Notice of the Final Oral Examination
for the Degree of Master of Science

of

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BSc (University of Victoria, 2014)

“Crowdsourced Data as a Tool for Cycling Research on Ridership Trends and Safety in the Capital Regional District”

Department of Geography

Wednesday, June 22, 2016
1:00PM
David Turpin Building
Room B215

Supervisory Committee:
Dr. Trisalyn Nelson, Department of Geography, University of Victoria (Supervisor)
Dr. Meghan Winters, Department of Geography, UVic (Member)

External Examiner:
Mr. Brian Patterson, Transportation Planning Leader, Urban Systems

Chair of Oral Examination:
Dr. Richard Rajala, Department of History, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

The benefits of cycling are well known and many communities are investing in cycling infrastructure in order to encourage and promote ridership. Safety is a primary concern for new cyclists and remains a barrier for increasing ridership. Understanding what influences cyclist safety requires knowing how many cyclists are riding in an area. Lack of ridership data is a common challenge for cycling research and limits our ability to properly assess safety and risk. The goal of our research was to incorporate new data available through crowdsourcing applications to advance cycling research on ridership and safety in the Capital Regional District (CRD), British Columbia (BC), Canada.

To meet our goal, our first analysis assessed how crowdsourced fitness app data can be used to map and to quantify the spatial and temporal variation of ridership. Using a dataset from popular fitness app Strava, we compared how manual cycling counts conducted at intersections during peak commuting hours in Victoria compared to the number of crowdsourced cyclists during these same count periods. In order to estimate ridership at unsampled manual count locations, we used Poisson regression to model the association between manual counts and infrastructure variables found to influence ridership. Our results found that there was a linear association (r^2 between 0.4 and 0.58) between crowdsourced cyclists and manual count cyclists, which amounted to one crowdsourced cyclist representing 51 riders. Crowdsourced cyclist volumes, traffic speeds, on street parking, slope, and time of year were found to significantly influence the amount of cyclists in different count locations with a predictive accuracy of 62%. Overall, crowdsourced data from fitness apps are a biased sample of ridership; however, in urban areas in mid-size North American cities, cyclists using fitness apps may choose similar routes as commuter cyclists.

Our second analysis used crowdsourced data on cyclist incidents to determine the factors that influence incident reporting at multiuse trail and roadway intersections. Using incident reports from BikeMaps.org, we characterized attributes of reported incidents at intersections between multiuse trails and roads and also examined infrastructure features at these intersections that are predictors of incident frequency. We conducted site observations at 32 multiuse trail-road intersections in the CRD to determine infrastructure characteristics that influence safety. Using Poisson regression we modeled the relationship between the number of incidents (collision and near misses) and the infrastructure characteristics at multiuse trail-road intersections. We found that collisions were more commonly reported (over near misses) at multiuse trail-road intersections than road-road intersections (38% versus 27%), and incidents involving an injury were more common (35% versus 21%). Cycling volumes, vehicle volumes, and lack of vehicle speed reduction factors were associated with incident frequency. Our analysis was able to use crowdsourced cycling incident data to provide valuable evidence on the factors that influence safety at intersections between multiuse trails and roadways where diverse transportation modes converge.

Through this thesis we help to overcome limitations for cycling research and planning by demonstrating how crowdsourced ridership and safety data can help fill gaps and supplement available data. Our methodology integrates the high spatial and temporal resolution of crowdsourced cycling data with the detailed attributes provided by traditional ridership counts. We also demonstrate how volunteered safety data can allow new questions on safety to be explored. Improving data available for cycling research allows for a more comprehensive understanding of the factors that influence ridership and safety and, in turn, informs decisions targeted at increasing cycling.