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ENHANCING TARGETED TRAFFIC ENFORCEMENT EFFORTS IN PORTLAND, OREGON

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ABSTRACT

Enforcement is a key component of any comprehensive traffic safety program, and through a unique effort the Portland Office of Transportation (PDOT) partners with schools, the court system, community groups and the Police Bureau to develop a coordinated citywide program to improve traffic safety. However, like many government agencies, the Police Bureau faces constraints that limit the resources it can devote to traffic safety. In response, PDOT and the Police Bureau’s Traffic Division have instituted a program of Strategic and Focused Enforcement (SAFE) to better allocate limited traffic safety personnel and resources. Using historical crash data, PDOT identified 30 high crash corridors and the Police Bureau directed enforcement to these areas. This paper explores alternative techniques to identify SAFE corridors using more recent crash and driver error data. It also highlights the potential for the city to carry this program through to a more robust, high-profile implementation phase, and the new data analysis options that will become available in the next few years. This study will be useful for other practitioners wishing to engage enforcement as a key ally in improving traffic safety.

INTRODUCTION

Portland, Oregon is commonly ranked as one of the most livable cities in the United States for its land use planning, pedestrian and cyclist friendly infrastructure, and transit services. However, motor vehicle crashes – and the subsequent impact to those involved – can have a deleterious effect on livability and community health. In 2004, there were approximately 9,000 reported motor vehicle crashes including nearly 37 related fatalities (1). Compared with 27 peer cities, the motor vehicle fatality rate in Portland (0.46 per MVMT) is below average but there is a strong desire to improve the safety of the transportation system for all users (2).

In 2003, the City of Portland’s Office of Transportation (PDOT), in conjunction with Portland State University and other partners, created a Community and School Traffic Safety Partnership (CSTSP). The CSTSP calls for targeted traffic safety investments in three major program areas: 1) reducing crashes associated with driver error, 2) improving pedestrian and bicycle safety, and 3) enhancing safety around schools. It is a community-based, coalition-led effort to improve Portland's traffic safety. Efforts in each of these major areas have a balanced approach, employing engineering, education, and enforcement strategies. One significant effort of the 2006 program has been a study of innovative best practice in traffic law enforcement to identify opportunities for new or modified programs in Portland. This paper describes the existing program in Portland, explores new techniques for identifying enforcement-intensive corridors, and suggests some program enhancements.
STRATEGIC AND FOCUSED ENFORCEMENT

Portland’s experiment with targeted traffic enforcement was inspired by Aurora, Colorado’s Special Traffic Enforcement Campaign. In 1998, Aurora’s municipal government used citizen complaints and crash data to identify high danger locations on the street network, and targeted these locations for increased traffic enforcement. In that year, the total number of traffic tickets issued increased 40% from the previous year, and the injury crash rate declined by almost 9% (3). Portland’s program - Strategic and Focused Enforcement (SAFE) - began in 2000 by identifying priority intersections based on citizen complaints. In 2003, PDOT identified intersections based on crash frequency that were aggregated into a series of 30 SAFE corridors. These corridors represent a small fraction of the Portland road network but a majority of the city’s motor vehicle crashes. Maps of the corridors were created and distributed to law enforcement. Actual enforcement efforts in these corridors have been primarily voluntary, in that all precincts have been encouraged to prioritize these areas but there has not been a coordinated, continuous effort to maintain enforcement in these corridors.

This study was originally focused on evaluating the SAFE initiative’s success in reducing crash rates within its targeted corridors. However, because enforcement efforts in the corridors have been on an “as available” basis and enforcement patterns are not recorded, it would be difficult to evaluate the effectiveness of the program (as currently implemented). Anecdotally, there has been one unexpected tangible benefit of the SAFE Corridor analysis in that police officers have used crash maps in court to explain enforcement actions and impress the gravity of the charges upon offenders. The following sections describe enhancements being explored for corridor identification and enforcement practices.

Enhanced Corridor Identification

While the SAFE corridor analysis in its current form is useful, the CSTSP is eager to improve its methodology. PDOT recently succeeded in mapping approximately 95,000 crash locations that occurred from 1995 through 2004. This ability to map crashes is expected to provide a clearer picture of where enforcement attention should be focused. In recent years, the techniques for screening transportation networks to identify high crash locations have been becoming more sophisticated. However, like many transportation agencies, the City of Portland lacks sufficient data, either in timeliness, completeness or accuracy, to implement many of the more recent advances. In general, networks can be screened and locations ranked based on frequency, severity value, crash rate, some combination weighting, by potential for improvement, trend, or pattern analysis. The more sophisticated methods are typically included in the potential for improvement, trend, or pattern analysis. Hauer argues that the primary purpose of network screening should be to produce a list of candidate locations for treatment (4). If a given location can be expected to have a high number of crashes, it does not necessarily need to be ranked as hazardous. Two screening methods are explored in this paper – both at the very preliminary stages.
Using ArcGIS 9.1, crash locations from 2002, 2003 and 2004 were spatially joined to the nearest road segment in the street shape file provided by Portland Metro’s Regional Land Information System (5), producing a crash count for each segment. At the current stage in the analysis, traffic volumes are not available in a GIS format but will be shortly. Crashes at intersections were assigned to the nearest segment, however this analysis could easily be conducted for intersections only. In screening, it is helpful to distinguish those segments that are above average or different from similar roadways. For comparison purposes, the road network was aggregated to 4 street classifications: primary arterials, secondary arterials, other arterials and minor streets. Lacking volumes, these functional classes should be similar enough that the comparisons between them are meaningful. The distribution of the crashes per mile per year is shown in the four panels of Figure 1. As one would expect, many street segments have no reported crashes for the three-year period and the density plots are heavily skewed towards zero. The average rate per mile per year is shown in Table 1. Because the distance between intersections tend to be very short in Portland (average segment length 400 feet), the per mile per year crash rates appear unusually high. As one would expect, the high order streets have higher per mile per year rates since they carry more volume.

Nonetheless, it is possible to use these average values to find possible outliers in the City street network. For each street classification, segments that are some standard deviation above the average for that classification can be identified. Figure 2 shows a possible representation of these segments identified to be 3 standard deviations above the average based on total crashes. A quick comparison to the City’s current SAFE corridors reveal that this slightly more advanced method identifies many of the same locations but a number of unique corridors are identified. This methodology could easily be expanded to only focus on driver error types that might be modified by an aggressive enforcement plan. Using the same calculations, Figure 3 shows the locations on the road network where “driving too fast for conditions” was a primary driver error. This information can inform strategic enforcement deployment, allowing automated enforcement tools to be deployed where they are most appropriate, and officers to patrol areas where they are most needed. For example, the areas highlighted in Figure 3 are prime candidates for photo radar application. Monsere et al have done other research for the CSTSP on photo radar deployments based on the neighborhood, rather than street segments (6). Clearly, the ability to map crashes allows significant flexibility in identifying “high crash” street segments. Future analysis will include volumes, controlling for regression-to-mean, and exploration of average crash frequencies using safety performance functions. Appropriate GIS techniques can be explored to combine these segments into corridors for enforcement actions.

Table 1 Average Crash Rates per Mile per Year

<table>
<thead>
<tr>
<th>Minor Streets</th>
<th>Other Arterial</th>
<th>Secondary Arterial</th>
<th>Primary Arterial</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.08</td>
<td>11.31</td>
<td>15.79</td>
<td>27.02</td>
</tr>
</tbody>
</table>
Figure 1 Density Plots of Crash Rate per Mile per Year by Road Classification
Figure 2 High Crash Street Segments

Figure 3 Speed-Related High Crash Street Segments
Once a corridor has been identified as a SAFE corridor, it may be necessary to know where along the corridor enforcement action could be targeted. One plotting technique that was explored is shown in Figures 4 and 5. Sandy Blvd is a primary arterial that has a number of high crash segments. Its location is highlighted in Figure 2. The average crash rate per mile per year along the length of Sandy Blvd is shown as the straight line in Figure 4. The stepped line (starting at the western end of Sandy Blvd) is a plot of the cumulative number of crashes along the arterial. When the slope of this cumulative line is greater than the average line, the rate of crashes along this distance is higher than average. Conversely when the slope is less, the rate is lower. By subtracting the cumulative crashes from the average crashes, the differences between the slopes can be made more apparent. As shown in Figure 5, the section of Sandy Blvd 10,000-15,000 feet from the start (NE 39th Avenue to NE 52nd Avenue) is clearly one of the major contributing locations to crash occurrence along Sandy and could be targeted as a key location that deserves enforcement attention. This plotting technique for freeway bottleneck analysis is explained in Bertini and Myton (7). Another method similar to this technique could be applied as in the work by Kononov identifying safety trends on rural Colorado highways (8).
Enforcement Enhancements

The most conventional method of improving traffic law enforcement is to add officers. If the budget does not allow for these improvements (as is the current situation in Portland), well-publicized enforcement missions can deter traffic violations more effectively than simply issuing citations can. In Scottsdale, Arizona, increased publicity has helped to reduce crash rates even when additional officers and funding did not (3). Portland has taken advantage of these high-profile missions regularly in the last few years, involving local politicians in traffic enforcement scenarios with heavy media coverage for crosswalk enforcement.

The CSTSP is considering a number of enhancements to the SAFE program including signing and branding of the corridors, allowing for increased fines, and additional data collection for future evaluation. The State of Oregon currently has a program to identify “Safety Corridors” that have above average fatal and serious injury crash rates. Oregon law allows a doubling of traffic fines in these corridors. Studies of the Oregon program as well as comparable programs in California and Texas suggest increased fines must be accompanied by an increase in the certainty that a citation will be issued when a violation occurs (9). Increased fines will not substitute for increased enforcement, but may lead to complementary improvements in speeding and crash reduction.

The CSTSP is exploring the feasibility of a similar local designation. Appropriate signage of SAFE corridors, particularly if an increased fine is applied to them, will be
critical to the success of the program. Currently, no signage exists to alert drivers to these high-crash corridors, or to suggest that enforcement will be focused there. Publicizing the program in this way may bring driver attention to these corridors more than increased enforcement could alone. The plan for branding and advertising the program should also include a reasonable criterion for the eventual removal of the designation and the signage.

For future evaluations of effectiveness, the CSTSP is considering gathering additional data. The Traffic Division of the Police Bureau is partnering with a local technology development firm to test a new system of issuing traffic tickets using handheld personal digital assistants (PDAs) wirelessly connected to driver information databases. This will help officers to issue tickets more quickly, reduce errors due to legibility problems or damaged paper tickets, and will enable a new kind of data collection. The devices currently have the capacity to geographically identify citation locations by intersection, location on a divided highway, address or street block or proximity to a major landmark. The next version of this ticketing software may include a mapping feature with global positioning system (GPS) capabilities, reducing the need for geocoding during data analysis, and significantly increasing data quality. The digital citations will contain all of the information currently included on paper ticket, down to the color of the vehicle, allowing for a wide variety of new data analysis options.

CONCLUSION

The Strategic and Focused Enforcement program has largely operated behind the scenes since its inception in the year 2000. New opportunities for more accurate data analysis and specialized enforcement targeting based on prevalent driver errors suggest that the program will grow in the coming years. Of the improvements under consideration, creating labeled elevated fine zones based on crash data analysis appears to have the greatest potential to influence driver behavior, but is also likely to pose the greatest political challenge. SAFE corridors could also receive additional engineering and education focus. The Community and School Traffic Safety Partnership should seek to expand current data collection and analysis efforts and encourage a higher profile for the Strategic and Focused Enforcement program.

REFERENCES


