

# **In-Depth Investigations of Motor-Vehicle Crashes and Moving-Vehicle Incidents Involving Wheelchair-Seated Passengers and Drivers**

**Principal Investigator:** Lawrence Schneider, Ph.D.  
University of Michigan Transportation Research Institute  
(UMTRI)

**Co-investigators:** Joel MacWilliams, Coordinator UMTRI Crash Investigations  
Jamie Moore, Crash Investigator II

## **Objectives and Specific Aims:**

The goals of this project are to identify crashes and other moving-vehicle incidents that result in injuries to wheelchair-seated drivers and passengers of different types of motor vehicles, and to conduct in-depth investigations of the conditions, circumstances, and factors involved in those events and the occupant injuries. These investigations will document details of the factors involved in the incident or crash, including a description of the particular circumstances surrounding a moving-vehicle incident or crash event, the position and orientation of the wheelchair-seated occupant in one or more involved vehicles, the type of wheelchair involved, the type of wheelchair tiedown and occupant restraint system (WTORS) that was available and used, information about the wheelchair users physical characteristics such as height, weight, and age, and physical disabilities. Each investigation will also obtain information about injuries sustained by the wheelchair user. Through these investigations it is expected to:

- a) identify areas and issues of motor-vehicle injuries that are unique to wheelchair-seated occupants in different types and sizes of vehicles and transportation services,
- b) document injury scenarios involving the use of inappropriate procedures, such as orienting wheelchair users facing sideways, the use of tiedown/restraint and wheelchairs that do not comply with current voluntary standards,
- c) evaluate the performance wheelchairs and WTORS that comply with current standards and recommended practices, and
- d) characterize, in relation the able-bodied population, the nature of injuries to wheelchair-seated occupants in different types and sizes of vehicles.

In the process of conducting this study, new variables and investigation procedures that are uniquely related to motor-vehicle crashes and moving-vehicle incidents involving wheelchair-seated occupants will be established. The project will also seek to increase awareness among other crash-investigation programs of the need to identify and investigate injury events involving occupants seated in wheelchairs.

## **Significance**

The results of this study will provide specific, accurate, and quantitative information on real-world incidents and crashes of moving motor vehicles that involved wheelchair-seated occupants, and will help identify occupant protection issues and injury scenarios that are unique to wheelchair-seated occupants. The results will provide valuable feedback on the real-world performance of wheelchairs, wheelchair tiedowns, and after-market occupant restraint systems that comply with newly developed voluntary standards. This information will be used to guide the development and upgrading of safety standards concerned with motor-vehicle transportation of wheelchair users, and will be used to develop educational materials to inform and educate consumers and transportation professionals about the need for using equipment and procedures that comply with these standards.

## **Research Design and Methods**

A key to the success of this study is obtaining timely notifications of crashes and moving motor-vehicle incidents that involved a wheelchair-seated passenger or driver. In order to do this, a network of contacts will be established to notify UMTRI crash investigators when a wheelchair user is involved in such an event. This network includes wheelchair and WTORS manufacturers, wheelchair seating clinics, public transit companies, school transportation groups, vehicle manufacturers and modifiers, insurance companies, other crash-investigation teams such as those in the NHTSA's NASS and Special Crash Investigations (SCI) programs, CIREN centers, Dynamics Sciences, Inc., the Michigan Association of Traffic Accident Investigators (MATAI), and similar organizations in other states. These and other organizations will be contacted and informed of the investigation program, and will be informed that any information collected in these investigations is protected from the Michigan Freedom of Information Act by Public Law Michigan Act No. 26 of the Public Acts of 1980 (see Attachment A). They will also be regularly updated with the poster of Attachment B to remind them to contact the UMTRI crash investigation team as soon as they become aware of a potentially relevant event.

Once UMTRI has been notified of an incident or crash of potential interest, the notifying individual will be instructed to contact the wheelchair user involved in the accident, or their legal representative, to inform them of the study and find out if they are willing to participate. The contacting person will document the time and date of this communication, and whether the involved party agrees to participate.

If the accident involved a personal vehicle, the UMTRI investigator may also request verbal consent to inspect and photograph the case vehicle. The date and time and name of the investigator who obtains verbal consent and conducts the interview will be documented and placed in the case file. Attachment C shows the type of information that will be obtained if consent to conduct the interview is granted. In those cases for which the vehicle is owned by a third party, such as a transit or paratransit company, permission to inspect the vehicle would be obtained from that party. If the wheelchair occupant or family member/guardian verbally indicates to the notifying individual that they are willing to participate in the study by being interviewed on the phone, the contact person document the time and date of this consent and will then notify an UMTRI crash investigator. The UMTRI investigator will then contact the

wheelchair user or their designated/legal representative to explain the study in further detail and request permission to conduct a phone interview while indicating that the participant will be paid \$50 to compensate for their time. The investigator will also make it clear to the participant that any and all information collected in the investigation will be sanitized in any reports and publication so as not to identify individuals, vehicles, or locations, and that the case file is protected from the Michigan Freedom of Information Act by Public Law Michigan Act No. 26 of the Public Acts of 1980.

If the wheelchair user or their legal representative verbally consents to be further interviewed, the investigator will document the time and date of this consent, and will then proceed with questions to obtain information listed on Attachment C. When the incident or crash involves a privately owned vehicle, the investigator may request verbal permission to inspect the vehicle.

In those cases where further information is desired on injuries sustained by the wheelchair user, signed consent will be obtained from the wheelchair user and/or their legal guardian or legal representative prior to obtaining this information from the treating medical facility. Information obtained from a treating facility will be limited to the wheelchair user's injuries sustained in the motor-vehicle incident or crash under investigation. This information will be provided by verbal or written transcription without personal identifiers. Copies of actual medical records will not be requested or obtained.

### **Data Collection and Statistical Considerations**

Once a case has been selected for a full investigation and, if appropriate, verbal consent has been obtained (and documented) to inspect and photograph the involved vehicle, a detailed inspection of the exterior and interior of the case vehicle will be performed. During this inspection, crush damage and interior deformations will be measured, and vehicle damage and interior contact marks will be documented using digital photography. The accident site will also be inspected, photographed, and measured when possible and when this is relevant to the case analysis. Standard measurement protocol established by the US Department of Transportation for the National Automotive Sampling System will be used to measure the vehicle and establish the Collision Deformation Classification (CDC) crash reconstruction code. When appropriate, an exemplar vehicle will be inspected and measured to establish exterior and interior crush and intrusion measurements. Whenever possible, the crash severity, expressed either as Delta V and/or Equivalent Barrier Speed (EBS), will be calculated using appropriate computer reconstruction programs, such as WinSmash.2.06. When appropriate and if written consent has been given, additional information on injuries sustained by the wheelchair user will be obtained from the treating medical facility. As previously noted, this will only involve the verbal transmission of injury information or the written transcription of injury data without inclusion of the participant's name. Copies of actual medical records will not be obtained.

A narrative report on each crash/incident will be prepared, including a description of the event, or sequence of events, and vehicle kinematics, including the locations of the vehicle or vehicles at impact. The narrative will also provide a description of the exterior and interior damage to the involved vehicles, the seated position of the wheelchair occupant prior to the collision, the type of wheelchair and securement system, the type of restraint system use, and estimates of the

wheelchair occupant kinematics, vehicle contact points, and causes of injuries. Injuries and restraint conditions for other vehicle occupants will also be documented and described. Occupant injuries and injury severities will be documented using the abbreviated injury scale as specified in the 2000 NASS Coding Manual.

Results from all investigations will be compiled in a standard case report, including the narrative, digital images of the exterior and interior of the vehicle and the accident scene, a scene drawing showing vehicle kinematics prior to, and following, the event. Analysis and reporting of the data will be performed in two ways - 1) by individual case (i.e., anecdotally) and 2) in a database of coded information from all cases investigated. In both the individual case reports and the database, all information will be sanitized to remove personal identifiers, license plate numbers, and street names, to prevent identification of individual, vehicles, and accident locations.

By the completion of the study, it is expected that data on 80 to 100 real-world crashes or moving-vehicle injury or near-injury incidents involving wheelchair-seated occupants. As this goal is reached, it will be possible to perform statistical analysis of the data to examine relationships between various crash variables, such as crash severity and impact direction, and injury outcome, such as Maximum Abbreviated Injury Score (MAIS) or Injury Severity Score (ISS). To do this, the completed set of coded data from each crash investigation will be entered into a special UMTRI wheelchair-occupant database. Results will be analyzed using logistical regression analysis to determine potential injury risk to wheelchair-seated occupants and to compare these risks to the risk of injury for the able bodied population under similar crash and vehicle conditions.

### **Attachments**

Attachment A - Michigan House Bill providing exemption from FOIA

Attachment B - Wanted Poster for Notifications

Attachment C - Phone Interview Information Form

**Attachment A**  
**Copy of Michigan House Bill 4377**

Act No. 26  
Public Acts of 1980  
Approved by Governor  
March 7, 1980

**STATE OF MICHIGAN**  
**80TH LEGISLATURE**  
**REGULAR SESSION OF 1980**

Introduced by Reps. Bullard, Roy Smith, Dongvillo and Fitzpatrick

**ENROLLED HOUSE BILL No. 4377**

AN ACT to amend section 624 of Act No. 300 of the Public Acts of 1949, entitled as amended "An act to provide for the registration, titling, sale, transfer, and regulation of vehicles operated upon the public highways of this state and distressed vehicles; to provide for the licensing of new vehicle dealers, used or secondhand vehicle dealers, vehicle scrap metal processors, distressed vehicle transporters, vehicle salvage pool operators, and used or secondhand vehicle parts dealers; to provide for the examination, licensing, and control of operators and chauffeurs; to provide for the giving of proof of financial responsibility and security by owners and operators of vehicles; to provide for the imposition, levy, and collection of specific taxes on vehicles, and the levy and collection of sales and use taxes, license fees, and permit fees; to provide for the regulation and use of streets and highways; to provide penalties and sanctions for a violation of this act; to provide for civil liability of owners and operators of vehicles and service of process on residents and nonresidents; to provide for the enforcement of this act; and to repeal all other acts or parts of acts inconsistent with this act or contrary to this act," being section 257.624 of the Compiled Laws of 1970.

*The People of the State of Michigan enact:*

Section 1. Section 624 of Act No. 300 of the Public Acts of 1949, being section 257.624 of the Compiled Laws of 1970, is amended to read as follows:

Sec. 624. (1) A report required by this chapter shall not be available for use in a court action, but a report shall be for the purpose of furnishing statistical information regarding the number and cause of accidents.

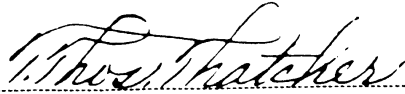
(2) The office of highway safety planning may authorize scientific studies and research for the reduction of death, injury, and property losses. All information, records of interviews, written reports, statements, notes, memoranda, or other data collected pursuant to the scientific studies and research conducted by the state, or by other persons, agencies, or organizations authorized by the office of highway safety planning shall be used solely for the purpose of medical or scientific research and shall not disclose the name or identity of a person unless the person authorizes, in writing, the use of his or her name or identity. If a subject of the research study is deceased, the executor or heir of the deceased person may authorize, in writing, the disclosure of the deceased's name or identity. The furnishing of information to the office of highway safety planning or to a representative of an authorized study or research project shall not subject a person, hospital, sanitarium, rest home, nursing home, or other person or agency furnishing the information to any action for damages or other relief. The information, records, reports, statements, notes, memoranda, or other data shall not be admissible as evidence in a court or before any other tribunal, board, agency, or person. A person participating in an authorized study or research project shall not disclose, directly or indirectly, the information so obtained except in strict conformity with the research project.

(14)

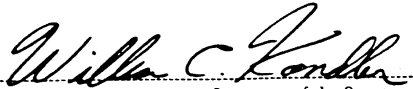
Attachment B (continued)

(3) A person who discloses information in violation of subsection (2) is guilty of a misdemeanor, punishable by a fine of not less than \$50.00.

This act is ordered to take immediate effect.



Clerk of the House of Representatives.



Secretary of the Senate.

Approved .....

.....  
Governor.



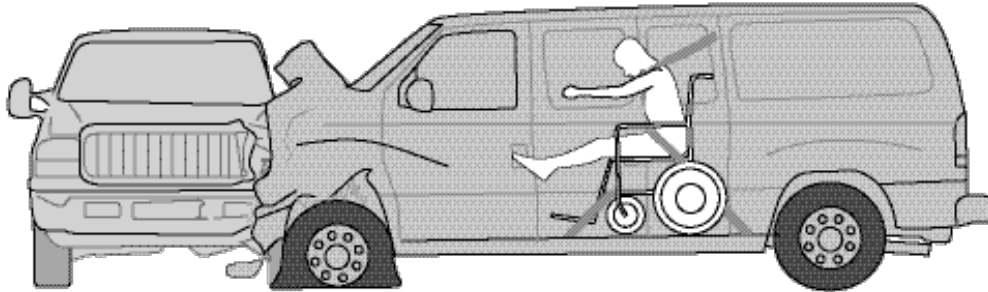
Attachment B

# WANTED !

---

**notifications of crashes and other moving-vehicle incidents involving wheelchair-seated travelers**

---



---

**Please contact Larry Schneider at:**

**734 936-1103**

and leave your name and phone number, or  
send an email to:

**[lws@umich.edu](mailto:lws@umich.edu)**

**Prompt notification is essential.**

Participation in this study is voluntary and contingent on providing signed consent.  
All information will be coded and sanitized so as not to  
identify individuals, accident scenes, or products.

### Attachment C Phone Interview Information Form

Case Number \_\_\_\_\_

Seating Location \_\_\_\_\_

Orientation in vehicle \_\_\_\_\_

Age \_\_\_\_\_ Gender \_\_\_\_\_

Height \_\_\_\_\_ Weight \_\_\_\_\_

Type of Wheelchair Used \_\_\_\_\_

Type of Seatbelt Used \_\_\_\_\_

Type of wheelchair tieddown \_\_\_\_\_

Other comments \_\_\_\_\_

Injury details \_\_\_\_\_



Type of vehicle: \_\_\_\_\_

Description of crash/incident scenario: \_\_\_\_\_

Description of injury scenario:

Medical Facility for Treatment \_\_\_\_\_ Hospitalized \_\_\_\_\_ How Long \_\_\_\_\_

Other Occupants in Vehicle \_\_\_\_\_ How Many? \_\_\_\_\_