# CIREN Program Report

## National Highway Traffic Safety Administration (NHTSA)

## Introduction

This is the NHTSA CIREN program's first Program Report. The report provides a description of the CIREN centers, the researchers, and their work. The individual centers have been operating for varying periods of time. While some centers have existed for nearly a decade others have been established more recently. This Overview chapter provides a brief description of the CIREN research process and presents a summary of research findings that have contributed to advancing the scientific understanding of serious crash injuries.

## The CIREN Mission

***The mission of NHTSA's Crash Injury Research and Engineering Network (CIREN) is to improve the prevention, treatment, and rehabilitation of motor vehicle crash injuries to reduce deaths, disabilities, and human and economic costs.***

The CIREN Centers perform medical and engineering research on serious crash injuries that contributes to the efforts of NHTSA and the automotive industry to improve safety. CIREN research helps advance the development, testing, and evaluation of new technologies for the prevention of injuries and new techniques for more effective emergency medical transport and treatment of crash injured people.

## The Goal

The goal of CIREN research is to identify opportunities for improvement in the prevention and treatment of crash injuries. This is accomplished through the coordinated efforts of medical researchers, working with engineers at NHTSA, the automobile industry, and academia to better understand the complex mechanisms of crash impact injuries.

This synergistic scientific approach enables engineers to learn how to improve vehicle designs, and medical practitioners to learn better means of treating crash victims. CIREN research provides the safety community with a "microscope" for the study of crash injuries in the real world. This is achieved by the collection and computerization of the extremely detailed crash and medical data contained in CIREN on serious injuries and their consequences.

The CIREN program strengthens America's highway safety infrastructure of people working at the national, State and local levels by providing a more realistic understanding of serious crash injuries. Valuable lessons are being learned from the study of real-world serious crash injuries in terms of both what is needed and what actually works.

CIREN research is also helping to advance the development of new technologies for improving crash safety, such as Automatic Crash Notification (ACN) systems. Research published in a series of papers co-authored by several CIREN investigators was influential in the enactment by Congress of the Wireless Communications and Public Safety Act of 1999, e.g., "*Automatic Crash Notification,*" "*URGENCY for a Safer America,*" and "*Reducing Highway Deaths and Disabilities with Automatic Wireless Transmission of Serious Injury Probability Ratings from Crash Recorders to Emergency Medical Services Providers*" (See citations in the Reference Section). The Wireless Communications and Public Safety Act's first finding states:

> "(1) the establishment and maintenance of an end-to-end communications infrastructure among members of the public, emergency safety, fire service and law enforcement officials, emergency dispatch providers, transportation officials, and hospital emergency and trauma care facilities will reduce response times for the delivery of emergency care, assist in delivering appropriate care, and thereby prevent fatalities, substantially reduce the severity and extent of injuries, reduce time lost from work, and save thousands of lives and billions of dollars"

A fundamental means of achieving CIREN goals is through research, education, and professional training. Numerous CIREN research findings have been published in scientific journals, and presented at international, national, state and local conferences. A unique feature of the CIREN program is its outreach efforts to educate and train a growing number of engineers and medical practitioners including physicians, nurses, paramedics, fire, rescue, and police (who often are the first emergency responders to crash victims). The result is a more informed and educated human infrastructure of safety and emergency medical care workers building a safer America.

## The Safety Problem: Deaths, Disabilities, and Human & Economic Costs

The magnitude of the safety problem that the CIREN program is helping to addresses is enormous as is revealed in national crash statistics. Every year there are nearly 42,000 crash deaths (almost half of the victims die without transport to a medical treatment facility), 250,000 life threatening injuries, 500,000 hospitalizations, 2,000,000 disabled by injuries, and 4,000,000 emergency department visits. Annually in America, motorists are involved in nearly 17 million crashes involving nearly 27 million vehicles. Each year crash injuries result in approximately $100 billion in economic costs, or $350 billion in comprehensive costs that include value for pain and suffering.

Historically, more than 3 million people have been killed and 300 million injured in crashes in America – more than 3 times the number of Americans killed and 200 times the number wounded in all wars since 1776.

Many of the people killed in crashes are young. Half are under age 34, and the average is 40 years of age for all crash deaths. Crash fatalities and serious injuries have devastating impacts on families. Many children, uninjured physically in crashes, are hurt in other ways. No count of this tragic toll on children is kept, but serious crash injuries often result in long-term physiological, psychological, and sociological impairments. Such impairments often have devastating impacts on individuals, families, and society.

Motor vehicle crashes are responsible for large numbers of serious, life-threatening, injuries. National estimates of the number of serious crash injuries occurring each year in the US are:

- 70,000 Brain Injuries
- 4,400 Neck and Spinal Cord Injuries
- 80,000 Chest & Abdominal Injuries: Heart, Lungs, Spleen, Liver, & Kidneys
- 18,000 Hip and Pelvic Injuries
- 35,000 Leg, Ankle and Foot Injuries

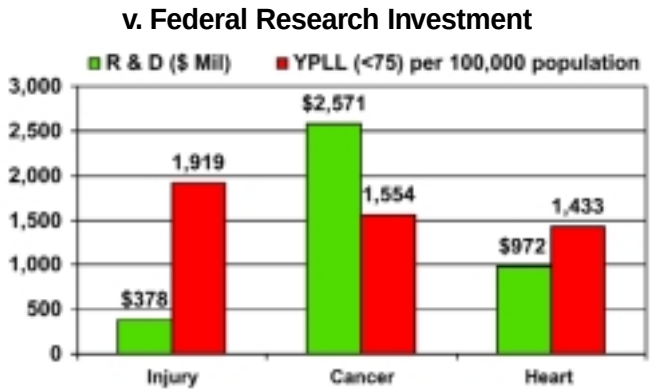
The above statistics do not include a much larger number of less serious injuries.

Nor do these statistics include injuries to pedestrians, motorcyclists, and heavy truck occupants, for which statistics on serious injuries are not available.

The need for greater scientific research on all injuries has been consistently recognized. In 1966, the National Academy of Sciences (NAS) published a landmark report *Accidental Death and Disability: The Neglected Disease of Modern Society*. In 1983 Congress, under the leadership of Representative William Lehman, enacted a law authorizing the Secretary of Transportation to request a second study on trauma by the National Academy of Sciences. In 1985 the NAS published *Injury in America – A Continuing Public Health Problem* that found "More than 2.5 million Americans have died from injuries since that report (the 1966 report) was issued." *Injury in America* recommended that a multidisciplinary approach be followed in research on the prevention and treatment of injury. The report recognized that research on crash injuries would not only improve motor vehicle safety, but also yield benefits in other fields of trauma prevention and treatment as well.

In 1999, the NAS published *Reducing the Burden of Injury*. This report once again highlighted the need for safety research to reduce all injuries and their tragic consequences. Figure 1 illustrates that the need is comparable to that of cancer and heart disease, but the resources allocated for crash injury research are much lower.

**Figure 1.**
**The Injury Problem and Federal R&D Budgets for Leading Causes of Life Lost**




**Note:** Figures show age-adjusted years of potential life lost (YPLL) before age 75 per 100,000 population vs. federal expenditures for R&D for three leading causes of death. Injury includes all unintentional injuries, homicide and suicide.

*Reducing the Burden of Injury* also specifically noted the value of CIREN as follows:

> "CIREN links trauma center clinicians and crash investigators in a nationwide computerized network. This enables engineers to better understand injury-producing mechanisms and to develop better criteria for vehicle safety design, while informing clinicians about emerging injury patterns, and thereby facilitating triage, diagnosis, and treatment of crash injuries."

The NHTSA and the international safety community have found that engaging multidisciplinary research teams in the study of trauma is fundamental to making progress in advancing automotive safety. In recent years, auto companies also have funded CIREN traumatology teams of physicians, engineers, crash analysts, and statisticians to find life-protecting solutions to injury.

## The CIREN Program: Research to Reduce Fatal and Serious Injuries in Crashes

NHTSA and the Congress have long recognized the need for better scientific understanding of crash injuries, their causes, treatments, and consequences. Thus, with strong bipartisan support for many years, Congress has encouraged and provided for crash injury research at the front lines of serious injuries – trauma centers. The combination of engineering research to prevent injuries and medical research to preserve lives and livelihoods has been seen to advance safety – both at the local and national level.

The NAS report *Injury in America* recommended national coordination and management of injury research. In 1996, NHTSA Administrator Ricardo Martinez, MD initiated an effort to create the CIREN program to coordinate crash injury research then being performed at 4 trauma centers (New Jersey Medical School, University of Maryland, University of Miami, FL, and the Children's National Medical Center, DC). In 1997, with financial support from the General Motors Corporation, 3 additional trauma centers (at San Diego, California, University of Washington in Seattle, and the University of Michigan at Ann Arbor), as well as a computer network linking the 7 centers were created to form CIREN.

The wisdom of the nation's investment in such research is widely recognized in both the public and private sectors. In 1999, Mercedes-Benz funded an eighth CIREN Center at the University of Alabama (Birmingham). In 2000, Ford Motor Company funded a ninth CIREN Center at Inova Hospital in Fairfax, Virginia. In 2001, the Medical College of Wisconsin in Milwaukee became the tenth CIREN Center.

## Learning Laboratory for Lifesaving: Serious Injuries Under the Microscope

The ten CIREN research teams are each affiliated with leading medical universities at major (Level 1) trauma centers. They are being linked by NHTSA into a computer network to create the nation's largest learning laboratory for lifesaving research. Together, the ten CIREN centers form a sophisticated system for the scientific study of serious crash injuries.

CIREN centers are a national, State, and local resource for the study of life threatening crash injuries. Examples of injury modes that are under investigation are devastating brain injuries, paralyzing spinal cord injuries, life-threatening internal organ injuries, crippling orthopedic injuries, and disfiguring burns.

The scope of CIREN covers the full range of injury research as pioneered by William Haddon, MD, the first Administrator of NHTSA. In accordance with Dr. Haddon's research matrix shown in Figure 2, CIREN researchers examine human, vehicle, and environmental factors operating in the pre-crash, crash, and post-crash phases of fatal and serious injury crashes.

**Figure 2.**
**Haddon Matrix for Safety Research and Development**

| | Human | Vehicle | Environment |
|---|---|---|---|
| **Pre-Event** | Age, Experience<br>Alcohol, Speed<br>Distraction | Crash Avoidance<br>Defects, Brakes<br>Tires | Visibility<br>Divided highways<br>Signalization |
| **Event** | Belt use<br>Human tolerance<br>Helmet use | Crashworthiness<br>Automatic restraints<br>Airbags | Guardrails<br>Median barriers<br>Breakaway posts |
| **Post-Event** | Age<br>Physical condition | Post-crash fires<br>Fuel leakage<br>ACN, URGENCY | Bystander care<br>EMS system<br>First responders |

CIREN scientific research on crash injuries is performed in the real world, and in near-real time, as they occur and as they are treated. In addition, the researchers are in touch with the crash victims and their families for long-term follow-up so that the consequences and costs of injuries in both human and economic terms are more fully understood.

## CIREN Progress: Medical & Engineering Research for a Safer America

CIREN centers have produced fundamental scientific research. Their "real world" findings have contributed to advancing NHTSA research programs in biomechanics, crashworthiness, and emergency medical services. Some of their research findings have been used by:

- **NHTSA** – in its research programs to improve crash biomechanics, emergency medical care, crashworthiness of vehicles, and public information & education;
- **National Transportation Safety Board (NTSB)** – in developing its recommendations on air bags and event data recorders (EDR);
- **Congress** – in its enactment of the Wireless Communications and Public Safety Act of 1999;
- **Federal Communications Commission (FCC)** – in setting national 9-1-1 policy;
- **The wireless and automobile industries** – in their development of Automatic Crash Notification (ACN) products and services;
- **The Federal Highway Administration** – in the development of its Intelligent Transportation Systems' Public Safety Initiatives;

- **The insurance industry** – in its efforts to reduce crash related losses;
- **The research community at large** – in its efforts to advance motor vehicle and highway safety

CIREN injury research teams are studying crash injuries of individuals at the local level, looking for patterns among their cases, and relating their local findings to national data on crash deaths and injuries. Through this scientific process they have been able to identify important problems worthy of more in-depth investigation by the broader safety research community.

## CIREN Center Research Contributions:

Crash injury research contributions of the CIREN Centers over the years include many findings that currently are in various stages of use, development, testing, evaluation, deployment, and application. As these findings are applied over time, the safety benefits of the basic research will become a reality resulting in a Safer America.

### Reducing Head and Neck Injuries:

- Documented the benefits of air bags in reducing the incidence and severity of brain injuries
- Increased knowledge of the need for improvements in air bag designs to reduce aggressive deployments
- Improved understanding of the need for safer child seats and their proper installation and use

### Reducing Thoracic and Abdominal Injuries:

- Discovery of new injury patterns involving people in crashes protected by air bags and belts
- Improved understanding of injury mechanisms of 2-point seat belts
- Advanced understanding of the need for 3-point belts in rear seats to better protect children and adults from lethal abdominal injuries and crippling spinal cord injuries
- Increasing NHTSA knowledge of the nature of aortic injuries, often fatal, and the enormous potential for saving lives by early diagnosis of aortic injuries

### Reducing Leg and Foot Injuries:

- Advanced the scientific understanding of lower extremity injuries, crash forces, occupant kinematics, and their significance in terms of long-term impairments and disability
- Explained injury mechanisms of acetabular (hip socket) fractures in angle offset frontal crashes
- Contributed to the development of safer vehicle structures to protect people from suffering leg injuries in frontal offset crashes as shown by improvements in vehicle crashworthiness found in crash tests by NHTSA and the Insurance Institute for Highway Safety

### Improving Emergency Medical Care:

- Developing improved diagnostic tools to recognize occult, or hidden, internal injuries: This resulted in the NHTSA recommendation to "Lift the air bag & look for steering wheel deformation" and the "Look Beyond the Obvious" national poster campaign to improve triage and treatment of occult injuries
- Improving recognition of automatic seat belt-induced liver and spleen injuries for triage & treatment
- Designing, developing, and now validating URGENCY software for faster and smarter emergency medical care for crash victims
- Improving communications and organization of trauma systems for better care of crash victims
- Educating police, fire, and EMS care providers to recognize crash victims that require a higher index of suspicion of internal injuries and transport to a trauma center for treatment

### Improving Automotive Safety Research:

- Provided medical guidance to the NHTSA on "Medical Indications for Air Bag Disconnection"
- Stimulated improvements in national data collection, crash intrusion measurements, statistical crash analysis files, and hospital studies
- Advanced the understanding of the need for restraint system improvements to protect older Americans with safer belt systems using load limiters, pre-tensioning retractors, and optimization for functioning in concert with air bags
- Supported improvements in crash test dummy design and instrumentation for lower extremity, pelvic, thoracic, and abdominal injuries
- Providing medical education on crash injuries to automotive industry safety engineers
- Educating engineers to the increased biomechanical safety needs of an aging population

CIREN studies are providing the safety community with a better understanding of the various factors that need to be addressed to improve the safety of American motorists. CIREN center teams are also advancing knowledge on a number of key issues concerning highway safety today:

- **Costs and Consequences of Crash Injuries:** By the year 2020, the U.S. Department of Transportation has projected that "fatalities and injuries could increase by 50 percent". CIREN Center researchers have advanced the understanding of the long-term consequences of serious crash injuries to individuals, families, and society. Leg and foot injuries were shown to be far more significant in terms of long-term impairment than previously understood. And CIREN researchers have shown that airbags that are currently in production vehicles are reducing serious brain injuries.

- **Aging & Injury Vulnerabilities:** The population of Americans age 65 or older is one of the fastest growing demographic groups. By the year 2020, that age group will have grown to 53 million from today's population of 35 million. Currently about 7,000 older Americans are killed in crashes each year. CIREN researchers have highlighted the increasing vulnerability to crash forces as people age. In crashes of a given severity, the probability of suffering a serious injury increases as the age of the occupant increases. For example, in a 30 mph frontal impact crash, a 25 year-old male has a 15% probability of suffering a serious injury. In a crash of the same severity, a male of age 75 faces four times the risk: a 60% probability of being seriously injured.
- **Gender & Size Crash Protection Needs:** CIREN researchers have been advancing the scientific understanding of gender and occupant size differences in crash injury prevention and treatment. The effects of gender can be appreciated by examining the effect of gender on injury risk. If the occupant in a 30 mph frontal impact crash is a female (instead of a male as in the above crash), at age 25, her risk of suffering serious injury is 22%, and at age 75, her risk is 70%. CIREN research has shown that occupant size also is important to reducing crash injury consequences. Occupants of short stature, often females, are at greater risk of internal injuries. CIREN center studies have shown that if occupants of short stature or large girth are in frontal crashes, emergency medical care providers should apply an increased index of suspicion for the possibility of occult, or hidden, internal injuries that could be fatal if not properly diagnosed and treated.
- **Advanced Dummies for Improved Occupant Restraint Systems for Protection from Thoracic, Abdominal, Pelvic and Leg injuries:** CIREN research has supported the need to develop advanced crash test dummies to better represent human injuries found in serious injury crashes. This research also points to the need for improved injury criteria for complex Knee-Thigh-Hip injuries. Specifically, advanced dummies now measure crash forces for loads on the chest and abdomen so that better belts and air bags can be designed. Advanced dummies now measure forces to the pelvis at varying angles to better protect against injuries in a wider variety of crash conditions. And advanced dummies now have the capability to measure crash forces to the foot, ankle, and upper and lower leg so that greater protection of these parts of the body can be designed into new vehicles.
- **Automatic Crash Notification (ACN):** CIREN research has identified the need for ACN systems. Moreover, CIREN researchers have developed Urgency computer software for ACN systems that measure crash severity and automatically estimate the probability of a serious injury being present in that crash. This software will improve the triage, transport, and treatment of crash victims to save lives and reduce disabilities. Ford Motor Company is currently demonstrating an ACN system, with URGENCY software, in its safety concept Rescue Car.

For the motoring public, CIREN center researchers, the NHTSA, the automotive industry, and emergency medical care providers are working together to create a Safer America.

## NHTSA CIREN Network: Researchers, Facilities, Data, Analyses, and Insights

CIREN is the nation's network of medical and engineering researchers working on safety at leading trauma centers. The NHTSA has established 10 CIREN Centers, 7 federally funded (3 of which were originally funded by GM), 2 privately funded, and one, at the Medical College of Wisconsin, that is self-funded. NHTSA has organized the ten CIREN Centers into a Network for the collection, analysis, and sharing of crash injury data. The Centers communicate electronically over a secure Wide Area Network established by NHTSA.

Detailed data from serious injury crashes are incorporated into a national knowledge base for safety analyses. The CIREN database contains the most detailed information on crashes and injuries available for safety research. Currently CIREN centers use this database in collaborative research. In the near future, the wider safety community also will be using it to advance the scientific understanding of opportunities to improve motor vehicle injury prevention and treatment.

Key data including X-ray, MRI, and CAT-Scan images are organized in a core repository so that all centers can review the status of cases across the network. Cases, in whole or in part, may be reviewed electronically so that individual center expertise may be shared in evaluating a case. Videoconferences are periodically conducted wherein cases are reviewed simultaneously across multiple centers.

The NHTSA National Automotive Sampling System - Crashworthiness Data System (NASS CDS) and CIREN operate on the same network and use the same basic crash data elements. CIREN expands upon these basic elements to include a detailed medical dataset. Both systems code all injuries using the NASS adaptation of the AIS codes. In addition, CIREN assigns appropriate ICDM-9 codes to injuries for more specificity.

NASS CDS provides national estimates of the incidence of injuries to occupants in light vehicles in tow-away crashes. CIREN data enable the detailed study of more severe injuries occurring in crashes. An example of how CIREN researchers use both CIREN and NASS data illustrates the scientific process that can lead to discoveries of safety problems and solutions. First, CIREN researchers observe injury

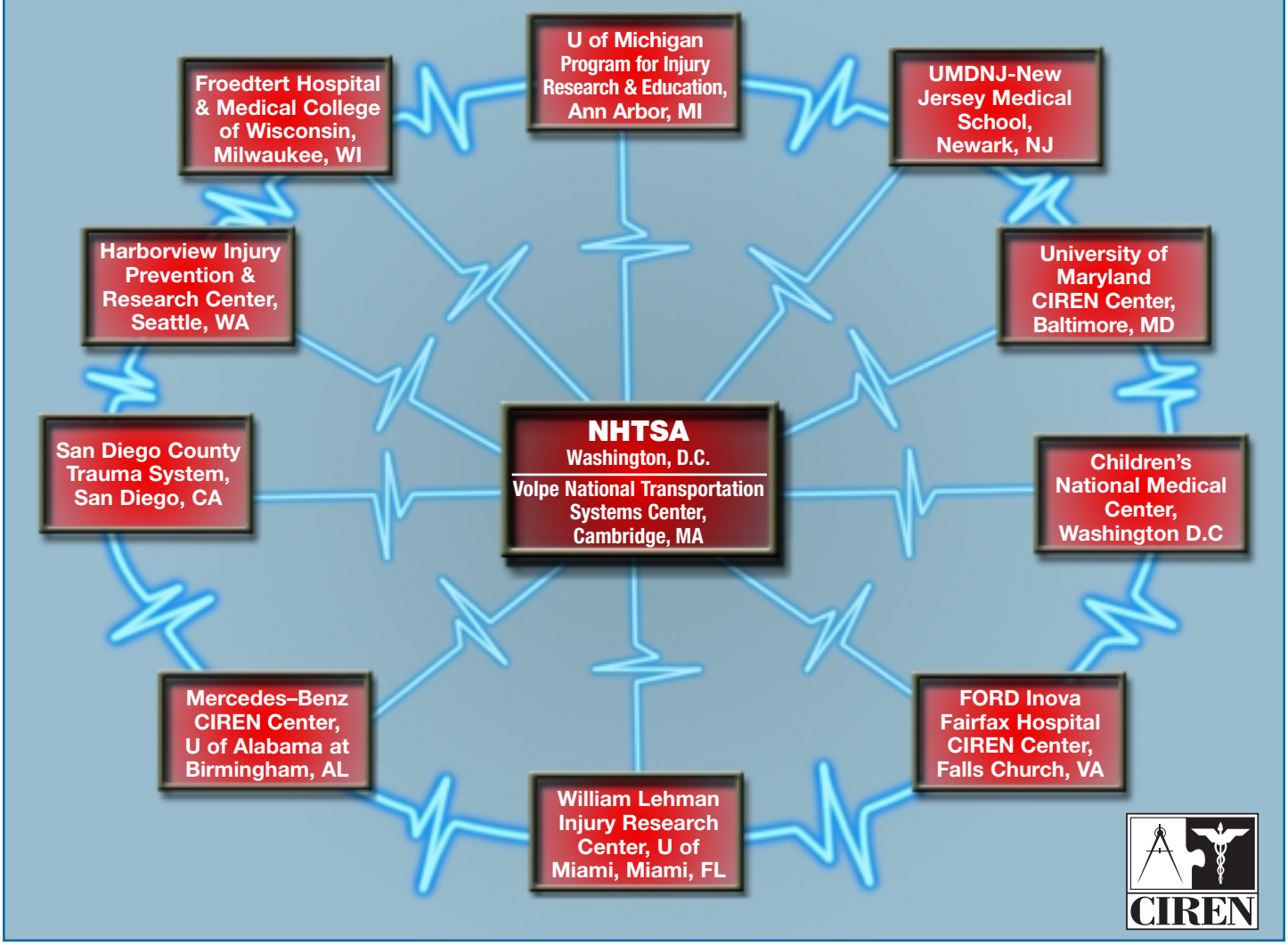
patterns in their trauma centers such as hidden, and potentially fatal, liver injuries in vehicles with 2 - point belts. Second, they check the CIREN database to see if the observed injury pattern is present beyond their local center. Third, the NASS database is examined for indications that the problem may be of national scope. If a safety problem of national dimensions is confirmed, then solutions are developed such as education of paramedics to better recognize hidden liver injuries and education of motorists to the importance of buckling up the lap belt as well as the shoulder belt.

CIREN cases involve people who are injured in motor vehicle crashes and transported to a participating Level 1 trauma center. Other criteria for being selected as a CIREN case include a focus on frontal impacts involving late model year cars (less than 8 years old), any impact where a child is injured and transported to the trauma center, all fire related cases, and rollover with fewer than two quarter turns. The cases researched by these centers have helped in providing an understanding of injury profiles such as injuries associated with and without air bags and "hidden" injuries such as bowel perforations in children or liver lacerations in adults.

CIREN crash investigators depend on the participation and cooperation of Police Departments, Fire Departments, Emergency Medical Services professionals, Social Workers, Crash Investigators, Nurses, Physicians, Medical Examiners, Coroners, hospitals, tow yard operators, garages, city vehicle pounds, and the individuals involved in the crashes. Cooperation from law enforcement agencies enables CIREN researchers to obtain police crash reports that provide key information on the location of the crash and vehicles involved in crashes.

CIREN crash investigators inspect and photograph vehicles, interview vehicle occupants, and photograph crash scenes in order to reconstruct the crash. CIREN medical research teams collect extensive medical data on the

**Figure 3.**
**CIREN Computer Communications Network and Database**



injured occupant as it is obtained during and after his/her hospitalization. The medical data includes descriptive text, drawings, x-rays and other pertinent medical images and photographs.

CIREN research teams, crash investigators and, as required, additional experts meet periodically to review their cases and analyze the injury mechanisms. These review conferences associate injuries with vehicle intrusions, occupant contacts, and biomechanical mechanisms.

The CIREN database consists of the NASS CDS data set plus additional medical and injury variables. The NASS CDS data set contains variables that describe an automotive crash including but not limited to:

- Crash Type
- Vehicle Make, Models, and Body Types
- Crash deformation classification (CDC)
- Crush Profiles
- Delta Vs
- Intrusions
- Occupant Contacts

The CIREN medical and injury data elements include tables for:

- Co-morbidity
- Diagnostic Procedures
- Complications
- Operative Procedures
- Medical Images
- Disability Measurements
- Emergency Medical Response
- Emergency Medical Treatment
- Vital Signs
- Physiologic Measurements
- Injury Location
- Ventilation Periods
- Intensive Care Unit Stays

Each CIREN case concerns one injured occupant in a motor vehicle crash. The medical data listed above is linked to the crash data. Due to the sensitivity of some of the medical information collected, special steps are taken to protect the privacy of individuals. Personal and location identifiers (e.g., name, address, telephone number, precise accident location), as well as detailed medical information (e.g., patient photographs, X-rays, medical histories) are not publicly released.

NASS CDS provides national estimates of the incidence of injuries, however, detail is limited for the more severe injuries. Often detailed injury data is needed for research on improvements in medical response, therapy, and/or vehicle design so as to decrease morbidity and mortality. On the other hand, CIREN data does not provide the total national picture of crash injuries. NASS collects data on 10 times as many crashes each year as does CIREN. CIREN analyzes many fewer crashes, about 400 each year, than NASS. But, the more detailed examination of serious crash injuries, their treatments, and patient outcomes in CIREN helps engineers and physicians to look for opportunities to make advances in injury prevention and treatment.

In Figures 4a, 4b & 5, injury severity levels are used as measured by the Abbreviated Injury Scale (AIS). Injury severity as measured in the AIS system means a greater threat to life as the AIS number increases, but it is not a measure of long-term morbidity. MAIS is a measure of the maximum injury recorded for the injured occupant.

Figure 4a compares the national distribution of occupant injuries by level of severity, as measured in NASS CDS 1997-2000 cases, against all cases in the CIREN system, currently about 1,250 cases. The NASS CDS data shown is weighted to represent the national crash injury experience. As can be seen in Figure 4a, the distribution of

**Figure 4a.**
**CIREN & NASS Weighted Data Comparison by Maximum Injury Severity Level**

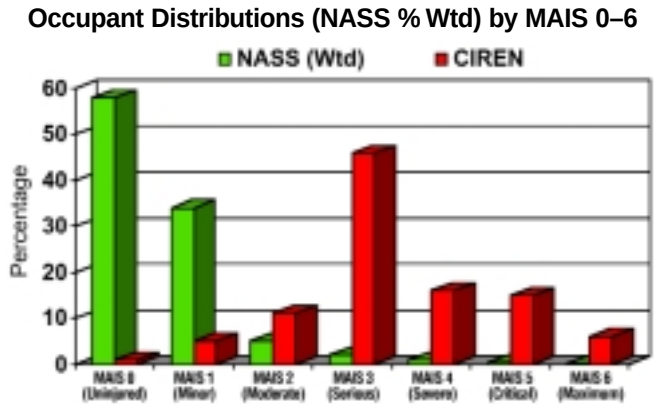
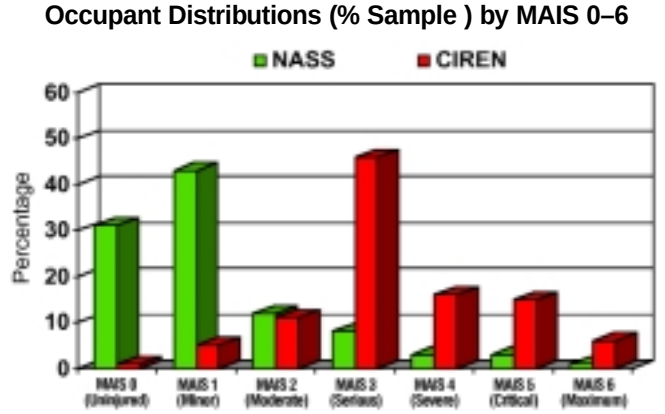



**Figure 4b.**
**CIREN & NASS Unweighted Data Comparison by Maximum Injury Severity Level**



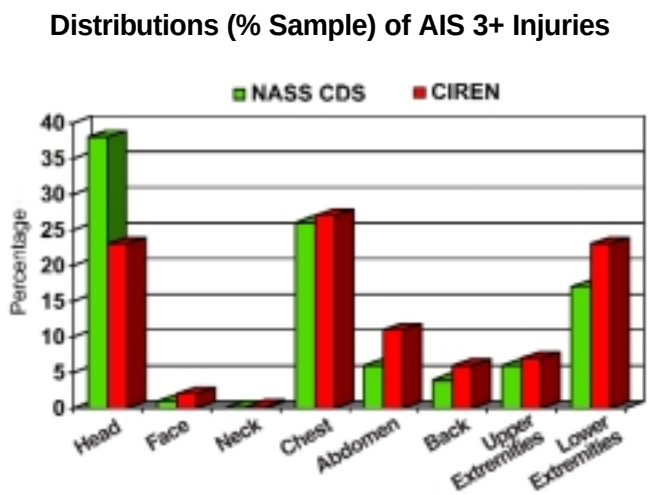
CIREN injuries tends to be more severe than those found in the nationally representative NASS CDS system. This is as it should be since CIREN is designed to better understand serious injuries, while NASS CDS is designed to provide a statistical picture of the full spectrum of crash injuries.

Figure 4b compares sample distributions showing the percent of samples in both NASS and CIREN by MAIS level. In this figure, NASS data are unweighted. Figure 4b shows that the CIREN sample focuses more heavily on the serious injuries as it is designed to do. Together, figures 4a and 4b show how CIREN complements, but does not substitute for NASS.

Below, Figure 5 compares the sample distribution of serious injuries (AIS 3+) in NASS CDS 1997-2000 cases with the sample distribution of CIREN cases by body region.

Note that CIREN has a similar distribution of serious injuries in the various body regions as is being collected in NASS. This indicates that CIREN is faithfully reflecting the distributions of serious injuries by body regions found in NASS.

**Figure 5.**
**CIREN and NASS Serious Injury Data Comparison by Body Regions**




The CIREN database with about 1,250 cases is now at the phase of becoming a new and useful tool for the study of serious crash injuries. The CIREN database complements and supplements NASS. The CIREN database is analogous to a new "microscope lens" for the more detailed study of serious crash injuries, and is now being used in conjunction with NASS. The CIREN database provides valuable medical and engineering biomechanics data whereas the NASS provides the nationally representative picture of crashes and injuries. Together, these two "lenses" create a valuable new tool for the advancement of automotive safety.

Thus, CIREN researchers and, increasingly, safety researchers nationwide are now using and applying CIREN data and its research findings to improve safety. CIREN is advancing safety in both the prevention and treatment of injuries that seriously threaten lives and livelihoods.

## CIREN Public Information Dissemination:

NHTSA has provided for public information and participation through the following:

- CIREN Conferences:

  University of Michigan, Medical Center, Ann Arbor, October 20, 1997

  University of Michigan, Medical Center, Ann Arbor, September 15, 1998

  San Diego County Trauma System, San Diego, CA, October 28,1999
- In lieu of annual meetings, in an effort to disseminate CIREN information more quickly, NHTSA began holding CIREN quarterly public meetings:

  Lower Extremity Injuries (May 5, 2000)

  Side Impact Crashes (July 21, 2000)

  Thoracic Injuries (Nov. 30, 2000)

  Offset Frontal Crashes (March 16, 2001)

  CIREN Outreach Efforts (June 21, 2001)

  Injuries Involving Sport Utility Vehicles (Sept. 6, 2001)

  Age Related Injuries [Elderly and Children] (Dec. 6, 2001)
- CIREN public presentations are made available on the NHTSA web site at http://www-nrd.nhtsa.dot.gov/departments/nrd-50/ciren/CIREN.html
- CIREN cases are publicly available in sanitized form for privacy protection as follows:

  Internet access to completed cases at http://www-nrd.nhtsa.dot.gov/bin/cirenfilter.dll

  Public Workstation at DOT Headquarters, 400 7th St. S.W., Washington, DC, 20590, in Room 6220.