slow down when bikes are on the road	•	•	•	•	•
Don't park in bike lanes	•	•	•	•	•
Don't drive in bike lanes	•	•	•	•	•
Watch for cyclists when opening driver's side doors	•	•	•	•	•
Leave plenty of room when passing bikes	•	•	•	•	•
Check for bikes when turning	•	•	•	•	•
Have a more positive attitude toward cyclists	•	•	•	•	•

26. Are there things that the North Shore Municipalities could do to make cycling safer?

Yes • No • Not sure •

27. If YES, what are the most important things that Municipalities can do? (Please rate these things on a scale from 1 to 5 with 1 meaning Least Important and 5 meaning Most Important.

	Least important	1	2	3	4	5	Most important
Create more on-road bike lanes		•	•	•	•	•	
Do a better job maintaining existing bike lanes		•	•	•	•	•	
Build more off-road bike paths		•	•	•	•	•	
Better signage		•	•	•	•	•	
More bike crossing signals		•	•	•	•	•	
Develop more adequate lighting		•	•	•	•	•	
Better identification of speed bumps		•	•	•	•	•	
Media campaign to encourage better driver – cyclist attitudes		•	•	•	•	•	

29. Are there any other factors, not included above, that you think would make it safer for you to ride on the roads of the North Shore?

[ ]

Thank you for helping to make cycling safer on the North Shore.

If you would like to be entered in the draw for one of three $50 MEC gift certificates, please complete the following.

Name email address

Would you like to have a copy of the report resulting from this study emailed to you?

Yes • No •

Appendix 2: Data analysis

The data were collected using an online survey platform. Duplicate responses from the same participant were not included in the data analysis. More detail on the data analysis is contained in the Appendices. Questions 1-12, 14, 20, 22-27 were automatically coded, with the exception of text responses in the "other" categories. Questions 13, 15-19, and 21 were manually coded. Intersections, roads and bike lanes were coded based on specific locations. Responses were verified on googlemaps or the *District of North Vancouver Bikeway Map* for validity. Any responses that were not clear were verified with multiple researchers before deemed invalid. Responses to "specify other" were grouped into categories and coded based on trends in the data. For identifying the most dangerous intersections, roads and bike lanes, responses were combined from multiple questions, which resulted in total responses greater than the sample size. For identifying factors that influence specific intersections, roads and bike lanes, a subset of the sample was examined, which resulted in a smaller sample size.

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