



International Road Safety Symposium

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BC Centre for Disease Control
Provincial Health Services Authority

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Acknowledgements

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Dr. Tarek Sayed – Distinguished Professor, Department of Civil Engineering, UBC
Ms. Megan Oakey – Provincial Manager, Injury Prevention, BCCDC

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International Expert Speakers:

Dr. Ben Beck – Deputy Head of Prehospital, Emergency and Trauma Research at Monash University (Australia)
Dr. Ezra Hauer – Emeritus Professor, Department of Civil Engineering, University of Toronto (Canada)
Dr. Tarek Sayed – Distinguished Professor, Department of Civil Engineering, UBC (Canada)
Dr. Simon Washington – Professor and Head of School, Civil Engineering, University of Queensland (Australia)
Dr. Fred Wegman – Emeritus Professor, Traffic Safety at Delft University of Technology (Netherlands)

Keynote Speaker:

Ms. Bowinn Ma, MLA for North Vancouver-Lonsdale; Parliamentary Secretary for TransLink

Expert panelists:

Ms. Shabnem Afzal – Manager Road Safety, Vision Zero Lead, City of Surrey
Mr. Neil Arason – Director, Injury Prevention and Healthy Settings, Ministry of Health
Dr. Jeff Brubacher – Emergency Physician, Vancouver General Hospital & Assistant Professor, Department of Emergency Medicine, UBC
Dr. Karim El-Basyouny – Department of Engineering, University of Alberta
Ms. Joanna Clark – Citywide Transportation Planner, City of Vancouver
Ms. Shewkar Ibrahim – Road Safety Engineer, City of Edmonton
Mr. Clark Lim – Adjunct Professor, Department of Civil Engineering, UBC
Ms. Megan Oakey – Provincial Manager, Injury Prevention, BCCDC
Mr. Brian Patterson – Active Transportation Lead & Principal, Urban Systems
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Introduction

The UBC Bureau of Integrated Transportation Safety and Advanced Mobility (BITSAM) hosted the International Road Safety Symposium in November 2019 in partnership with the BC Centre for Disease Control (BCCDC), to continue supporting expertise and knowledge exchange for road safety across BC. Renowned international experts from the Netherlands, Australia, and Canada joined municipal and provincial experts to discuss and share their experience and recent research, with a emphasis on application, implementation, and equity at the local level. The focused discussions on specific issues and solutions from this symposium are captured within this compendium.



Left to right: Dr. Simon Washington; Dr. Ezra Hauer; Dr. Fred Wegman; Dr. Tarek Sayed; Dr. Ben Beck; and Ms. Megan Oakey



Speaker Presentations



Road Safety Challenges in the Smart Mobility Era

Dr. Tarek Sayed

Distinguished Professor, Department of Civil Engineering, UBC (Canada)



Dr. Sayed is a distinguished professor and a Tier 1 Canada Research Chair of Transportation Safety and Advanced Mobility at UBC. He is a Fellow of the Engineering Institute of Canada, the Canadian Academy of Engineering and the Canadian Society for Civil Engineering. He has more than 350 publications and has supervised 85 Masters and PhD students. Dr. Sayed's research on improving traffic safety analysis and evaluation is helping to reshape how road safety problems are identified and evaluated. His work on proactive road safety management has received wide recognition and is being applied in several countries worldwide.

"The road network is a product that is faulty."



Dr. Tarek Sayed presented on automated safety analysis using computer vision techniques. Dr. Sayed uses Bayesian safety models, automated safety analysis using computer vision techniques, traffic conflict techniques, pedestrian and cyclist modeling, and Intelligent Transport System (ITS) in order to make safety evaluations. He recognizes that in the world of road safety, we are "data rich and understanding poor". His work is focused on helping to correct this.

Dr. Sayed's transportation engineering research focuses on three main areas:

- 1) to improve road safety analysis and evaluation techniques
- 2) to improve the level of knowledge associated with the safety implications of traffic operations and highway design
- 3) developing and evaluating ITS to increase the efficiency of traffic.

Road Safety Challenges in the Smart Mobility Era: Q & A

Q: What is best practice when reporting on fatality rates? E.g., per capita, per kilometer.

A: We don't like using rates for location or small areas, the relationship between collisions and small areas is not linear and can cause misleading results. Other statistic techniques can be used to rank these areas, and can control for variance.

Q: Do you think proactive safety analysis is mostly suited for study of individual locations and developing targeted countermeasures, or can it also develop generalized knowledge of system characteristics associated with better safety outcomes?

A: You can do both with multiscale modelling.

Q: How can big data help smaller municipalities?

A: A multitude of ways: you can capture near misses, traffic volume, speed profiles, etc. Often small municipalities struggle with not having enough data, and these methods collect a lot.

Q: How long does a municipality need to be monitored for statistically significant data?

A: We usually do two days, with twelve hours of data on each day. Of course, this varies by area, and the amount of road users.

Q: How can you identify the gender of pedestrians with this software?

A: In general, the walking mechanism varies between males and females. Step frequency is faster in females, with shorter strides. We are able to identify the gender of pedestrians with 80% accuracy of classification, and 20% error.

From Birth to Recovery - The Public Health Approach to Road Trauma

Dr. Ben Beck



Deputy Head of Prehospital, Emergency and Trauma Research at Monash University (Australia)

Dr. Beck is President of the Australasian Injury Prevention Network. He is Chief Investigator on the Victorian State Trauma Registry and currently holds an Australian Research Council DECRA Fellowship that focuses on linking trauma and crash data to develop and evaluate injury prevention strategies for road trauma. He has a strong background in road safety, injury biomechanics and injury epidemiology and leads a large body of trauma and injury prevention research, with a focus on vulnerable road users.

“The impacts of how we move about our cities is far broader than just road trauma.”



Through four main focus areas, Dr. Ben Beck has situated road trauma within a broader public health perspective. (1) *Road User Behaviour*: While deterrence is important, the underlying societal reasons for the “fatal five” (Speeding; Seat belts; Drink/Drug Driving; Fatigue; and Distraction) need to be addressed. (2) *Land Use Planning & Urban Design*: Cycling for transport is associated with a 41% decrease in risk of early death as compared to commuting by car. The key barrier to active transport is ‘perceived safety’. (3) *Health and Wellbeing*: A focus on post-crash care within the health system has brought about high-quality and rapid prehospital trauma care, transport to trauma centres with specialist care, and timely and appropriate rehabilitation. However, only a small proportion of patients return to pre-injury levels of function. (4) *Equity*: Transport is a determinant of health that contributes to the existence, persistence, and (sometimes widening of) health inequities within and between cities. Put simply, increasing car dependency has led to increasing unfairness. Dr. Beck finished his presentation by discussing three of nine recommendations from the academic expert group regarding the second global Decade of Action for Road Safety: Modal shift; Children’s health; and Speed limit of 30 km/hr. The goal of Vision Flourish, of which Vision Zero is a component, is to plan for children, which means that ultimately other vulnerable groups, such as older people and those with disabilities, are included.

From Birth to Recovery - The Public Health Approach to Road Trauma: Q & A

Q: Why does the requirement for separation between vehicles and other users vary so much from city to city?

A: The requirement for separation between vehicles and other users varies by road user cultures, and how the culture of cycling is continued over time. In Amsterdam, it's been a part of life for a long time. In Melbourne, it's come out of a culture of sport, and they are looking for more risk. The main users are called MAMILs, or Middle-Aged Men in Lycra. How do we change the culture of cycling, to move away from recreational sport, the "commuter cup", those who race along river at 40 km/hr? How do we expect children to use those paths safely? We have speed moderation on some of our paths, and that is one way forward.

Q: Are you aware of good models or frameworks already developed for applying health impact assessment to transportation?

A: The [Health Impact Assessment](#), developed by the World Health Organization.

Q: What are your thoughts on lane filtering, especially with motorcycle riders requesting it?

A: I have not seen any evidence to support rear-end reductions, but that doesn't mean that they don't exist. Reports like this are held in the transport organizations, and not distributed more widely, and we also do this in academic organizations which is why an event like this is so important.

Q: What is your advice to BC health authorities in terms of making a move towards linking their data to collision data to allow municipalities to better target road trauma?

A: We will get there, and the power of these data are significant. Megan will be presenting on this tomorrow.

Q: What is public health's role in land use planning and urban design when this is predominantly the role of municipal governments? Advocacy through data?

A: The role that public health needs to take is to break down silos, and to bring local governments to the table across everything we do - research, advocacy, planning, strategy.

Evidence-Based Road Safety Management - What Yields True Road Safety Benefits?

Dr. Ezra Hauer

Emeritus Professor, Department of Civil Engineering, University of Toronto (Canada)



Dr. Hauer has been active in road safety research and consulting since 1970. He has gained an international reputation for his scientific rigor and practical understanding in the study of the relationships between roadway design and safety. In addition to developing new statistical methods and theories, he has excelled in translating statistical theory into techniques useful for practicing engineers and researchers alike. Hauer received the Roy W. Crum Award, the highest honour bestowed by the Transportation Research Board, in 1999.

***“In public health the target of prevention are groups.
Diagnosis and treatment of specific patients is not prevention.”***



Dr. Ezra Hauer began his presentation with a quote from the 2016 Ontario Road Safety Annual Report: “Ontario’s roads continue to be among the safest in North America.” He questioned why the report applauded the roads rather than the drivers, and presented the ‘benevolent answer’, which is that drivers cause accidents, and the ‘malevolent answer’, which is that admitting drivers are safe would mean less money spent on roads. He discussed crash causation and prevention, weighing the road-user centered approach against the safe systems approach. Dr. Hauer argued for the need for a safe systems approach, citing the 2018 Humboldt Broncos bus crash in Saskatchewan and the subsequent prevention response, as a case study.

Evidence-Based Road Safety Management - What Yields True Road Safety Benefits? Q & A

Q: How do you choose the best solution? Cost effectiveness? What should we do to select among potential solutions?

A: Solutions to the problem depends on understanding the causes of the problem. Norms do not determine the cause, as it is objective. Compliance with a norm does not remove a circumstance or action from being a cause, for example, the drivers in the Bronco crash did not speed.

Q: How can we get federal leaders to step up to the challenge of enacting evidence-based road safety management?

A: It is a good habit when you give evidence to stick to your expertise. So, I will say, I don't know. I will tell you that there are several meetings happening at the University of Toronto, showing that strong grass root advocates can have influence at the top.

Q: Why don't governments set their sights higher in terms of road safety?

A: The perception of safety, the level of road safety to aim for is societal. What you do about the causes of crashes and collisions must respect the society in which you live.

Safe Systems Approach - Critical Success Factors

Dr. Fred Wegman *Emeritus Professor, Traffic Safety at Delft University of Technology (Netherlands)*



Dr. Wegman is a founding father of the Safe System approach to road safety. Prior to his position at Delft, Dr. Wegman served as managing director of the SWOV Institute for Road Safety Research (Netherlands) for 14 years. He chairs the International Traffic Safety Data and Analysis Group for the Organisation for Economic Co-operation and Development/ International Transport Forum, and is a member of the Academic Expert Group for the 3rd Global Ministerial Conference on Road Safety (Stockholm 2020).

"An ethical approach, a proactive approach, people are the measure of all things: human capacities and limitations are the guiding factors, both physically and psychologically."



Dr. Fred Wegman described the safe systems approach as dealing with the 'environment' of the road user: the road, the vehicle, technology, regulation and legislation, etc. The aim of which is to eliminate or at least substantially reduce dangerous behaviours resulting in crashes. Until now, we have inherited an inherently unsafe road safety transport system, and the main approach has been to add risk reducing measures (without limiting individual freedom too much) delivered by government via regulation and compliance. In future, we ought to be improving road safety by investing in the Safe System approach, finding new mechanisms for compliance, and using technology. Further, there is a need to leave the road safety silo and engage with other agendas.

Safe Systems Approach - Critical Success Factors: Q & A

Q: What should the speed limit on an undivided rural highway be?

A: The highway shouldn't be undivided, we need separation between directions. In your country, as in all countries, speed limits are very political. We can give the evidence, and they have to make a decision. We have seen a tendency in Europe that the roadways, some of which are up to 130km/hr, are being reduced for environmental reasons, not safety reasons.

Q: How do we account for mobility and micro mobility in a safe systems approach?

A: Be proactive. Expect that it will come. Create regulations - whether devices are to be used on the sidewalk or on the road, what devices will require helmet use, what the speeds should be. Do not wait for the problem and then act, anticipate potential problems and address them proactively.

Q: What is an example of a successful road safety partnership with non-traditional stakeholders?

A: IKEA has very strict regulations on their transport; the whole strategy starts with no exposure, and whether they can change their production and way of transporting their goods differently, and then leading to risk reduction. They were invited by the Swedish government to be so strict in their regulations. In my country [Netherlands] I work with Heineken Brewing around legislation wherein drivers are not allowed to use their mobile devices. There is an event recorder in their cars, and it can be detected if they do that. And then management takes that into account. If you talk about public transport, the more passengers you take, the more money you make. There is incentive not to be safe.

Road User Distraction

Dr. Simon Washington



Professor and Head of School, Civil Engineering, University of Queensland (Australia)

Dr. Washington is recognized internationally for his contributions in the fields of behavioural econometrics applied in the areas of transport and urban planning, transport safety and risk across all travel modes and travel behaviour. He is Associate Editor or Editorial Advisory Board Member on six leading international transport journals, and has authored or co-authored more than 150 peer-reviewed journal articles, 6 book chapters, and a 2nd edition of a textbook adopted in over 20 countries. He has been lead investigator on more than \$26 million in competitive research grants in Australia and the United States.

“If something captures your attention at the right time it could save you from a crash.”



Dr. Simon Washington began his presentation with an anecdote of his recent experience as a court expert for a case involving distracted driving and billboards. Billboards are often rented and leased to ad agencies by the transport authority, generating substantial revenue, a portion of which is devoted to funding road safety investments. Advertisers would never pay for these roadside billboards if drivers did not look at them; however, until there is hard evidence that crashes are increasing due to billboards, the jury is out. Dr. Washington elaborated on distracted driving and his recent research on texting and driving. Despite causing a six times higher likelihood of crashing, many drivers do not perceive texting and driving to be dangerous.

Road User Distraction: Q & A

Q: Do we need to focus on cultural change when it comes to phone use while driving? Can we make it uncool?

A: That would be great! I think we need more sociologists in on the game, that's not my specialty. I can say that culture, and what a certain culture decides is acceptable behaviour, plays a huge factor. Upon the third drunk driving offence in Australia, they crush your car. If I come to America and say, "Hey, let's do that," I don't think it would happen.

Q: What would you say to the public who believe that this is seen as "a war on cars"?

A: This is a question that we are all grappling with. It's something we need to discuss further: How do we get them with us to understand the trade-offs? That is the exact tension that everyone in this room is fighting against.

Q: Why do you think Australia has such a progressive attitude to traffic safety compared to North American countries?

A: A study 15 years ago showed that the most important thing was champions of road safety in the system, someone who owned the road safety campaign and the aims, so the political leadership in the road safety space is absolutely essential for what happened in Australia. There has been really strong state level political leadership, as well as the collective legal system that says the benefits of the majority outweigh the rights of the individual, so crushing a car is an acceptable response to driving under the influence three times.



Panel Presentations



Speed Management Panel

Lead / Moderator: Professor Fred Wegman

Professor Ezra Hauer, Ms. Liliana Quintero, Professor Karim El-Basyouny

Dr. Fred Wegman discussed that speed management is more than a game between one cat and a lot of mice. We want to help road users make better judgements, protect vulnerable road users, decrease fuel consumption as well as air and noise pollution. There is growing interest to link road safety with other sustainable development goals. There is a difference between excessive speed (faster than speed limit) and inappropriate speed (too fast for prevailing conditions, but within the limits). The former is easier to measure. Speed limit setting is an optimization problem, but it is also very political. People enjoy driving fast. How to get public support and to organize compliance? That is the question he wanted everyone to think about during the session.

Dr. Ezra Hauer shared that five years ago, he went to Holland with his friend and his grandson to bicycle along the canal. The three of them, coming from Canada, all wore their helmets, but noticed that no Dutch person wore a helmet. Why is it that they protect people from themselves, controlling their speed, and allow others to not wear bicycle helmets? He suggested that we have to come to some ground reason why we control speed, and protecting people from themselves is a fuzzy issue. It's the culture of political circumstance. He stated that the basic reason for controlling speed comes from economists, who say you have to pay for the full cost of your activities; if you don't pay, there are externalities. This is why BC has a carbon tax - you pay the full cost of emissions. When one drives fast, one endangers their neighbour. The principle behind controlling speeds is that what one does affects their neighbour.



Speed Management Panel

Ms. Liliana Quintero discussed the Neighbourhood Slow Zones pilot in Vancouver. The city was sectioned into 144 zones and broken up as squares between arterials. Industrial areas were removed, as well as small zones, emergency routes, etc., to identify areas where it would be difficult to implement traffic calming. The four criteria they used to prioritize zones for traffic calming were collisions, speed, vulnerable users, and community amenities and infrastructure. Average speeds were studied through car share city fleet GPS data and the city's speed radar data. The neighbourhoods chosen for this pilot include the West End and Strathcona. Next steps are public engagement, and purchasing Google speed data analysis to evaluate before and after implementation. The evaluation will also include safety results and public perception. The goal is to continue to add new slow zones based on ongoing analysis and neighbourhood led petitions.

Dr. Karim El-Basyouny shared lessons learned from the City of Edmonton. The first study was about the development of an excessive speed legislation for Alberta. Such a legislation already exists in Quebec, Ontario, and BC, but they did not have similar legislation in Alberta. He was asked by the then Edmonton police chief to explore whether this legislation would have an impact on speed safety; it turned out that there were substantial reductions in fatal crashes in the provinces with such a legislation as a result of the implementation. Overall, the conclusion was that excessive speed legislation would be effective in Alberta. Now, with a new police chief and a new government, they will see if they can implement it. The second study was about school zones, which they do not have in Edmonton. The third project was about posted speed limit reduction, which allowed communities to request a review to lower the posted speed limit; this initiative was determined to be effective. All of these projects involved three important principles: technical expertise, communication, and leadership.

Speed Management Panel: Q & A

Q: Dr. Wegman, you mentioned that people like to drive fast. Has any jurisdiction in the world been successful in shifting their road safety culture?

A: Dr. Wegman: We live in a paradox. The personal experience is no justification for reducing speeds. We have to design a policy knowing that people won't like it; I would agree with the idea that we have to communicate, we need to convince people. Convincing communities to reduce to 30 km/hr is no problem when it comes to residential travel speeds. The public fully understands, with parents, with schools, no problem. There is no problem when it comes to explaining that you have to reduce urban speeds. The problem starts when you try to convince people to reduce speeds on freeways. They think, "It's free, nothing is around, it's empty, what is the reason why I should slow down here." Personally, I believe that changing behaviour is better than changing culture. Some people say you have to change the attitude, I think you do it the other way around. Change the behaviour, then change the attitude.

Q: Dr. Hauer, should road engineers dump the 85th percentile guideline when setting speed limits?

A: Dr. Hauer: Yes. The source of the 85th percentile is an unspecified judgement regarding what percent of people would be made lawbreakers, and 15% seemed to be the acceptable number. And people that argued for it, they didn't realize that people adapt automatically. The mean speeds go up.

Q: Ms. Quintero, can you tell us more about Google Speed Data?

A: Ms. Quintero: The way we did our analysis was with the car share city fleet sample, so it was a limited sample. Google Speed Data covers all of the data that is captured on your phone when you drive, providing speed data, time traveling data; as you know, your phones are always tracking you. We will do the same in the spring, prior to the pilot, and afterwards. It will help us compare speeds, evaluate behaviour change, and provide that information to the public.

Speed Management Panel: Q & A

Q: Ms. Quintero, what is your advice to municipalities considering 40 km/hr rather than 40 km/hr because it is more politically accepted?

A: Ms. Quintero: I think that depends on the type of street where you're doing a speed reduction. You have to think about the type of street. Right now, we are doing 30 km/hr on residential streets.

Q: To the panel, there is talk in BC about amending the Motor Vehicle Act to reduce the default speed limit on residential roads. Given that this may take years to implement, what is your advice to municipalities in the meantime?

A: Ms. Quintero: Sign every block. It's expensive, but it's better than waiting.

Dr. El-Basyouny: It's an important part of the conversation to understand that it's not just about improving safety and how a 30 km/hr speed limit will bring about safety benefits. The part of the conversation that gets missed is that people will be more likely to go out into the community, there is an impact to society, to livability, to businesses. That part of the discussion needs to be more robust and highlighted.

Q: To the panel, how should neighbourhoods speed limits be posted?

A: Ms. Quintero: In our pilot, we will do gateway entrances outlining that this is a slow zone, and we will sign at the beginning of every block.

Dr. Wegman: In the Netherlands, with every change from 50 km/hr to 30 km/hr, there is a gate. Then we have speed measurements at every intersection. Whether something is needed in between, we decide case by case depending on the stretch of the road. Every intersection there is a table, and every entrance and exit, there is a gate.

Speed Management Panel: Q & A

Q: To the panel, what are your thoughts on the socially accepted practice of driving at speeds up to 10 km/hour higher than the limit. Should enforcement be used to create “hard limits” and fine individuals violating this and what would the implications be for safety?

A: Dr. Wegman: That’s socially acceptable? That’s a fine area for change.

Dr. Hauer: The main speed is 110 km/hr to 115 km/hr, for 100 km/hr. The belief is that the police don’t have enough resource to ticket everyone.

Dr. Wegman: We only take technical margins higher than the speed limit in Europe, meaning that we have 6 km/hr, I always have 106 km/hr in my mind, and everyone knows this one, it’s technical, it has nothing to do with social acceptability. Now when you talk about point to point control, the margin is lower, 2 km/hr, you have a section under this speed limit, and the police are communicating that. If you drive over 3 km/hr, there is a fine and you will have to pay that. And the way that this program is administered, there is no one who would dispute their fine in court. If you talk about point to point, the acceptability is higher than spot controls. In France, they have a massive program on speed limits. The funny story behind that was, they announced this program. There were no cameras yet, but just the announcement itself was enough to reduce speeds. Then they installed camera programs, step by step, and it was very effective. The yellow jerseys in France, that was an uncomfortable feeling in France, they burned down many of these cameras. This movement was far broader than these cameras, and the government said that they would reconsider the program. There is a lot of evidence coming from France that it was a very successful program.

Dr. El-Basyouny: Do we have anyone here from the Royal Canadian Mounted Police or the Vancouver Police? This is an important question because the threshold for enforcement changes, and the Royal Canadian Mounted Police told me that they had to increase the tolerance because they couldn’t keep up with the amount of people speeding.

Police officer in the audience: One of the issues is officer safety, in the sense of having to pull over cars and issue a ticket, you don’t want the officer to be hit by ongoing traffic. It’s better to let the traffic flow at the rate that it is flowing than enforcing speed limits. You get looky-loos, which can cause chain reactions. Rather than do west bound traffic in the morning, we will do east-bound traffic, and using marked cars gives the public the idea that police are out there. There have been many examples where one crash causes a second, and a third, and a fourth, and then you get gridlock over the entire system. My unit does enforcement over the Lower mainland, and there are only a few areas where an officer can safely pull over someone. There are ditches on either side, and municipalities have not been supportive in spending the money

Speed Management Panel: Q & A

to have some filled in. We do a lot of distracted driving enforcement, including foot traffic on intersections. We see a lot of “crotching”; keeping their phones down low in their crotch. Plain clothes officers can walk up to the window and catch them while texting.

Q: To the panel, how do we convince the public to accept automated speed enforcement? Or convince the politicians to go ahead without public support?

A: Dr. El-Basyouny: I love this question; I get asked it all the time. I have done a lot of work on automated enforcement and its use in City of Edmonton. When you say automated enforcement, the first thing that comes to mind has to do with cash, and the second has to do with a cow. People think, “I got a ticket, how is that going to improve safety, and make me safer, and improve safety for everyone in this room?” Part of this has to do with the lack of understanding, and how we design the roads is influencing that process. All the decisions [in regards to the automated enforcement program] you are making along the way is also influencing that process: what thresholds you are using, how fast you are going to issue those tickets - getting a ticket in the mail two months later, is that enough? These are very difficult questions, and until we are able to answer these questions, we cannot convince the public of anything.; saying, some of the money will be reinvested in road safety, is not enough. It’s about understanding the challenges of running a transparent program.

Dr. Hauer: I can only tell two stories. One is that the Liberal Party was in power in Ontario some fifteen, twenty years ago, they started an automated speed enforcement program, elections came, it was leaked to the press, and the opposition for automated speed enforcement was one of the major reasons why the Conservatives came to power. The second comment is about thinking out of the box. In Stockholm, their system, whereby you pay your fine if you exceed the speed limit, it goes into a lottery, and people driving below the speed limit, get the money. So, there is no cash cow involved, and it seems to be working fairly well. It is a fairly powerful example. The cash cow is real, government likes to tax us, they need the money. To counteract this, you need to give the money back to the people. Almost as in the carbon tax system.

Dr. Wegman: It’s important to understand that all police enforcement is not oriented to making money, it’s on changing behaviour. On trying to deter people from violating. You need to make fines, but the aim of police enforcement is changing behaviour. It is a paradox that a lot of politicians would like to increase fines.

Active Road User Safety Panel

*Lead / Moderator: Professor Ben Beck
Professor Tarek Sayed, Neil Arason, Brian Patterson*

Dr. Beck: In the State of Victoria, Australia, there is no cycling passing distance legislation. We had the opportunity in Melbourne to collect data, and to do this we had a MetreBox, which are small, aerodynamic equipment mounted on bicycles which recorded passing events. Overall, we had over 18,500 passing events. The median passing distance was 173 centimeters with an average of 2 close passing events < 1.0 m per 10 km travelled. When we think about that in terms of an average cyclist that's riding to and from work, around 10 KM a day, that's an average of 4 close passing events every day.

What was the most interesting finding was the role that infrastructure played in passing distance. Keep in mind, we drive on the wrong side of the road. When we introduced a painted bike lane, vehicles passed 27 centimeters closer. A parked car but no painted bike lane, the passing event was 30 centimeters closer. This illustrates the inadequacy of paint as infrastructure. I think we all know the important role of separated infrastructure, and this is something we all need to advocate for. Where separated infrastructure exists, it has not solved all of our problems, but we would never accept these passing distances for a mother pushing her pram down a bike lane.



Active Road User Safety Panel

Dr. Sayed: Does walkable and bikeable mean safe for walking and cycling? Walkability and bikeability indices are used to succinctly quantify how conducive an environment is to walking and cycling, often including factors related to comfort and perceived safety. The potential assumption that walkable and bikeable means safe for walking and cycling (i.e., the association with objective safety or crash risk) has not yet been examined. This study investigates the association between two widely-used measures (Walk Score and Bike Score) and pedestrian and cyclist crashes in Vancouver, Canada, to determine whether more walkable and bikeable areas of the city are also safer for walking and biking, after controlling for exposure. Multivariate Bayesian crash models with random and spatial effects are developed for pedestrian-motor vehicle and cyclist-motor vehicle crashes in 134 traffic analysis zones using 5 years of crash data with walking, cycling, and motor vehicle traffic volume controls for exposure.

Results indicate that areas of the city with higher walkability and bikeability are associated with greater pedestrian and cyclist crash risk, respectively, even after controlling for exposure. While the clear answer is that neighborhood walkability and bikeability does not indicate safety for pedestrians and cyclists, questions remain as to whether they should, and if so, how they could be modified to better incorporate objective risk. Active travel behaviour is influenced by safety concerns and environmental factors that increase perceived safety and comfort. These are different than objective safety. Destinations and commercial business are a major component of walkability and bikeability, and network connectivity is a major factor in calculating them. But, they are positively associated with crashes. There is a need for a composite index.

Mr. Arason: My interest in the characteristics of left and right turning vehicle-pedestrian crashes is both professional and personal. My wife and I were out for a walk in Victoria one evening, and we heard this loud, god-awful thud. A young woman was hit by a left turning vehicle. We were the first on the scene. Intersection crashes involving turning vehicles hitting pedestrians is an issue that is not fully understood or given sufficient attention. In a study presented at this year's Canadian Association of Road Safety Professionals Conference, we sought to compare the frequency of left- and right-turning single vehicle-pedestrian crashes versus other single vehicle-pedestrian crash configurations. We also sought to identify crash countermeasures that can respond to these crash situations. We used police crash reports in British Columbia between January 2004 and December 2015 to determine the count and proportion of crashes, injuries, and fatalities for single-vehicle versus pedestrian crashes. We explored several factors that contribute to pedestrian injury or fatality, including driver pre-collision action (left or right turn), crash location (at/between signalized or non-signalized intersection) road type (number of lanes, divided/undivided, speed limit), and driver impairment or distraction.

Active Road User Safety Panel

Over the total study period there were 3,878 crashes with a serious pedestrian injury or fatality. Of these crashes, road conditions were typically and clear, most occurred in a 50 km/h speed zone, many occurred during daylight hours, and just over half occurred at an intersection. Serious injury and fatality left-turn vehicle-pedestrian crashes are almost four times more likely to occur than right-turn ones. Most pedestrians when struck were proceeding in a legal manner underscoring the need for road design solutions. Indeed, many low-cost solutions to this problem exist at intersections including: changing signalization from permissive to protected-only phasing, banning the right-turn-on-red, leading pedestrian intervals, pedestrian scrambles, tighter turning radius, better lighting, innovative protected intersection designs, and many other measures. [Link to presentation slides](#)

Mr. Patterson: I'm presenting on the BC Active Transportation Design Guide. Why is improving road safety important? We know the magnitude of the issue, with 4,200 annual pedestrian and cyclist injuries and fatalities. As said before, paint is not infrastructure. So how do we provide facilities that are safe, comfortable and attractive for people of all ages and abilities? Only 2% of collisions involve pedestrians and cyclists, but they represent 1/3 of fatalities. The Ministry of Transportation and Infrastructure committed to improving active transportation through the Active Transportation Strategy. To help implement the Strategy, they developed the BC Active Transportation Design Guide. There are 9 sections and 39 chapters, nearly 600 pages of content, which I cannot cover during the course of this presentation, but of interest is that the foundational principle is planning for people of all ages and abilities. There is a focus on safety in rural context, on accessibility - what are some of the needs and issues of people with different mobility challenges? A second theme is what are the tools that we can look at to improve accessibility? A third key theme of the design guide is focusing on all ages and abilities infrastructure, we know that people want to ride on facilities that are separated. All ages and abilities infrastructure, includes busy streets protected bike lanes, quiet streets, and neighbourhood bikeways. Separating pedestrians and cyclists through multiuse pathways, yes, people really like multiuse pathways. The gold standard to provide cyclist and pedestrian safety is creating physical separation as well as separation in time.

Active Road User Safety Panel: Q & A

Q: To the panel, where do you think our knowledge gaps are, in promoting cycling and walking and improving safety?

A: Mr. Arason: There are a lot of measures that aren't proven, and when you have limited budgets it's difficult to choose what to focus on. There is a need for further research.

Mr. Patterson: There is a lot of research around pedestrian safety, but not as much in terms of protected bike lanes for cyclists.

Dr. Sayed: A word of caution – doing proper before and after research is not easy, and there are more dangers of before and after studies that produce erroneous conclusions and we should be very careful interpreting those results. We should have the ability to rank the quality of these studies, something like a 50% reduction is too good to be true. We need to be very careful, because many available studies are not done well and do not account for many of the confounding factors that explain why you can see this reduction.

Dr. Beck: We are also missing robust data for small areas.

Q: To the panel, how do you suggest managing the Lycra Heroes riding on a separated infrastructure that is going to be shared with pedestrians and recreational cyclists?

A: Mr. Patterson: There are different types of cyclists, and in terms of the BC Active Transportation Design Guide, the focus is on the slowest user. What we recognize with protective infrastructure, we need to consider the speed of different users, be they Lycra Heroes or e-bike users, and separate bicycle and pedestrian pathways, and ensure that the lanes are wide enough to accommodate passing and people traveling at different speeds.

Dr. Sayed: Interactions at low speeds, in shared space, are very good for safety. There is a big movement in planning around the significant safety benefits from allowing vehicles, pedestrians, and cyclists to share the same space at low speeds – And the issue is low speeds.

Active Road User Safety Panel: Q & A

Q: Mr. Arason, is there any work at the provincial level to prohibit a right turn on red unless allowed with a green arrow, as it is in Europe?

A: Mr. Arason: This has been a known problem, illustrated by research dating back to the 1970s, and people don't actually stop at that red light before a turn. A few years ago, the Provincial Health Officer released a report, *Where the Rubber Meets the Road*, and that outlines the work that we've been doing with local governments. And we need your help to advocate for these changes; the more voices we have, then it will be able to be heard at a higher level that these are the kind of changes we want to make.

Q: Dr. Sayed, how did you adjust for exposure being qualitatively different in more or less walkable areas? Residents in more walkable areas may walk to work in all conditions, in a rush, and those in less walkable areas may walk for recreation when light and sunny.

A: Dr. Sayed: We did not have that granularity, we need more exposure data. We can collect very detailed, microscopic exposure data with cameras. We need to look at interactions if we can, but hopefully with new technology we will be getting more and better exposure data.

Q: To the panel, can you speak to the evidence on roundabouts, regarding pedestrian and cyclist safety, and vehicle on vehicle collisions?

A: Mr. Arason: A benefit of the roundabouts when all vehicles are traveling at the same speed, there is no opportunity for right angle crashes, speeds are reduced, and it's very hard to have serious injury for vehicle occupants. Some roundabouts without pedestrians, such as the McTavish Interchange on Vancouver Island, are popular to complain about, but there has not been a fatality. You still have the magic of reduced speeds, but they need to be designed as well as they have been in Europe - with tighter diameters, slower speeds, single lanes are preferable, with design features such as separated paths for pedestrians and cyclists.

Active Road User Safety Panel: Q & A

Q: To the panel, if Leading Pedestrian Intervals (LPIs) are so cost-effective and easy to implement, why don't they get applied everywhere?

A: Dr. Sayed: I am a big fan, we should have many of them, they are cheap and easy.

Mr. Arason: That is my question too, they are so low cost, and so effective, and so simple. [Mr. Arason asks Ms. Shabnem Afzal, Manager Road Safety, Vision Zero Lead at the City of Surrey for her thoughts].

Ms. Afzal: As you said, we are actively putting in LPIs in the City of Surrey, and right now we have 40, so we are leading in BC. In terms of pushback, it is a perceived thing; people think that vehicles will have to wait longer, and we use 7 seconds, and extended the green light for vehicles following LPIs. I would say to everyone, go for it.

Dr. John Carsley: I've been in Montreal recently, and they have gone to LPIs of at least 6 to 8 seconds depending on the width of the street, but they're not entirely LLPIs, as the green light starts off with arrows in both directions. It only slows the traffic that is waiting to make a turn. It really makes a difference. Crossing at one of the LPIs in Vancouver, it's not close to long enough. If it's a longer interval, most pedestrians have gotten halfway across the street. We definitely need more of them.

Dr. Sayed: So far, we've done six evaluations of LPIs in Surrey and Vancouver, and the results are quite strong. Of course, you can increase the number of seconds, but you have to balance with the delay. The goal is to have the pedestrian reach the middle of the intersection.

Q: Mr. Patterson, if the Ministry of Transportation and Infrastructure is committed to active transportation, why is there no committed standard for bike infrastructure?

A: Mr. Patterson: It's not intended to be prescriptive, but provide guidelines and tools. The guideline is the first step. Maybe there is a distinction to be made between standards and guidelines. They're intended to be context sensitive to provide street designers with a range of tools.

Active Road User Safety Panel: Q & A

Q: To the panel, has there been any studies to indicate whether the bike lane should be located on the left side or the right side of a right turn lane at the non-protected intersection?

A: Dr. Wegman: The left side.

Q: I'm from the City of Edmonton, and I haven't been able to find a good design principle or guideline regarding the section of cars coming out of the driving and interacting with pedestrians and cyclists along their protected infrastructure. Any advice?

A: Dr. Sayed: Two years ago, we did a consultation project, and there was a very liberal access management policy, which you would never find in Vancouver. When we tried to raise the issue, the comment was absolutely don't bring that up, because we will not be able to make changes as it's highly political.

Mr. Patterson: I would agree that the first step should be access management, and then other tools you can use, such as green markings on conflict zones. There are a number of conflicts to be managed in that case, mid-block crossings and driveways, signage and pavement markings can be a tool to raise awareness if you cannot close those zones.

Dr. Sayed: Closing access will always raise safety, but it is not that easy to close an access for a business.

Mr. Arason: We need more research about the design of bike lanes, not just at intersections but along the route. There is an issue with bi-directional bike lanes, in that it sacrifices less parking lots.

Intoxicants and Road Safety Panel

*Lead / Moderator: Dr. Jeff Brubacher
Sgt. Brian Sampson*

Dr. Brubacher: I'm Jeff Brubacher, I'm an emergency physician at Vancouver General Hospital and I'm a clinical toxicologist. It's not a big surprise that I'm interested in drug impaired driving. I have no conflicts of interest or commercial disclosures, unfortunately. There is a lot of interest in impaired driving due to cannabis. In cannabis, the active ingredient is THC which binds to receptors in the brain and inhibits transmitters. It quiets things down, people feel euphoric, they feel relaxed. It causes impairments – attention deficits, impaired coordination, slowed reaction, altered sense of time, and slow information processing. With all of those effects, you would expect that cannabis impairs driving ability. In this study from the Netherlands by Jans Ramaekers et al., you can quantify how much people weave, before and after drugs, with dual controls and a driving instructor in the car. You weave more with cannabis, have difficulty maintaining a constant speed, and maintaining headways.

Can drivers compensate? On the other hand, there's this hint in the literature, that people who use cannabis – this isn't the case with alcohol – people who use cannabis are aware of their increased risk, and they compensate. They slow down, they have more headway, they do don't risky maneuvers that people with alcohol do. There are a number of reasons why the research is technically difficult, and the bottom line is that you have to measure THC in the blood, and that's hard to get. I'm going to tell you the results of a study that we've done here in BC, called a culpability study. Everyone in the study has been in a crash, which means you can test for drugs using the exact same methods and protocols. The case is a driver who should've been able to avoid the crash, the control is someone who is innocently involved. If you're slowing down legally and someone drives into you, you're a control, you were randomly selected to participate, is how I look at it. We've been doing the Development and Validation of a Crash Culpability Scoring Tool study in BC since around 2012, and most samples come from these four hospitals: Vancouver General, Victoria General, Royal Columbian, and Kelowna General. How it works is we're including drivers of a car or light truck, mostly drivers who come by ambulance, and blood is obtained within 6 hours of a crash. They're injured enough that someone independently decides that they need to have bloodwork done. We have a waiver of consent that we get the leftover blood. The choice of why blood work is done, it is based on apparent injury severity, not related to suspected drug use.

Intoxicants and Road Safety Panel



These are the results of the first 3000 drivers, of those 2300 have a matching police report, we only have blood work in around 20 - 25 percent of patients. The fender benders don't get blood work done, so they were in a significant crash, but unfortunately not all of them have a police report. We excluded cases where we couldn't determine culpability scores - we want it black and white. In terms of population, these are middle aged men. The average age is 44 years old, and two thirds are men. A little over a third were in a night time crash, one third were in a single vehicle crash, and one third were admitted to hospital, so I call it a moderately injured population.

I would have liked to have everyone's bloodwork in under an hour, but three quarters of our sample were within two hours. Just looking at Blood Alcohol Content (BAC), we find that the risk of crash is almost double. For high BAC, the risk of crash increases monumentally. This is consistent with big alcohol case control studies, such as the Fort Lauderdale study: as BAC goes up the odds of being in a crash become exponentially high - over a hundred with high BAC. There's information for other recreational drugs, cocaine and methamphetamines, medications, sleeping pills and antihistamines, sedating medications. The question is, what about THC? How does that affect crash risk? This is where things get interesting. Two nanograms of THC per ml of blood is where penalties come in Canada, higher than five nanograms is where criminal penalties come in.

Intoxicants and Road Safety Panel

I would caution, we only had 20 drivers in our sample with those levels, it's probably the power, but it's not statistically significant. We have not shown that it is safe to drive after using cannabis. This data was mostly collected before legalization. I suspect that a lot of people behind the wheel were habitual users who had become tolerant to cannabis. We know that for alcohol the risk of crashing rises more steeply for younger drivers – inexperienced drivers, inexperienced drinkers. We expect that the same is true of cannabis. Young, occasional users who smoke once in a while and aren't tolerant, are likely to be more at risk. And then drunk and high, when you mix alcohol with cannabis, the risk is high. In our study, 44 drivers had positive BAC and positive THC, and 42 of them were culpable. If you mix the two, even at low levels, everything falls apart.

A study we just started, taking the same methods, minus police reports, is expanding to national coverage. We've been collecting blood samples in Alberta, Saskatchewan, and Ontario, for a year and a half, and just started to roll out in Quebec, Nova Scotia and Newfoundland and Labrador. Since January 2018, we've had 2200 patients from the national sample. About half of this population test positive for some impairing substance. Forty-two percent test positive for some drug. Fifteen percent had been drinking, about twelve percent had BAC above the legal limit. A low level of THC you might see in a heavy user for days after their use. THC above 2 nanograms though, that usually indicates recent use in the last 4 hours. And THC above 5, this is where we think we will start seeing risk, about 2.4% crash risk. When you look at the overall sample in terms of regional variation, the numbers from Saskatchewan are small, with a sample of only 100, but the other numbers are fairly robust. British Columbia actually has the lowest levels of alcohol and THC, contrary to the expectation. Perhaps when British Columbians use cannabis they do not drive as much. Variation by age is what you'd expect: younger drivers aged 34 and below have the highest prevalence of alcohol use. Cannabis use is a bit higher in the older age groups. In terms of sex, men are more likely to be drinking, using cannabis, and sedating medications. Drivers in single vehicle crashes were more often drinking vs. drivers in multivehicle crashes, and you do not see that effect for cannabis, however, alcohol and cannabis are often used together. The main takeaway is, while drugs are an issue, let's not lose sight of alcohol, which is still our biggest problem. If people are interested in this, we are putting together a report on the BC data, you can email our research coordinator, mmasud@mail.ubc.ca, she can give it to you.

Intoxicants and Road Safety Panel

There is also growing interest in edibles, which have been legalized, and are on the market in January. Many people ask me questions about edibles, so I'd like to share a few points for consideration: The first one has to do with the timing. Within 10 to 15 minutes when cannabis is smoked, the THC levels peak, and it happens almost instantly. When cannabis smoking ceases, the THC levels drop off acutely and tail off more slowly. Usually by 4 hours afterwards there is less than 2 nanograms per ml of blood. With edibles, however, the timeline is different. The amount of THC might peak at lower levels, however, with this method of delivery it is in the tissue more than when consumed via smoking, so the effects can be substantial. The onset is slower, the peak effect is at around four hours, and it's going to last for eight to twelve hours. If someone has a THC infused drink, taken on an empty stomach, the effects will be more immediate. If someone consumes THC in fatty food, such as a brownie, on a full stomach, the effects will be delayed. So, the effects from edibles are going to last longer, and it's easy to overdose. Someone who is not quite familiar with it, may take a little bit, wait an hour, and when they do not feel the effects of THC they may consume more. In an hour they could feel the effects of the first dose, and then after another hour they could feel the effects of the second dose and be substantially impaired. At that point, they cannot stop the effects, there is no control to stop the effects like with smoking.

Furthermore, the labeling is confusing; people do not know what 10 milligrams means, and there are gummies that have 50 milligrams that look exactly the same. The overdose is not like a heroin overdose where breathing stops and death occurs; instead, people feel anxious, paranoid, and generally unwell. Furthermore, given that edibles look like candy, it can be easy for someone to consume without realizing that it has THC. Recently we saw someone at Vancouver General Hospital, a hotel cleaning staff worker who had been left a bag of gummies as a tip. They were hungry, didn't read the label, and consumed the entire package - 80 milligrams. They had a panic attack, were vomiting, and miserable. We had another case where a child had eaten honey infused with THC; they presented as vomiting, and it took a while to figure out what they had gotten into. Now imagine that this happens behind the wheel of a car. We haven't seen that yet, but I imagine that we will.

Intoxicants and Road Safety Panel

Sgt. Sampson: Provided an overview of the RCMP's Integrated Impaired Driving Unit. While other traffic police combine enforcement with response to calls and crash investigations, the Integrated Road Safety Units (IRSU) focus solely on conducting strategic traffic enforcement to reduce serious injuries and fatal collisions on B.C.'s roads. IRSUs are made up of over 100 full-time, dedicated traffic enforcement officers from both the RCMP and independent municipal police. Because traffic problems don't stop at municipal boundaries, these specialized units work across traditional police jurisdictions to improve road safety. In the Integrated Impaired Driving Unit, officers are trained in Standardized Field Sobriety Testing (SFST). Before, or at, a traffic stop, police officers use their training as well as what they see, hear and smell to look for signs that a driver may have alcohol and/or drugs in their body. An officer can either make a breath demand for alcohol, a blood demand, or a drug expert demand. A blood demand is new to Canada. There are 171 drug recognition experts in BC. Of people who use drugs, 80% engage in poly-drug use. Drug recognition experts are only involved after the person is arrested, wherein the drug recognition expert will complete a 12-step standardized evaluation of the person. When testing oral fluid - it is not referred to as saliva - the technology is limited. The criminal code only allows us to test for two drugs, cannabis and cocaine, and it only shows recent consumption. With alcohol impaired driving, there is a correlation between someone's breath and their blood alcohol content. Furthermore, oral fluid screening equipment can be quite large, it is temperature sensitive, it has to be at a level within 10 degrees, it is expensive, with each test costing \$28, and it is time consuming. We were just recently approved for the Abbott SoToxa Mobile Test Screening, which will only test for THC. The mandatory screening provision in Bill C-46, the Government of Canada's legislation to reform impaired driving law, which was introduced in April 2017 and received Royal Assent in June 2018 strengthens the criminal law approach to impaired driving. Looking to the future, technology is limited, so the RCMP's Integrated Impaired Driving Unit will continue to have its SFST trained members, who have been utilizing their skills since the 1970s, as the frontline foundation for policing.

Intoxicants and Road Safety Panel: Q & A

Q: Sgt. Sampson, are you saying that essentially police are using their training, so largely nothing has changed?

A: Sgt. Sampson: Largely, yes. The technology has hit the market, but it's limited in its capabilities and its effectiveness.

Q: To the panel, are there any safety concerns about the legalization of cannabis topicals?

A: Dr. Brubacher: I don't think it would be much of an issue; I don't see creams posing a safety problem. **Sgt. Sampson:** If someone smokes cannabis, the effects take 8-9 seconds, if the drug is taken orally through food, the potency is not as high but the duration is much longer and the onset takes a lot longer. Edibles will be the turning point for those working in road safety.

Q: Sgt. Sampson, are you able to take blood samples roadside? And if not, how long does THC present in the bloodstream?

A: Sgt. Sampson: Blood samples are not taken roadside, they are done at a hospital or clinic. By the criminal code, we must have the blood drawn within two hours. How long THC is present in the bloodstream depends on the injection method.

Q: Sgt. Sampson, why would the SoToxa test be used, when it can only test for THC and cocaine, if polydrug use is so prevalent?

A: Sgt. Sampson: When it comes to oral fluid screening, the criminal code outlines what we can test for. If we had the technology we would try to test for hundreds of drugs, but it is just not there yet.

Q: Dr. Brubacher, in conducting cannabis impaired driving research, do we have to wait for negative events? How can we be more proactive?

A: Dr. Brubacher: It depends on what kind of research you're doing; if you're doing epidemiology public health research like what I'm doing, you do have to wait for negative events. We set limits at 5 nanograms per milliliter; we're not sure that's the right level, but we're being proactive.

Data Driven Transport Safety & New and Advanced Mobility

Lead / Moderator: Professor Tarek Sayed

Ms. Megan Oakey, Ms. Shabnem Afzal, Ms. Shewkar Ibrahim, Professor Simon Washington, Mr. Clark Lim, Ms. Joanna Clark

Ms. Afzal: Presented on setting the foundation – using data to establish political will when collaborating with partners, and consulting with the community. Each year, 20 people are killed on the City of Surrey’s roads and 12,000 people are injured. These injuries range from minor to very serious, life changing injuries. Every hour one person is injured on Surrey’s roads; they’ve made a commitment to reverse that trend. Looking at the data to isolate locations of harm helps to focus finite resources where the most issues are. Going upstream, Vision Zero is part of the city charter. This includes equitable resource allocation – looking at our processes with a magnifying glass, or even a microscope. Motivating action through a data driven and evidence led narrative. When we have that dialogue and we share that information, I have never failed to move people from where they have been by showing them the data and telling them why it’s important. We have a number of different datasets; all of them are important and interrelated, and we can’t make the most impact if we only use one set of data. In terms of serious injuries, we don’t have connected health data yet, and we need the health data, and the ambulance data too.

Recently I went to a conference and I heard from Toronto about some work they’d been doing looking at traffic calming in school zones. The requests for traffic calming in school zones came from wealthier areas. It’s mind boggling to me that we still face resource allocation around traffic calming, and citizens don’t have an equal level of ability to make those requests and decisions, as the low-income areas are the very same areas where collisions are taking place. We need to look at using the data to fulfill our ethical responsibility for equitable changes. People often see congestion and safety as oppositional forces; the main reason the public does not support leading pedestrian intervals is the perception that there will be a delay for vehicles. When you have a reliable road network, however, you can predict how long travel times will be. When you have catastrophic collisions, it closes an intersection for up to five hours, which has a tremendous impact on the reliability of that network.

Data Driven Transport Safety & New and Advanced Mobility

The fire service attends every collision that results in a fatality or serious injury, and they collect data as well. In the City of Surrey, we are fortunate to have a Fire Chief who is focused on evidenced led and real time data, and has created a dashboard. We are always looking to work with partners to enhance our ability to use data as well. Every single intersection has a camera, which records 24/7. They were installed to monitor traffic flow, with the purpose of easing congestion, keeping the city moving, and making it economically vibrant. There wasn't much, if any, focus on safety. But now, we can actually use this rich source of information. We have invested in conflict analysis, as Dr. Sayed discussed yesterday. In my experience we have seen some amazing dashboards, but when I looked at the underlying data that was used to create them, it didn't hold up. In the City of Surrey, we are undertaking a data review to identify the gaps and opportunities, to see where we can use data from different departments to enhance our current work and inform strategic direction.



Data Driven Transport Safety & New and Advanced Mobility

Ms. Ibrahim: Edmonton adopted Vision Zero in 2015, and was the first Canadian city to do so. We are nearing the end of the first iteration of our road safety strategy which allows me to be vulnerable with you today about what worked, and what didn't work. To provide context through contrasting Edmonton with Vancouver, we have urban sprawl within our city; we have designed out instead of up. So even with the low-cost measures, the quick wins, you are still covering a lot of kilometers, so even low-cost measures spiral into high costs when you apply them everywhere. We're fully funded by traffic safety, we are not funded by tax, which is great because when people call in and say, "I pay your salary," we can say, "Absolutely, but that's because you're speeding, so maybe don't speed." We are also the only municipal office of traffic safety that I am aware of, with a holistic approach to traffic safety. Vancouver and Edmonton have the same vision, achieving Vision Zero through safe and livable streets. Most focuses on engineering seem to miss, and I will be talking about the critical success factors, political interest and support.

Political Interest & Support: The City of Edmonton has two councillors who are traffic safety champions. They push forward and create buy-in at the City Council level, and it's fundamental to have that formal recognition, communication and engagement. There is work to do, however, to create even bigger buy in among the councillors and with the public as well. Provincially, there is much work to do. Alberta released the first traffic safety plan in 2007 which is driver centric. The Edmonton Vision Zero plan is evidence-based and data driven. However, we did not leverage the release and roll out on different platforms. When the public thinks of safety, they think of security, personal safety. The other gap is that we usually focus on external stakeholders, which is really important, but we also need buy in from internal stakeholders within our organizations, such as snow removal, etc. If they know why a signal light has been put in a certain area, they can be local champions and effect change through their interactions with the public as well. We need more work to include lived experience, with a focus on lived experience and proactive strategies. We need to make sure that when citizens call in to complain we can say, "I heard you, I understand why you're having this concern," and look into that with a toolkit to address their issues.

Critical Success Factors: We saw a linear reduction in collisions year over year, and it gives us an idea of what the path is that we need to go down. We have been able to pick those low-hanging fruit and get a high reduction, but one thing we weren't mindful of in the beginning, is that as you make your way down this chart, to reduce the final serious injuries and fatalities, the costs will be exponential.

Data Driven Transport Safety & New and Advanced Mobility

Stakeholders: We worked closely with our Edmonton Police Service, with the capital region intersection safety partnership, and with a community advocacy group. YEG CoreZone approached us and said, we want to have a voice, and work towards change, and in our private industries. We also have support from our road safety researchers, which helps to explain the work that we're doing, and why it does or doesn't work.

Overall: We are seeing a reduction in the number of collisions and serious injuries in spite of increase in the population and the number of passenger vehicles. We need to be mindful that these are not statistics, these are peoples being killed by something that we believe inherently is predictable and preventable.

Ms. Oakey: For health data, location information comes from the ambulances, which is the only data source that records location of collisions. The quality of these data has increased when they began to electronic input using tablets, with latitude and longitude recorded automatically, rather than carbon copies. We then link it with our different data sources: The BC Trauma Registry, which are data that has not been used publicly as the data set traditionally has been used for quality improvement for the service they provide to critically injured patients. Trauma patients require a team of doctors, and the injuries are bad enough that they know you're on your way. They have an injury severity score of nine or greater. Seventy-five percent are picked up by ambulance, and for the other twenty-five percent they use postal code to indicate where the injuries occurred. These are the worst injuries, and probably a good Vision Zero definition of "serious injuries." What we've been using as the default for serious injuries comes from the Discharge Abstract Database, what we call the hospitalizations, wherein patients stay at least one night in hospital. There are a good deal more hospitalization patients than trauma patients, however less are transported by ambulance. The last set that we have are the emergency department visits. We can figure out based on the ambulance data, rather than the hospital data, that it was a vehicle related injury, which the hospital data does not record.

You will notice fatalities are not included. Of course, we know where almost all the patients that die in hospital are picked up by ambulance. For those that don't die in hospital, we do not have those records. Vital statistics does, but there is not location, and so we are still trying to wrap our head around fatalities. These maps are one piece of the puzzle, this is not the panacea, we are cognizant of that. Using the last five fiscal years of data from these sources, maps have been generated for Vancouver and Surrey. Overlaying the locations of Intersection Safety Cameras, we see that the hot spots, based on the overall number of injuries, not the severity of the injuries themselves, match up.

Data Driven Transport Safety & New and Advanced Mobility



Mr. Lim: Data are a commodity. Oil is now a commodity, but it was only because of the internal combustion engine that it became of use. Data are the basic building blocks for processes and decisions. Big data fuels strategic information, automation, collective interactions all in real time. With Facebook and the like, we have become data cows, and you wonder why your apps are free. In the modern connected world, data is a strategic commodity. If data equals evidence, evidence equals truth, and then data equals truth. Truth in data should be able to go backwards and forwards. This doesn't just mean transparency, but that truth in data concept. When you think about us as human beings, you try to model us as information processing and gathering entities. And we sort of are, because we have five senses, and how many institutions have a good data monitoring program, and how many are really blind and deaf in that sense. As we get older, our senses decline. And in that sense, with institutions, we see them embracing the big data era or declining. Data are required for accountability. You cannot change what you cannot manage. And you cannot manage what you cannot or do not measure. I say to students at the University of British Columbia, hopefully you don't just become a traffic engineer. That will be your title, but what we are trying to improve is livability. Good data equals good governance, and good governance requires good management. Data is the plumbing and wiring of the governance structure. Yesterday so many speakers mentioned the need for targeting and monitoring. There are vague indicators and no mention of budgets. Goals require indicators and

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the monitoring of targets. A project we are working on in Kelowna, we have created a metric to quantify congestion for every hour of the day for two years, and we have a congestion score to see what is normal and what is abnormal. We are also developing an economic assessment based on that, and what is a healthy level of congestion. Having low level of congestion might look good on a map, lighting up all green, such as in the middle of the night, but if the same happens in the middle of the day the city is dead and it is bad for businesses. It is a different world out there. Ending on the following quote by T.S. Eliot: "Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?" I like smart cities, but we need more wise cities.

Ms. Clark: The City of Vancouver goals are the foundation of all of our work in mobility. We are working toward zero traffic fatalities. Our modal hierarchy is walking, cycling, transit, and then vehicles. When we're looking at these new mobilities, we're looking at zero traffic fatalities, and we're also looking at more people walking, cycling and taking transit. And drastically reduced carbon emissions, we've just adopted the carbon emissions response. This is an emergency, we're really looking for bold moves in this area. In terms of equity, how are we focusing on marginalized populations with our efforts? We are expecting ride hailing in 2020. To start, we put together principles that the council endorsed, we want to make sure that there is seamless coordination. Passenger safety is public safety, so we consider what is the impact of this street for passenger as well. We've heard from taxi companies that there could be a reduction in wheelchair accessible vehicles. There are opportunities for passenger vehicles on the streets, and ride hailing is an important part of that transportation system. Reducing carbon emissions, economic viability, driver equity are important parts of the conversation.

Our city regulatory framework, what we came up with, our municipalities have two regulatory controls. We can provide some requirements. We need to look at how we can be bold with our street traffic bylaw and reduce the congestion that we're expecting in our downtown core. We're requiring a business license, a per trip vehicle fee, and our curbside licensing. We're pricing the curb, between 7 AM and 7 PM. It is kind of like parking, but we're charging \$0.30 per curb stop. If we see impacts for vulnerable road users, we can up the price. We can incentivize zero emission vehicles and accessible vehicles as well, at 50% and 100% respectively. We are preparing for e-scooters and micro-mobility, so maybe if this symposium is here next year you'll all be coming on your e-scooters. Finally, did anyone ride ELA? In February 2019, as part of the Smart Cities Challenge, the ELectric Automation (ELA) visited Surrey and Vancouver. A driverless vehicle that, if you were walking or biking right beside it, it would slow down. I admit that I did walk right in front of it and it stopped, which was good. You can basically walk faster than it, and there was salt on the road at the time, which got on the sensors and stopped it. So, there is a lot we're doing, but there is also a long way to go.

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Q: Ms. Ibrahim, can you explain further how your work is informed by lived experiences?

A: Ms. Ibrahim: This is a new adoption that we're looking at in Edmonton, and was flagged for us through our work with Dr. Sayed; you remember that intersection which was very skewed, where they are coming in at a high speed and there is a little curve in the roadway. When we were out doing a review, we couldn't find evidence of a lot of collisions. You try to look for skid marks, or issues with roadside infrastructure, what looks like it has been hit, etc. Then, with the video analysis that we got with Dr. Sayed, we saw a multi-stage crossing: if there was a parent with two kids they had to do the trip twice to get from one stage to the other. That was one thing that wasn't really reflected in the collision data. The second piece was a bus stop that was so close to the intersection, and they saw the bus yielding, and no one wanted to wait for the bus to offload their passengers, and cars were encroaching into oncoming traffic to avoid the bus, and they were doing these aggressive maneuvers in the middle of the intersections. We went out to the community, and said, we couldn't see it in the collision data, we saw it in the conflict analysis, and there was an overwhelming sigh of relief, they said, "Finally, you get it."

Q: To the panel, how can these data driven, evidence-based approaches benefit our rural municipalities that may not have the same resources as our urban municipalities?

A: Mr. Chad Williams, audience member: I'm the transportation engineer with the City of Kelowna, and we are using Google Data that is available to everyone. Big data is a huge thing for us, we look at the City of Surrey and the City of Vancouver, and try to steal all your good ideas, skimming off the top for what we can implement in Kelowna with fewer resources. As I see some of these big data projects being implemented, hopefully smaller communities will be able to leverage the best practices and learnings.

Ms. Afzal: I would suggest smaller communities build relationships with the local police; they also do analysis, and this is an important partnership.

Ms. Ibrahim: I would recommend leveraging relationship with the province, who can provide grants to assist you with building the framework to get a program up and started.

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Q: Ms. Afzal, how did you engage not one but two councils to adopt Vision Zero and how much is it costing?

A: Ms. Afzal: At first, I used the drip approach, engage the council slowly with the data, the statistics, and then the election happened and we were back to square one. I was a little worried for a while because it felt like adopting Vision Zero wasn't going to be a priority anymore. And then we had the Smart Cities bid, and we were putting in the bid with the City of Vancouver, and the timing was right to declare Vision Zero at the same time, as it would strengthen our bid for the Smart Cities Challenge. We made a video with our local community members, members of families who had lost loved ones on the road, and that emotional impact coupled with the data, is what made councillors say, "There's no way we can say no to this, this is our community, we are elected officials." In terms of how much it is costing, we didn't have a defined budget. Instead, what we do have is a will to integrate Vision Zero into all of our organizations. For example, land planning as well as parks and recreation now work with the Vision Zero team with the imperative to move our work upstream to prevention as well as reaction.

Q: Ms. Oakey, does transport related injury include all pedestrian and cyclist incidents on roads and pathways?

A: Ms. Oakey: Yes, and we can break it down by all road users. I didn't show it today, but in our preliminary conversations with our GIS staff person, the pinpoints that we saw on the maps are not enough to identify anyone, but where it gets a little more challenging is when we start breaking it down by age and gender, as it can allow patients to potentially be identified. But we will be able to share it from a road user perspective. Also, it does not include forest roads, forest service roads are not accounted for in those databases.

Q: How is the truth from these data shared with the public? Shouldn't the true ownership be from the public, as the data is of the public?

A: Mr. Lim: Open data acknowledges that. I used to work for TransLink, and when we have a new data set, people wanted to get that data right away. There is resistance to reveal everything, as you don't know what you have and you're still analyzing it. Even the congestion data, there is a caution there when you're a political body, and secondly, when you give the

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raw data – a lot of academics want the raw data – there have been cases where they didn't analyze and then report properly, they forgot we had certain factors, they didn't account for it, the results come out, they're published, and then you're refuting the data of an academic who published something completely wrong. There is a caution of how exposed you go, or whether we should allow a lot to be out there.

Ms. Ibrahim: You open that data up, and then you become very vulnerable, you have ideas that people are going to use these data for malicious intent. More and more I have seen that there are lots of opportunities where we are releasing a lot of these information. An example is the hackathons that are springing up all over British Columbia and Alberta, and data is being opened up to a certain population, it's not opened up to the full public. An excellent example came out of Calgary, where an app was developed to estimate how much the reduction of the speed limit, say from 40 km/h to 30 km/h, will impact your commute under current conditions. That helps you engage with people and show transparency. For us the biggest hot topic is Automated Speed Enforcement data, because we look after that. At any point in time you will know where we will be the next week. We are also looking at how we're doing it from a safety perspective. If we're constantly thinking, this is mine, and I can't share it because I'm scared, the public will pick up on that and it will make them more uncomfortable. It is a very good point and very good topic.

Q: Ms. Clark, how is the City of Vancouver planning for e-scooters?

A: Ms. Clark: We've been getting calls from operators daily who want to be putting them on our streets, and we've the luxury of saying they're not allowed due to provincial regulations. Now that the provincial regulations may change we are looking at what we will do; developing a pilot and then figuring out what our requirements are. Remembering that safety, the public realm, and walkability are our number one priorities. I will be very surprised if we allow them on the sidewalk; a lot of cities are starting to fine significantly for them on the sidewalk. But also, they need a safe place to go.

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Q: When can municipalities expect to have access to the linked health data? What detail level will be shared with municipalities?

A: Ms. Oakey: We are dealing with significant fiscal restraint within our health authorities. Generating these maps requires computer programmer time, and my budget has disappeared. It evaporated this year, as I'm sure a lot of yours have as well. Conservatively we're 9 months away from this being available internally, and we are going to have to make a platform for our municipalities to access it. I would like to make this public the way ICBC has, but in nine months to a year I will be able to share this with municipalities on an individual basis, and my hope is to be able to add ICBC data as well, to add power, as they have personal health number, which is how we do our linkage. Ms. Afzal: I know this is a really important issue for municipalities, and we've heard about advocacy. I know Ms. Oakey has worked really hard for this to happen. But is it time for municipalities to raise their voices? Otherwise, we wait nine months, a year? Eighteen months? And in the meantime, what are we seeing on our roads? We can help Ms. Oakey with our voices, this is of real critical importance.

Keynote

Ms. Bowinn Ma (MLA, P.Eng)



MLA for North Vancouver-Lonsdale; Parliamentary Secretary for TransLink

Elected as the MLA for North Vancouver-Lonsdale in May 2017, Bowinn is also a licensed Professional Engineer and certified Project Management Professional. Prior to being elected MLA, she managed terminal expansion and redevelopment projects at the Vancouver International Airport.

As a local MLA, Bowinn focuses on the issues of housing, transportation, and child care. In 2018 she initiated and chaired the Integrated North Shore Transportation Planning Project, which brought all levels of government together to develop a unified transportation plan for the region. Bowinn also serves as the Parliamentary Secretary for TransLink and on several cabinet and parliamentary committees including Treasury Board, Housing Working Group, Select Standing Committee on Public Accounts, and Select Standing Committee on Crown Corporations.

I am a politician, but I am also a professional engineer. Mr. Lim and Dr. Sayed taught me. I want to talk to you about politics, and why road safety cannot happen in isolation from politics. I wasn't engaged in politics outside of UBC student politics. I remember saying things like, "I care about science, not politics," or, "I want what's right, leave politics out of this," or, "Who cares about politics, just do what's right." As is the case with all Canadian engineers, we must abide by a code of ethics. The iron ring represents that we hold paramount human welfare and the environment. If you delve deeper, it becomes more complex, if you think of how to execute it. For example, if I develop a technology that is then weaponized and used against innocent civilians, did I hold paramount human life?

If we want to believe professionals hold roles in our world, our obligation to the public cannot and should not end with our fingertips on a calculator. We must look beyond the scope of our immediate work. These factors don't disappear because I've applied the right factor of safety in my designs. Something being legal is not the same as being ethical or moral; how far does my responsibility go? It can be difficult to see the forest for the trees. In the world of engineers, the value of influencing human behaviour through design and the availability and cost of resources is easily recognized. Transportation patterns can be influenced by the cost of gas. Governance and politics influence the way the public behaves, and vice versa.

Keynote

Civic engagement and advocacy were a part of my role as an engineer and a part of society. It became apparent to me that most of our challenges in society were not technological, they were political – not just elections and Donald Trump, but all of us, as humans, how we interact with each other is political, and what we believe we know is right, is important, is moral, all influences how we do or do not vote, creating governments that manifest the worst and best parts of our society that we all end up living our lives and operating under. Politics influences how we elect our governments, and in turn, what we can do and say, the options we have in living our life and how you can run your business. Politics determines the fundamental framework in which people live, work, fail, succeed, suffer, or die. My life is political and has always been, as has yours. My ability to serve as an MLA is because of the women before me who fought for the right to vote, to hold office; the public had to be moved towards us. Sometimes we forget how recently this has happened. Only 114 MLA to the BC legislature were women, and nearly 30% of them, are sitting today. That is how recent that is.

What I can or cannot do with my body as a woman is political; my access to healthcare, that we expect toilet paper to be free in washrooms but not menstrual products. Transportation is political. Whose voices are louder during public debates? Whose perspective is considered more important? We tend to use the term politics when what we really mean is partisanship. Sniping back and forth, trying to win your vote. Or, I didn't vote, because it won't matter. Or, this conference is about road safety, not politics. Dr. Sayed and Mr. Clark came to me to ask for my help in lowering speed limits. When to bring the public along so that the rapid bus in West Vancouver doesn't get shut down by fear and disinformation. Or when to compromise in order to get something important done. Today, Vancouver is able to boast more than fifty percent of their trips taken in their city, are taken by non-car modes. To get there, Vancouver officials endured years of vicious blow back. Having strong leadership and representation matters. Having representation that knows what it feels like to wait in line for a bus or how vulnerable you feel cycling alongside a 5-ton truck matters. How technologies interact with the public and facilitates greater mobility for all matters. As leaders in the field who have the right answers on paper but never seem to get politicians to get it, remember the influence.

Keynote

Q: How do we force professionals and others to make the values underlying their recommendations explicit?

A: I have no idea. Their biases? That they're transparent? That's a really tough question, you win, I don't know.

Q: Is TransLink willing to incorporate Vision Zero into its policies and strategies and plans?

A: I don't represent TransLink, I represent the province and our relationship with TransLink.

Q: Do you have a professional opinion on Vision Zero?

A: Minister Claire Trevena talks about Vision Zero regularly; she's a cyclist, she commutes on bike eight km both ways, with four hills one way, and three on the other. It was one of her goals to promote active transportation – for commuting and connection, with funding coming out for municipalities this fall.

Q: How should we (the non-political) road safety community better engage with politicians to change policy and public perception?

A: What I'm here to tell you is that you're all political, whether you engage in politics or not. When you talk about your values, that is political. I don't say no to meetings from any of my constituents. Email your representatives, ask for a meeting, go out, talk to them on the street. On the municipal level, there are those public engagement opportunities. Often times, the people who engage in the public engagement opportunities, the people who show up, are the same people, over and over, and they often represent a very specific and repeating demographic – not younger, not younger families, who work, who are engaged in work at the time. They tend to be people who have a little more time on their hands. So, they don't get a proper cross section of people in the communities. Most of the road infrastructure is managed by municipalities. Getting your voice out will help balance some more old-fashioned opinions on what our roads should be about.

Keynote

Q: How can BC make road safety the priority it needs to be?

A: Governments can do multiple things at the same time. The Ministry of Transportation and Infrastructure does certainly have a responsibility to ensure that BC is as safe as possible. Having a province wide active transportation strategy with the goal of increasing cyclists on the road, these guides are all really important. But it's also about setting the foundation about what we expect out of our governments in the future. Having a strategy doesn't make all the roads safer overnight. Our government formed as a minority government 2.5 years ago. New Democrat Party governments don't come to BC very often; this is the third time ever. A lot of our work is establishing long term frameworks we hope will live past our government. Out on the North Shore, the Lower Lynn Corridor, we're doing a study we announced yesterday, to develop a long-term strategy to deal with that stretch of highway. We will determine the traffic volumes and needs from the Horseshoe Bay ferry terminal upgrade. Developing long term strategies allows us to outlive our government. If we've done that foundational work to help move into the future, then it won't be for nothing.

Q: What are your thoughts on allowing cities to have ownership of their own Automated Speed Enforcement tech?

A: Different municipalities will want different things. One of the challenges of provincial government, and for me as a very urban centric MLA, sometimes I forget we have over 200 local governments and 200 First Nations in this province alone. Urban governments have lots of resources and sophisticated staff teams, but there are a lot of local governments that don't have that. And when a province makes something available and changes laws, it happens across the board, it affects all communities. Some of the changes that larger communities want, they can devastate smaller communities.

Keynote

Q: In BC we have a 120 km/h limit on many highways, almost no Automated Speed Enforcement, and a culture of optional red lights, how are we so far behind best practices?

A: We have a history of electing governments in BC that have been very car centric. The highway speeds actually increased under the previous government. What I can mention is Minister Claire Trevena started up a pilot project with variable speed limits, which are usually put on certain highways to account for road conditions based on weather. The pilot project is based in Abbotsford, and is supposed to reduce congestion. If you slow down, you reduce collisions, which is what jams up the highways. This is going to be a little controversial - ICBC used to play a really important role in improving road safety in BC. As a public insurer, they had access to data, and put funds into improving problematic areas, reducing costs, to their benefit, as a public insurer. Between 2002 and 2017, there was a concerted effort to dismantle ICBC. The amount of money they are able to invest in road safety improvements has dramatically decreased as well. It's not just infrastructure, it's how we have a culture of road safety.

Q: What are you doing in North Vancouver in the road safety realm?

A: Nine public agencies participated in the development of this collective plan to address the Highway 1 along the Lynn Corridor, and this partnership allows us to look at the entire North Shore transportation system. For far too long and far too frequently, improvements in transportation are done on a case by case basis. Traditionally hundreds of millions of dollars or billions of dollars are spent on one area - maybe you upgrade one interchange, or you add one 10-lane bridge - where you deal with one congestion problem and it just moves the congestion somewhere else, and then you end up chasing the congestion. That's not a good use of taxpayer money and it's not good long-term planning either. I brought all the players to the table, it sounds very simple, but was the first time had been done. We had never had a collective, multi-agency approach to transportation.

Overview and Concluding Comments

Road trauma is a health epidemic. Would you travel by plane if you knew 300 people died every year in B.C. in plane crashes? You'd probably think twice! Yet we've come to accept that 300 people die and 4,000 people are hospitalized in road traffic crashes every year.

If you were asked how many people from your family should be part of those numbers, you would probably say zero. And that's what drives road safety experts; no one should die from road traffic crashes. They are predictable and, most importantly, they are preventable.

The International Road Safety Symposium, hosted in partnership by the BCCDC and UBC's Bureau of Integrated Transportation Safety and Advanced Mobility, supported knowledge exchange, partnership building and frank discussion about the challenges and politics we face to keep British Columbians safe on our roads.

The symposium invited speakers from the Netherlands, Australia and Canada to speak on the newest evidence on topics such as vehicle speed management, cyclist and pedestrian safety, better use of data to inform our work, and how to tackle the increases in deaths and serious injuries we are seeing on our roads. The solutions do not lie in trying to change humans since humans will always be fallible. The research is clear: we must build a system around us to protect us. Such a road system includes lower speed limits, barriers to prevent head-on collisions, and better intersections design.

Key learnings:

1. Speed is always the fundamental factor in crash severity. The 30 kilometers per hour speed zones should not just be around schools, it should be on all local roads. A pedestrian has a 10 per cent chance of dying if hit at 30 kilometers per hour but a 90 per cent chance of dying if hit at 50 kilometers per hour.
2. Road Safety is one of the major barriers to active transportation, particularly cycling, and more separated cycle lanes are needed; painted lanes are not protective.
3. Increasing partnership work between health, engineering, municipalities, ICBC, police and government is critical to make health gains and to garner political will.

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