Research Project Work Plan

for

RISK FACTORS FOR PEDESTRIAN AND BICYCLE CRASHES

Project Number SPR 779

Submitted by

Christopher M. Monsere, Ph.D.
Associate Professor

Portland State University
Department of Civil and Environmental Engineering
PO Box 751
Portland, Oregon 97207

Haizhong Wang, Ph.D.
Assistant Professor

Oregon State University
School of Civil and Construction Engineering
101 Kearney Hall
Corvallis, Oregon 97331

for

Oregon Department of Transportation
Research Unit
200 Hawthorne Ave. SE, Suite B-240
Salem, Oregon 97301-5192

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1.0 Identification

1.1 Organizations Sponsoring Research

Oregon Department of Transportation (ODOT)
Research Unit
200 Hawthorne Ave. SE, Suite B-240
Salem, OR 97301-5192 Phone: (503) 986-2700

Federal Highway Administration (FHWA)
Washington, D.C. 20590

1.2 Principal Investigator(s)

Christopher M. Monsere, Ph.D. P.E., Associate Professor (PI)
Department of Civil and Environmental Engineering
Portland State University
PO Box 751
Portland, OR 97201 Phone: 503-725-9746
Email: monsere@pdx.edu

Haizhong Wang, Ph.D., Assistant Professor (Co-PI)
School of Civil and Construction Engineering
Oregon State University
101 Kearney Hall
Corvallis, OR 97331 Phone: 541-737-8538
Email: Haizhong.Wang@oregonstate.edu

1.3 Technical Advisory Committee (TAC) Members

Mark Joerger, ODOT Research Section 503 986-3464
Doug Bish, ODOT Traffic-Roadway Section 503 986-3594
Amanda Salyer, Senior Traffic Investigator, ODOT Technical Services
Gary Obery, ODOT Alternate Mode Traffic Engineer, 503 986-4062
Chris Woods, FHWA Traffic Safety Engineer

1.4 Friends of the Committee (if any): TBD

1.5 Project Coordinator: Mark Joerger, ODOT Research Section

1.6 Project Consultant: N/A

1.7 Project Champion: *Doug Bish, ODOT Traffic and Roadway*

2.0 Problem Statement

In Oregon, pedestrian and bicyclist fatalities comprise more than 15% of all traffic deaths and are of primary concern for many communities in Oregon (there were 56 bicycle and 247 pedestrian fatalities in the last five years). Oregon has identified pedestrian and bicycle crashes as a primary focus area for investing infrastructure funding and has marked approximately $4 million in the All Roads Safety Program to help address this key need. However, developing a plan for targeted investments is challenging because pedestrian and bicycle crashes are uncommon enough to make it difficult to predict where they will occur next. This random nature also makes it difficult to identify high crash locations and corridors. As preliminary work towards this problem, ODOT TRS hired a consultant in Spring 2013 to prepare a plan to reduce bicycle and pedestrian crashes by focusing limited resources on locations that have the greatest potential for crash reductions. The objectives of the plan were to match key effective safety systemic infrastructure countermeasures with potential locations for improvements by identifying a few key patterns of behavior and roadway conditions that cause the high risk locations. The results of the plan were presented and discussed with stakeholders from around Oregon. The identification of risk factors and the magnitude of their influence on the likelihood of future crashes were significantly constrained by limited roadway information used in the analysis such as bicyclist and pedestrian volumes, the presence of a crossing treatment, presence of a turn lane, driveway activity, and sight distances. To improve ODOT's ability to target limited resources more certainty is needed about the most important risk factors.

3.0 Objectives of the Study

The objective of this work is to develop a tool for ODOT to improve methods to identify and prioritize locations with increased risk, rather than a simple crash history, so they can be proactively treated. Using the consultant's work as a starting point, this research would continue to investigate the factors related to the common causes of pedestrian and bicycle crashes. This research will seek to identify key risk factors that contribute to higher than average numbers of serious or fatal pedestrian and bicycle crashes to generate best practices in pedestrian and bicycle problem identification and prioritization, and identify data elements that support decision making and prioritization.

3.1 Benefits

There is a high potential pay-off for a better understanding of pedestrian and bicycle safety issues. Each fatal and serious injury crash not only affects the community economically but also emotionally. The total estimated cost of each fatal and serious injury is in the millions of dollars. ODOT has implemented a new program to invest $4 million per year in pedestrian and bicycle safety improvements. To effectively invest these funds, ODOT needs a systematic method for investing the funds to achieve the greatest reduction in fatal and

serious injury crashes possible. The research may also identify improvements that may be needed in ODOT's roadway inventory.

4.0 Implementation

The research will produce guidance for best practices that will most effectively reduce pedestrian and bicycle fatal and serious injury crashes. This may be in the form of a risk score to prioritize locations of safety projects, a method of identifying potential project corridors, or the ranking of risk factors that are associated with pedestrian and bicycle crashes. The tool developed in Task 5 will assist in implementation.

5.0 Research Tasks

The specific tasks to complete the study are described below. The project is estimated to cost $164,963 with an 20 month schedule (some tasks durations below overlap, see section 6.0 Time Schedule).

Task 0: Project Kick Off Meeting

The team will hold a project kick-off meeting with TAC to outline the project and review the work plan.

Task 1: Brief Literature Review

Both parties will take part in conducting a brief literature review with the objective of identifying the key geometric, operational and other variables that potentially influence pedestrian (PSU) and bicycle (OSU) crashes. The review will also attempt to discover innovative ways that data elements could be collected. Finally, the review will summarize possible methodological approaches to the development of a risk-based model (e.g. case control study, scenario analysis, focus groups, or accident failure analysis).

Time Frame: Three Months
Responsible Party: Chris Monsere (PSU) and Haizhong Wang (OSU)
Cost: $15,000
Deliverable: None - Literature review to be included in Task 2 deliverable.
TAC Decision/Action: None

Task 2: Develop a Data Collection Plan

Based on the literature review, researchers will develop a data collection and sampling plan in consultation with the project TAC that will provide a sufficient data for the selected modeling method. As many pedestrian and bicycle crashes occur off the state system, the both parties will consider non-state highway data sources. The research team will be split focus on data elements: bicycles (OSU) or pedestrians (PSU). The plan will carefully consider the various roadway classifications and identify the common data elements in project applications. A small pilot of the data collection techniques will be done to refine the plan.

Time Frame: Three months

Responsible Party: Chris Monsere (PSU) and Haizhong Wang (OSU)
Cost: $15,000
Deliverable: Interim report including literature review and data collection plan.
TAC Decision/Action: TAC Meeting to review and comment on the data collection plan.

Task 3: Data Collection

The plan described in Task 2 will be put into action and the researchers envision most data collected will be from current databases, past projects, GIS files, or remotely via Digital Video Log. These elements will be merged with ODOT's statewide crash database to identify the characteristics of locations of each serious bicycle or pedestrian crash. OSU will focus on collecting data specific to bicycle crashes while PSU will focus on pedestrian crashes. As part of the process, the data will be quality checked and formatted for modeling in Task 4.

Time Frame: Five months
Responsible Party: Chris Monsere (PSU) and Haizhong Wang (OSU)
Cost: $50,000
Deliverable: Brief status report that documents the data collected and sources used.
TAC Decision/Action: Review and comment as appropriate.

Task 4: Development of Risk Models

The research team will use the collected data to develop models that can be used to estimate the amount of risk to pedestrian and bicyclists that a particular set of geometric and operational elements might represent. PSU will focus on developing a pedestrian specific model and OSU will focus on developing a bicycle specific model following a similar approach. The model(s) will be developed based on the methods identified in Task 2 with the objective of quantifying the change in risk of improvements identified in typical projects. If improvements to ODOT's roadway inventory are needed they will be identified.

Time Frame: Four months
Responsible Party: Chris Monsere (PSU) and Haizhong Wang (OSU)
Cost: $40,000
Deliverable: Interim report documenting model development.
TAC Decision/Action: TAC meeting to review models and provide guidance on appropriate direction for Task 5.

Task 5: Development of Risk-based Prioritization Tool

The research team will develop a user-friendly tool where the results of this work can be easily implemented. The tool will combine the bicycle and pedestrian models into one interface. There is likely to be overlapping risk factors between the bicycle and pedestrian models. Depending on the timing of the All Roads Safety Program project selections, it may be possible to pilot the tool on real applications.

Time Frame: Three months
Responsible Party: Chris Monsere (PSU) and Haizhong Wang (OSU)
Cost: $30,000

Deliverable: A project prioritization tool
TAC Decision/Action: Review and comment as appropriate

Task 6: Final Report

Prepare and submit a final report documenting the research study, conclusions, and recommendations. The final report will also include a final version of the risk-based prioritization tool and preliminary results of the tool if they are applied to real applications.

Time Frame: Four months
Responsible Party: Chris Monsere (PSU) and Haizhong Wang (OSU)
Cost: $15,000
Deliverable: Preliminary draft of the final report.
TAC Decision/Action: Review and comment as appropriate

The following matrix may be useful for listing the task elements mentioned above:

Task	**Responsible Party (ies)**	**Approximate Cost**
Task #1: Brief Literature Review *Time Frame:* Three months *Deliverable:* Literature review report included in interim report. *TAC Decision/Action:* Review, comment, and approve.	Chris Monsere (PSU) Haizhong Wang (OSU)	$15,000
Task #2: Development of Data Collection Plan *Time Frame:* Three months *Deliverable:* Interim report # 1 for Task 1 and 2. *TAC Decision/Action:* Review and comment as appropriate	Chris Monsere (PSU) Haizhong Wang (OSU)	$15,000
Task #3: Data Collection *Time Frame:* Five months *Deliverable:* Documentation of data collected and sources used *TAC Decision/Action:* Review and comment as appropriate	Chris Monsere (PSU) Haizhong Wang (OSU)	$50,000
Task #4: Development of Risk Models *Time Frame:* Four months *Deliverable:* Interim Model Development Report for Economic Analysis. *TAC Decision/Action:* Review and comment as appropriate	Chris Monsere (PSU) Haizhong Wang (OSU)	$40,000
Task #5: Development of Risk-based Prioritization Tool *Time Frame:* Three *Deliverable:* A project prioritization tool. *TAC Decision/Action:* Review and comment as appropriate	Chris Monsere (PSU) Haizhong Wang (OSU)	$30,000
Task #6: Final Report *Time Frame:* Two to three months *Deliverable:* Draft preliminary final report. *TAC Decision/Action:* Review and comment as appropriate	Chris Monsere (PSU) Haizhong Wang (OSU)	$15,000

5.1 Reporting

All reports shall be produced in the standard ODOT Research Section report format provided to the Project Investigator by the Research Coordinator unless some other format is deemed to be more appropriate. The Project Investigator shall be responsible for submitting reports of professional-level written composition equivalent to the writing standards of peer-reviewed journals. These writing considerations include grammar, spelling, syntax, organization, and conciseness. The Project Investigator, in consultation with the TAC and Research Coordinator, shall deliver to ODOT in electronic format the data produced during the project. The Project Investigator shall ensure the data is labeled and organized to facilitate future access. ODOT shall warehouse the data.

5.2 Safety and Related Training

Prior to accessing ODOT right-of-way (ROW), all personnel who will work on ODOT ROW shall complete safety training appropriate to the work to be performed within the ROW (should field data collection be necessary). The Project Investigator shall notify the Project Coordinator in writing (email accepted) prior to the first day of work within the ROW that all project personnel who will access ODOT ROW have been trained. Until all ROW work is completed, the Project Investigator shall notify the Project Coordinator in writing (email accepted) annually that safety training appropriate to the work to be performed within the ROW has been completed by all personnel who will work on ODOT ROW. As part of this process ODOT District Manager needs to be informed when people are working on ODOT ROW locations. The Project Coordinator will assist with initial contact between the ODOT District Managers and the Investigator after which it is the Investigator's responsibility to make contact with the District Manager or designated contact before going on site each time.

6.0 Time Schedule

This section specifies the time line for the project, listing the task headings and showing monthly and/or quarterly time blocks in which each task will be accomplished. Also shown are interim and final deliverables. For the purposes of this proposal, the ODOT starting date has been assumed as Oct 1, 2014; however, this date is flexible and the schedule will be modified to reflect actual contract start time. The total project duration is to be 20 months.

Task	2014			2015									2016								
	FY 15												FY 16								
	Oct - Dec			Jan - Mar			Apr - Jun			Jul - Sep			Oct - Dec			Jan - Mar			Apr - Jun		
1	T																				
2						*T															
3											*										
4															* T						
5																	*				
6																		*R T		F	

T - TAC Meeting Proposed
*Deliverables
R - Draft report submitted for ODOT review.
F - Revised report submitted to ODOT for publication. End of contract.

7.0 Budget Estimate

An itemized budget for the project is included below, showing expenditures for each item by fiscal year and in total.

PSU		9/15/14 - 6/30/15	7/1/15 - 3/14/16	Total
Personnel				
Chris Monsere, PSU	$	2,408	7,440	9,847
Graduate Students		16,170	5,552	21,722
Hourly Students		0	2,400	2,400
Total Salaries	**$**	**18,578**	**20,891**	**39,469**
Fringe Benefits				
Faculty	$	734	2,269	3,003
Student	$	1,294	1,088	2,382
Total Fringe Benefits	**$**	**2,028**	**3,357**	**5,385**
Total Personnel Costs	$	**20,606**	**24,248**	**44,854**
Travel	**$**	200	1300	1500
Services and Supplies	**$**	250	250	500
Student Tuition Waiver	$	11,085	7,612	18,697
Total Direct Costs for PSU		**32,141**	**33,410**	**65,551**
Indirect Costs for PSU Activity (26.6% overhead rate)	**$**	8,357	8,687	17,043
Total PSU Project Costs	**$**	**40,497**	**42,097**	**82,594**

OSU		Year 1 (09/15/14 - 6/30/15)	Year 2 (7/1/15 - 03/31/16)	Total
Personnel				
Haizhonog Wang - OSU	$	0	9,574	9,574
Graduate Students		19,700	9,550	29,250
Hourly Students		0	0	0
Total Salaries	**$**	**19,700**	**19,124**	**38,824**
Fringe Benefits				
Faculty	$	0	2,968	2,968
Student	$	3,050	1,399	4,449
Total Fringe Benefits	**$**	**3,050**	**4,367**	**7,417**
Total Personnel Costs	$	**22,750**	**23,491**	**46,241**
Travel	**$**	750	750	1500
Operating Expenses	**$**	500	500	1000
Student Tuition Waiver	$	15,549	5,387	20,936
Total Direct Costs for OSU	**$**	**39,549**	**30,128**	**69,677**
Indirect Costs for OSU Activity (26.0% overhead rate)	**$**	6,240	6,433	12,673
Total OSU Project Costs	**$**	**45,789**	**36,560**	**82,349**

TOTAL PROJECT		Year 1 (09/15/14 - 6/30/15)	Year 2 (7/1/15 - 03/31/16)	Total
Personnel				
Faculty	$	2,408	17,013	19,421
Graduate Students		35,870	15,102	50,972
Hourly Students		0	2,400	2,400
Total Salaries	**$**	**38,278**	**40,015**	**78,293**
Fringe Benefits				
Faculty	$	734	5,237	5,971
Student	$	4,344	2,487	6,831
Total Fringe Benefits	**$**	**5,078**	**7,724**	**12,802**
Total Personnel Costs	$	**43,356**	**47,739**	**91,095**
Travel	**$**	950	2050	3000
Services and Supplies	**$**	750	750	1500
Student Tuition Waiver	$	26,634	12,999	39,633
Total Direct Costs	**$**	**71,690**	**63,538**	**135,227**
Indirect Costs	**$**	14,597	15,119	29,716
Total Project Costs	**$**	**86,286**	**78,657**	**164,943**