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Going beyond the Numbers: an interview with incoming TSC Director Simon Washington on traffic safety myths and the importance of correcting them



Simon Washington will be assuming the directorship of the UC Berkeley Traffic Safety Center on August 1, after a national search to replace David Ragland, the founding director, who is retiring this year. Ragland will continue teaching and doing research at the TSC.

Washington, a professor in the department of civil, environmental, and sustainable engineering at Arizona State University for the past four years, will be taking over at a time when the TSC is handling some \$8 million in research projects and administrative grants and has upwards of 30 staff members including faculty and student researchers.

Washington received his PhD in civil engineering from UC-Davis in 1995, and has strong ties to California, having spent a large portion of his childhood in San Mateo and Sonoma Counties, completing high school in Sebastopol, and his undergraduate and master's degrees at California State University, Chico.

Although his PhD research focused on environmental aspects of transportation, safety was the focus of his MS degree and his first research passion. Simon re-ignited his interest in safety research as an assistant professor at the Georgia Institute of Technology, motivated by a need for safety research in the region.

"As these things sometimes do, the research snowballed, with one safety project leading to another, and another," he recalled, "resulting in a fairly quick transition to mostly safety research."

Washington is an active bicyclist. "All of the miles I've logged on the side of the road have given me an appreciation for vulnerable road users."

Six years later, yearning to head back west, Washington and his family settled in Arizona (four years each at the University of Arizona and Arizona State University). In Arizona he continued his work on highway safety, leading research projects funded by the National Cooperative Highway Research Program, the Federal Highway Administration, the National Highway Traffic Safety Administration, the Governor's Office of Highway Safety, and various state departments of transportation.

During his academic career, Washington has advised dozens of PhD and master's students, designed numerous undergraduate and graduate courses, and authored or co-authored nearly 100 peer-reviewed journal and conference papers, books and book chapters, and technical reports. He has been invited to present his work to audiences in nine different countries and has been keynote speaker at national and international safety conferences. He co-authored the graduate-level textbook, *Statistical and Econometric Methods for Transportation Data Analysis*, in 2003, with Mathew Karlaftis and Fred

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Mannerings. It has been used in upwards of 40 universities in more than 14 countries.

Most of his work has focused on statistical methods and data analysis for identifying and assessing traffic safety risks and for quantifying the effectiveness of safety countermeasures and programs. Recent projects of his have paid attention to rail crossing safety, rural road safety, the identification of high-risk locations, measuring the effectiveness of red-light cameras and automated speed enforcement, and the development of analytical tools for forecasting the traffic safety consequences of planning policies on a regional scale.

"When the UC Berkeley Traffic Safety Center position was announced, I viewed it as an ideal job at an ideal time. The prospect of working at a renowned research institute affiliated with one of the top transportation programs in the world and to return to California to live near my extended family was extremely appealing.

The Traffic Safety Center's cross-affiliations with engineering and public health make it extremely competitive and positioned well to tackle interdisciplinary safety issues.

"The research mission and accomplishments of the TSC along with the reputation of the Institute of Transportation Studies and the world class transportation faculty and researchers at UC Berkeley were extremely compelling reasons for me to accept the position," Washington said. He was also drawn to the TSC's cross-affiliations with engineering and public health: "The role of the School of Public Health in the TSC is unique and makes it extremely competitive and positioned well to tackle interdisciplinary safety issues," he said.

Washington is an active bicyclist, racing "as a hobby" for the past 20 years, mainly road races, but some mountain bike competitions as well. "All of the miles I've logged on the side of the road have given me an appreciation for vulnerable road users," he said. He has had only one minor encounter with a car over all those years of training and racing. "My interest in riding and racing bicycles will continue long into the future," Washington said.

Washington also has raced in sanctioned automobile races and has been a driving instructor for performance driving for the last three years in Arizona: "My experiences from racing and teaching drivers how to reach the performance limits of their vehicles enhances my understanding of vehicle dynamics and its role in highway safety," Washington said. "Although my car racing days are behind me the skills and experiences will continue to provide me critical insights into highway safety and motor vehicle crashes into the future."

Recently, Washington spoke to the TSC Newsletter by phone from his home in Tempe, Arizona.

In a 2008 Transportation Research Record paper, "[New Criteria for Evaluating Methods of Identifying Hot Spots](#)," you mention the sea-change in attitudes about the importance placed on safety at the federal level, first in the Intermodal Surface Transportation Efficiency Act of 1991 and the subsequent Transportation Equity Act for the 21st Century. This has really evolved, hasn't it?

Yes it has. In the last decade or so there has been recognition by people holding positions in high levels of national and state governments that traffic fatalities and injuries should extend beyond the radar screen of public health professionals and that transportation professionals had a major and proactive role to play. The keyword here is "proactive," as the past has been dominated by reactive safety programs.

As an example, it has historically been assumed that when we design highways according to current standards we are building the safest of facilities. We then build and operate these facilities and find, sometimes surprisingly, that safety issues arise—which we then try to mitigate. Considerable effort is now being made to understand the safety tradeoffs in the design and planning stages.

Has this push for quantifying safety meant changes in how it is studied?

The more we examine the complex analytical relationships between safety and exposure to risk (e.g. vehicle miles traveled), roadway features, and driver behavior, the more we discover that the relationships are complicated and that better tools and an improved understanding of how, why, and when these factors interact are needed. Just like any applied field, such as travel behavior, safety has its own unique set of nuances and conditions that need to be better understood.

In a 2003 Transportation Research Record paper, [Validation of FHWA Crash Models for Rural Intersections Lessons Learned](#), you and your co-authors write, "it is possible for a model to predict an underlying data-generating process adequately but fail to illuminate and explain the nature of the underlying process." This is a concern of yours that you have expressed repeatedly in your work. Could you elaborate?

The key is to understand that the sometimes complex statistical methods and models we use are just tools devised to provide a glimpse of the underlying "reality." The profession in my humble view really needs to increasingly focus on the fundamental or basic knowledge that is afforded by the use of statistical models on well-thought-out experiments and field studies and pay less attention to the models themselves—I think the research is slightly out of kilter in this respect. It is fundamental knowledge—which is admittedly extremely elusive—that will serve the profession best in the long term.

I am optimistic that the top cadre of professionals in road safety is aware of the analytical problems and knowledge gaps we face. There's a significant cost of being consumed with the analysis of casually observed crash data at the expense of designing field studies, experiments, and analysis methodologies that strive to learn more basic and fundamental knowledge. The profession is aware of this and is working collectively to explore new and promising research directions.

In that same paper, you cited as an example of the complexities of safety decisions, the decision to install lighting to reduce nighttime crashes. However, the presence of light poles increases risks for daytime drivers.

The example of installing light poles should be credited to my esteemed colleague Ezra Hauer. There are numerous other examples of these types of safety tradeoffs. Installing speed photo enforcement and red light running cameras, as examples, typically increase rear-end crashes while reducing other crash types.

Another complexity when considering safety investments is that we don't get a complete and accurate picture of highway safety. Often, we are missing information that could be critical to understanding a crash—someone adjusting a radio or answering a cell phone prior to a crash, glare in a driver's eyes, prescription or over-the-counter drug impairment, or driver fatigue. In the absence of this often critical information we might mistakenly associate a crash with a roadway or roadside feature in a statistical sense. Moreover, many crashes that result in property damage and no injuries are inconsistently reported—often skewing our ability to assess highway safety.

Road safety is akin to putting together a puzzle without all of the pieces. We can either try to infer what is missing as best we can or strive to get more information—both of which are worthwhile pursuits to improve road safety knowledge.

What additional puzzle pieces are needed?

That's a really important question: what aspects of safety information do we need to know in order to get the biggest bang for the buck—or contribution to knowledge? Is it more information? Better information? Is it using simulators versus using field studies? Is it changing the types of models we use to understand safety?

The quality of the data stream needs to be improved—we need to know accurate details of crashes. We also need better exposure data at intersections regarding turning movements, mainline exposure data, and pedestrian and bicyclist exposure data—which are virtually non-existent. We also need to better understand safety culture, how it influences driver behavior, and how it might be influenced.

In a paper you co-authored on [evaluating methods for identifying hot spots](#), you point out the "alarming" practice by safety agencies of using accident rates to rank hot spots. Intuitively, that would seem to be an acceptable method, but it performs very poorly in identifying them. Could you explain?

There is an ongoing misperception that one can use accident rates to level the playing field with respect to exposure when identifying high risk locations. This is marginally true at high levels of aggregation but increasingly less true as one begins to examine particular types of sites. The problem with using crash rates is that they typically decrease once exposure reaches a certain threshold. In other words, as traffic volumes increase over time with growth of VMT, accident rates generally tend to improve. So, comparing two otherwise similar sites with differing VMT often does not serve as a meaningful metric to gauge their relative safety.

Another critical aspect of the relationship between safety and exposure is the changing crash severity distribution as VMT increases—this is true on road segments and at intersections. Clearly a fatal crash is more harmful to society than an injury crash which in turn is more harmful than a property damage only [PDO] crash. A research interest of mine is to improve and standardize how we incorporate crash severity into high-risk site identification.

Another challenge is to know what the goal is and what level of safety you are trying to achieve.

The profession is unclear on how to address this interesting and complex question. We typically strive to improve sites whose safety records are worse than the "mean of similar sites," with resources typically limiting improvement to the top five or 10 percent of sites. We have not spent much time as a profession looking at sites that consistently over-perform with respect to safety. I believe that much can be learned from pursuing this line of inquiry.

And how do you measure things that don't happen, like near-misses, or conflicts, that do not necessarily result in crashes, but are signs of potential problems?

Surrogate measures of safety and how to measure unsafe situations in the absence of crashes is another perplexing area of research with relatively little fundamental knowledge. It would be extremely useful to identify harbingers of crashes. Some current studies with instrumented vehicles and information on driver behavior and actions will undoubtedly offer new insights in this regard.

Some of the preliminary results we're seeing at first seem counterintuitive. Behavior that we tend to think of as risky—for example, dramatic braking and sudden lane-changing—tends to occur when crashes are prevented or avoided.

Some of the preliminary results we're seeing at first seem counterintuitive. Behavior that we tend to think of as risky—for example, dramatic braking and sudden lane-changing—tends to occur when crashes are prevented or avoided. Crashes tend to occur during more typical braking and lane-changing maneuvers—for example at deceleration rates well within typical road design guidelines. This observation is easily explained: attentive drivers will avoid crashes by braking or swerving, whereas distracted drivers will fail to react aggressively and appropriately.

Since there are far more near-misses than actual crashes we can infer that aggressive actions on the highways may not serve in general as reliable predictors of troubled locations. We probably need to observe more than just driver actions to predict trouble spots; we will need also to predict or identify locations where there is a high level of driver distraction and cognitive loads, static as well as dynamic.

Another area you have been looking at is safety assessments on the regional level, akin to environmental impact assessments and other forecasts of the effects of regional-level changes in land use, transportation, and the like.

Currently there are no nationally available tools available for forecasting traffic safety at the regional scale. I have been working with top researchers to develop a tool—named PLANSAFE—that will forecast the safety impacts of socio-demographic changes and alternative future growth and transportation investment scenarios. This proactive safety tool will enable planners to consider the safety impacts of transportation and infrastructure investments, alongside congestion and air quality impacts. This tool is intended to support routine sketch and long-range planning activities.

The recent economic downturn has led to reductions in VMT over the last couple of years. Government agencies and other safety analysts have noted a marked improvement in safety. However, we don't know if or how much the reduction in VMT has contributed to the observed safety improvement.

As an example of the value added by PLANSAFE, the recent economic downturn has led to reductions in VMT over the last couple of years. Government agencies and other safety analysts have noted a marked improvement in safety over this same time period—and may understandably conclude that past safety investments have led to these safety improvements. However, we don't know if or how much the reduction in VMT has contributed to the observed safety improvement.

It could be the case that safety has gotten worse but the reduction in crashes due to reduced VMT has more than offset the worsened safety. The intent of PLANSAFE, in part, is to enable the prediction of the safety impacts of socio-demographic and other regional scale transportation system changes so that difficult questions like these can be answered.

You have also researched how regions differ. It's very tough to make broad, sweeping comparisons across states or even across cities within a state?

Yes, it is extremely difficult to make meaningful comparisons across states and cities. Consider just some of the important differences that can affect safety. Cultural driving norms differ: in some cities street drag racing is a chronic problem while in others it is relatively non-existent; the elderly in some cities have access to good public transportation while in others they must drive for mobility; and basic driver etiquette varies considerably across states and regions. Local highway design guidelines differ across cities and states for motorists, bicyclist, and pedestrians.

The mix of transportation modes differ across states: warmer climate states tend to have heavy pedestrian and bicycle use compared to colder states. Weather effects are substantially different across cities and states, with snow, rain, ice, freezing rain, wind, and fog having drastically different influences on safety. Finally, city and state laws that affect safety such as graduated driver licensing, driver education, safety restraint use, and impaired driving are substantially different.

As a result, it is extremely important to understand the limitations of such inter-regional comparisons and to limit the influence of such differences by focusing safety analysis efforts within cities and regions and not across them. The listing of differences across cities and states also highlights my earlier point that there is much information to be known about the potential influences in highway safety—and seldom are all of these influences known.

One area of traffic safety research you mentioned you were interested in is how people perceive risk and compensate for it.

I think this is one of the most exciting areas of safety research—to better understand and measure people's risk compensation behavior.

Think of using a cell phone while driving—which is illegal in California and several other states. The generally accepted belief is that using a cell phone while driving is risky. What we really don't know is if risk-compensation occurs when drivers use a cell phone, and if so, if they are compensating sufficiently for the increased risk. Moreover, certain

segments of the driving public may be compensating while others are not. Many elderly drivers, for example, may be compensating for the increased risk by not using the cell phone at all (in states where it is legal). Other drivers may move immediately into the right-most lane, turn off the radio, and reduce their travel speed prior to using the phone.

The basic knowledge we are lacking is the extent to which the increased risk is offset by compensatory behavior among different driving groups.

The basic knowledge we are lacking is the extent to which the increased risk associated with using a cell phone (or other behaviors such as speeding, driving aggressively, driving with a passenger, driving on narrower roads, etc.) is offset by compensatory behavior among different driving groups.

Equally intriguing is that we don't understand well the reverse risk-compensation scenario either: which driving groups increase their driving risk, and to what extent, when a driving environment is perceived to be safer? Does a new, more capable and safer car lead to more aggressive driving? Do wide travel lanes and shoulders tend to make people drive faster?

These and related questions are examples of fundamental and basic knowledge desirable for moving the safety profession forward.

How would you get that information?

There are number of ways each with their strengths and limitations.

Some cleverly crafted surveys may provide some insights, as could observations of driving behavior and examination of individuals' driving records.

Studies using driving simulators are invaluable for collecting this type of information, but, of course, great care must be given to the design of such studies.

Finally, some well-thought-out field studies may provide valuable insights. As a simple illustration of early work in the area of risk compensation, nighttime travel speeds at an intersection were observed before and after lighting was installed. Speeds were significantly higher after. The research question is whether the increase in speeds resulted in a reduction or improvement in the safety of the intersection.

You have done a lot of work [evaluating red-light cameras](#) and automated speed enforcement, two controversial technologies. Can you share some thoughts?

History has shown that people are generally accepting of safety devices as long as they don't compromise their perceived mobility. Some motorists view speed enforcement as a compromise to mobility; although my own preliminary research has shown this not to be the case. Also, there is an aversion by some individuals to being monitored (be it video, email, telephone, etc.) It should be noted, however, that monitoring only occurs if a laws is broken and so monitoring is actually a choice made by the motorist.

I'm convinced that, for these devices to be effective and accepted, the public must believe that improving safety is the prime motivation for the existence of these devices.

After studying both intersection cameras that enforce red-light running and cameras that enforce mainline speeds, I'm convinced that, for these devices to be effective and accepted, the public must believe that improving safety is the prime motivation for the existence of these devices.

If the public believes that either safety is not improved or there are ulterior motives, then the effectiveness of these devices is undermined. Moreover, there is a real risk that a negatively perceived program will affect the overall safety culture and the effectiveness of other safety devices or programs. There are ways to roll out such programs to mitigate negative perceptions and to gain widespread support; however, it seems to require a delicate and well-thought-out implementation plan and a receptive public.

As for speeding—rarely is it the sole cause of a crash. Problems occur when you combine speeding with other risk factors such as fatigue, driver distraction, and following too closely. Finding effective strategies to mitigate driver fatigue, driver distraction, and following too closely is likely to yield equal or greater safety dividends than focusing on speed; enforcing speed limits simply represents going after the “low-hanging fruit.”

You are a cyclist, and that gives you a perspective that many people who only drive do not have. Do you think people's lack of experience outside of their cars is a factor in today's traffic safety climate?

Yes, it is one of many factors. In many cities across the US there are few pedestrians and bicyclists. There are far fewer children walking and riding bicycles to and from school today than in prior generations. I'm not aware of research that has tried to examine the effect that being a pedestrian or bicyclist has on one's ability to be a good motorist; although such research would be very interesting.

My own experience tells me that considerable time spent as a vulnerable road user is bound to influence the way you treat other vulnerable road users as a motorist; but this is purely anecdotal.

My own experience tells me that considerable time spent as a vulnerable road user is bound to influence the way you treat other vulnerable road users as a motorist; but this is purely anecdotal.

What other things would you like to do at the TSC?

The TSC is unique, because of its origins in both the School of Public Health and the Institute of Transportation Studies.

The combination of perspectives is immensely beneficial because it positions the center as a multi-disciplinary research unit able to address a variety of vexing practical and fundamental safety questions—some of which I mentioned previously. I am looking forward to learning about the research strengths and interests of the researchers and staff at the TSC, to maintaining the excellent work and activities of the center, and to exploring new directions with the staff of the TSC.

I am also grateful to David Ragland for laying the groundwork and building a solid foundation for the TSC that I'm fortunate to inherit. Moreover David has hand-picked an excellent staff and TSC Assistant Director, without whom the center would not have flourished. With this excellent track record, staff, and resources I hope to work with the TSC toward the mission of reducing travel and mobility risk regionally, nationally, and internationally.

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