A Comprehensive Surveillance of Occupational Injury in Maryland
Final Report

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Table of Contents

List of Abbreviations.

ACD	Ambulatory Care Data Set
AIS	Abbreviated Injury Scale
CFOI	National Census of Fatal Occupational Injury Program
CITI	Collaborative IRB Training Initiative
CODES	Crash Outcomes Data Evaluation System Data Network
DHMH	Department of Health and Mental Hygiene
DTHC	Death Certificates
Dx	Diagnosis(es)
E-code	External Cause of Injury
ED	Emergency Department
EMS	Emergency Medical System
fx	fracture
H&P	History and Physical
HDD	Hospital discharge diagnoses
HIPAA	Health Insurance Portability and Accountability Act of 1996
HRPO	Human Research Protections Office
HSCRC	Maryland Health Services Cost Review Commission
ICD-9-CM	International Classification of Diseases, 9th edition, Clinical Modification
IRB	Institutional Review Board(s)
ISS	Injury Severity Score
IWIF	Injured Workers' Insurance Fund
LOC	Loss of consciousness
MAARS	Maryland Automated Accident Reporting System
MAIS	Maryland Ambulance Information System
MCC	Motorcycle collision
MEO	Medical Examiners Office
MIEMSS	Maryland Institute for Emergency Medical Services Systems
MOSH	Maryland Occupational Safety and Health
MSPCRD	Maryland State Police Central Records Division
MTR	Maryland Trauma Registry
MVA	Motor Vehicle Administration (Maryland)
MVC	Motor vehicle collision
MWCC	Maryland Workers' Compensation Commission
NAICS	North American Industry Classification System
NHTSA	National Highway Traffic Safety Administration
NORA	National Occupational Research Agenda
NSC	Charles McC. Mathias, Jr. National Study Center for Trauma and EMS
NWR	Non-work related
OCME	Office of the Chief Medical Examiner
OIDP	Office of Injury Disability and Prevention (Maryland DHMH)
PARC	Primary Adult Resource Center
PI	Principle Investigator
SIC	Standard Industrial Classification System
SOC	Standard Occupational Classification
SSN	Social Security Number
STC	R Adams Cowley Shock Trauma Center
SYSCOM	System Communications (Maryland)
TBI	Traumatic brain injury
TNC	Trauma Nurse Coordinators
UB-82	U. S. Uniform billing, 1982
UMB	University of Maryland, Baltimore
UMMC	University of Maryland Medical Centers
UMMS	University of Maryland Medical System

US	United States
WC	Workers' compensation
WR	Work-related

Abstract.

Background. The long-term objective of this research is to provide comprehensive data on serious occupational injuries, in order to be able to identify priority areas for reduction of death and disability in the workplace. While much is known about fatal work-related injuries, there is little information regarding the incidence of injuries serious enough to require treatment in an emergency department (ED) or admission to a hospital. The goal of this research was to develop a model for comprehensive statewide surveillance of severe occupational injuries at the state level. To our knowledge, this is the first state to attempt such an endeavor that involves linking different databases.

Methods. Severe injuries were defined as deaths, hospitalizations, or emergency department visits. Available sources of data in Maryland were linked together to create an incident-specific database. These data included emergency department and hospital discharge records, trauma registry records, ambulance run sheets (EMS), police crash reports, death certificates and medical examiners' autopsy reports. We established a definition of what constituted a work-related injury for each database. These definitions ranged from Workers' Compensation as expected payor source in hospital data, to industrial as injury type in ambulance run reports and crash injuries occurring in commercial vehicles. If any source used in the linkage indicated an injury as work-related we considered it to be an occupational injury case. We also conducted validation studies of each variable for its usefulness as an indicator of work-relatedness.

There were two aspects to the study: (1) a passive, retrospective linkage of the previously mentioned datasets for the years 2001-2004, and (2) an active prospective study of injured trauma patients, including screening and documentation of work-relatedness, and in-depth interviews of a sample of patients who were injured while working. A chart review of a sample of ED patients, inpatients, and deceased workers with sentinel injuries was used to validate reporting of work-relatedness by the variables used from linked data. This was conducted for a sample of community hospitals and for the major trauma centers in the state. Sentinel injuries were selected based on their strong likelihood of being work-related, including falls from elevation and machinery or electrical injuries. About 43-64% of cases involving machinery, electric current and "caught between objects" were identified as occupational in the hospital data, but many fewer cases involving "struck by object" or overexertion were classified as work-related. The sensitivity and specificity of each proxy work-related variable in each database were evaluated with regard to whether they identified these sentinel injuries as occupational in nature. Finally, we also sought to determine the type of industry/ occupation and circumstances of the injury and the availability of this data in medical records.

Results

Data linkage and sentinel identifiers increased detection of occupational injuries. Based on the linkage of the data for 2001-2004, 7.6% of all ED visits for injury were work-related versus 7.5% before linkage. For hospital admissions 5.3% were work-related compared to 4.5% before linkage and 8.0% vs. 5.1% for trauma registry cases. Percentage increases in counts and rates for work injuries from data linkage were as follows: 2% in ED patients, 19% in hospital discharges and 58% in trauma registry cases. Over the four year period there were an estimated 163,739 ED visits and 9,847 hospitalizations for occupational injuries.

Among the 9,847 cases of work-related hospitalizations, payor source of Workers' Compensation was the identifying factor for 77%, with a further 6% identified as having an industrial place of occurrence. Using farm occurrence, only 56 additional cases were identified. Falls from 15 or more feet, identified from the EMS data, brought in an additional 5% of the cases. Finally, linkage with the trauma registry added 6%, representing the most severe of the injuries requiring hospitalization.

Agreement varied by data source. While agreement of work-relatedness for each data source with the ED data occurred approximately75% of the time, much lower agreement rates were found with death certificate data, police reports, and ambulance run sheets. As expected, identification of work-related injuries due to motor vehicle crashes was relatively low. Using police reported data on drivers of commercial vehicles as the "gold" standard, 52% and 65% of the ED and Inpatient data, respectively, gave an indication that the injury was work-related. For the trauma registry, there was only a 49% agreement. For death certificates, however, 89% were identified as work-related. The largest

discrepancy between data sources was with the EMS variable injury mechanism fall over 15 ft as a work-related proxy, especially outside the working age group 16-64 years of age. Falls from 15 feet can capture both occupational and non-occupational injuries.

Chart review of sentinel injuries. Chart review of sentinel injuries suggest that even with our data linkage, there is still considerable under-reporting of work-relatedness using available data. Of the 225 hospital charts for sentinel injuries classified as non-occupational based on linked data, chart reviews indicated that 4.3% actually were work-related (15.6% for ED injuries and 10.9% for trauma center cases). Further examination of the fall reporting by EMS seems to indicate that it may not be specific enough to indicate work-related injuries, especially in the extremes of age.

Injury characteristics Age and gender had strong effects on injury risk and hospitalization risk. The highest proportion of occupational injuries occurred among those 29-32 years of age. By age 60 the proportion of work-related injuries started to decline, falling to a low of 2% by age 70. Only 887 (0.5% of total) ED visits and 85 (0.8%) hospitalized injuries occurred to persons under 16. Further analyses are ongoing to examine these injuries in younger persons.

Occupational injuries tended to be more severe than other injuries resulting in hospital admission: 59% were admitted to a trauma hospital, compared with 39% among all hospitalized injuries. Inpatients were significantly older than those treated in EDs (42 vs. 36 years), and included more men (82% vs. 68%).

The major injury mechanisms identified among the total work-related population were: falls (20%), motor vehicle-related incidents (6%), and hot objects or fire (3%). The other mechanisms included injuries from cutting and piercing instruments (20%), struck by an object (18%) and overexertion (14%). Workers injured in falls or motor vehicle crashes were significantly more likely to be hospitalized.

Upper and lower extremity injuries accounted for more than half of all occupational injuries. Inpatients, as compared with workers treated in the ED, were more likely to have injuries to the head, thorax, and abdomen. Although the most common injuries were to the extremities, for upper extremities, those treated in the ED primarily had lacerations, while those admitted had forearm fractures. For lower extremities, ankle/foot sprains were common among those treated in the ED, while those admitted had primarily ankle/foot fractures.

Interviews of injured workers Interviews conducted with injured workers hospitalized in a trauma center provided more insights into injury causes and further analyses are ongoing. Linkage of interviews with workers' compensation records found that only 53% of injured workers interviewed had a claim on file for the current injury in the state workers' compensation files, underscoring the importance of using ancillary data sources as adjuncts to Workers' Compensation files when conducting occupational injury surveillance.

Discussion. We were successful in linking together a disparate group of databases, and creating an incident specific database to conduct a surveillance of serious occupational injury. Expected payor type as Workers' Compensation is commonly used as a proxy for work-related injuries in other studies but would have missed 23% of work injuries identified by data linkage. Despite our ability to link multiple data sources, chart reviews suggest our estimates of work-related injuries likely were still undercounts. In the course of this research, we have identified those datasets that provide the most accurate information, and can provide the basis for an ongoing surveillance system for occupational injury. Our planned publications will serve as a manual for Maryland and other states to enhance methods for occupational injury surveillance and to monitor trends in occupational injury. We are working with the different state agencies to determine how reporting of occupational injuries can be improved in available databases in order to provide more useful information on injury source and work-relatedness. The addition of an "injury at work" variable (as exists on death certificates) to the hospital discharge and ED databases for example would greatly improve reporting of work-related injuries. We are also exploring collaboration with the Maryland Injured Workers' Insurance Fund regarding linkage with workers' compensation data. Findings from this research are being shared with the Maryland Department of Health and Mental Hygiene, Maryland Occupational Safety and Health Administration, as well as the leaders of the state trauma care system and Office of the Chief Medical Examiner. The knowledge we have gained in this process will be useful to other states who wish to improve identification of occupational injuries.

Highlights/Significant Findings.

As described in the report we have successfully linked data from six distinct datasets, creating an incident-specific database to be able to estimate the incidence of serious work-related injury in the state of Maryland. Based on the findings from this work, the following highlights stand out:

- Over the four-year period 2001-2004, 7.6% of all ED visits for injury were work-related, as were 5.3% of hospital admissions and 8.0% of trauma registry cases. Thus, even in a small state there were an estimated 163,739 ED visits and 9,847 hospitalizations for occupational injuries over the four year period.

- While agreement of work-relatedness for each data source with the ED data occurred approximately 75% of the time, much lower agreement rates were found with death certificate data, police reports, and ambulance runsheets.

- As expected, identification of work-related injuries due to motor vehicle crashes was relatively low. Using police reported data on drivers of commercial vehicles as the "gold" standard, 52% and 65% of the ED and inpatient data, respectively, gave an indication that the injury was work-related. For the trauma registry, there was only a 49% agreement. For death certificates, however, 89% were identified as work-related.

- Agreement results increased dramatically with respect to identification of non-work-related cases, both fatal and non-fatal. At least 97% of cases identified as being non-work-related in each database and linking to a second database were reported as not being work-related in that second data source. This finding suggests that the indicators of work-relatedness we used were very specific but not particularly sensitive at identifying injuries as work-related. Thus, our estimates are likely to be undercounts despite our ability to link multiple data sources

- Among the 9,847 cases of work-related hospitalizations, payor source of Workmen's Compensation was the identifying factor for 77.1% of the cases identified in the linked dataset as work-related. A further 6% were identified with an "industrial" place of occurrence. Only 56 additional cases were identified with farm as the place of occurrence. Fall from 15 or more feet, identified from the EMS data, brought in an additional 499, or 5.1% of cases. Linkage with the trauma registry then brought in 6% of cases, illustrating the value of including the question of work-relatedness in that database, which constitutes approximately 39% (the most serious) of hospitalized injuries. However, we still found considerable underreporting in the trauma registry, and have been working to improve this situation.

- Validation of the surveillance data was conducted based on the choice of several sentinel injuries which were believed to be more associated with work-relatedness, including falls from heights, commercial vehicle/ pick-up drivers' injuries, and others including overexertion, "struck by, caught in or between objects, machinery and electric current. This provided a m ore efficient means of evaluating records for work-relatedness than just choosing a sample of all injuries where only 4.5-7.5% are likely to be work-related, depending on the source. Although 43-64% of cases involving machinery, electric current and "caught between objects" were identified as occupational in the hospital data, many fewer cases involving "struck by object", falling from a height or overexertion were classified as work-related. Since falls are a major cause of injury hospitalization, the vast majority of sentinel injuries chosen were due to falls; however, overall only 8.4% of these cases were found to have occurred on the job.

- Based on the chart reviews for sentinel injuries, of those who were determined from the linked data to have sustained non-work related injuries (i.e. false positives), 10.8% actually did have occupational injuries noted in the physical record (15.6% for ED and 4.3% for inpatients). By applying this rate to the two years of data on which it was based, this would mean that approximately 49,287 additional cases of occupational injuries were treated in either an ED or hospital setting.

- Based on chart reviews for patients who were identified in the linked data as having work-related injuries, 14.7% were actually found not to have been injured at work., or approximately 4,863 fewer work-related cases in the two-year period. However, it is still not known whether these are true false positives or simply attributable to the poor information written in the charts.

- By combining the additional cases found among false negatives and subtracting the cases found to be false positives, an additional 44,125 work-related sentinel cases would be found, *representing a potential 50% increase* to the number of individuals identified with occupational injuries.

- The highest proportion of occupational injuries occurs among those aged 29-32. At age 60 the proportion of injuries that are work-related starts to decline, falling to a low of 2.2% by age 70.

- Although the majority of injuries among injured workers were minor (ISS 1-4), 4,700 required hospitalization; 50% of these were admitted to a trauma hospital. Inpatients were significantly older than those treated in EDs (42 vs. 36 years), and included more men (82% vs. 68%).

- The major injury mechanisms identified among the total work-related population were: fall (20%), cut/pierce (20%), and struck by object (18%). Overexertion accounted for 14%, while 6% were associated with motor vehicle-related incidents and 3% with hot objects or fire. Workers injured in falls or motor vehicle crashes were significantly more likely to be hospitalized. Upper and lower extremity injuries accounted for more than half of all injuries.

- Inpatients, as compared to workers treated in the ED, were more likely to have injuries to the head, thorax, and abdomen. Although the most common injuries were to the extremities, for upper extremities, those treated in the ED had primarily lacerations while those admitted had forearm fractures; for lower extremities, ankle/ foot sprains were common among those treated in the ED, while those admitted had primarily ankle/foot fractures.

Translation of Findings.

As pointed out previously, the first step required in order to prevent occupational injuries is to understand the incidence, nature and severity of these injuries. This is the first comprehensive study to document the magnitude of the problem of serious occupational injury on a statewide basis. Despite the necessity for treatment in an ED or hospitalization, it is apparent that many of the injuries sustained by workers were relatively minor, with one primary body part injured; many of these injuries are unlikely to result in long-term disability. However, given their frequency, these injures in aggregate have significant implications with respect to burden on the health care system, and financial repercussions. The more serious, multisystem injuries resulted primarily from falls (largely related to construction work), and motor vehicle crashes. Previous studies of severe occupational injuries have concentrated largely on fatalities. Few have documented the incidence of the more serious injuries requiring hospitalization, largely because of the difficulties identifying these injuries as work-related.

One of the major contributions of this research is a better understanding of the difficulty in identifying work-related injuries, and some of the practical implications of trying to resolve these problems. The immediate contribution of this research will be to enable an effective, ongoing surveillance in the state of Maryland, using those databases which have been found to provide the best yield and the highest sensitivity of detecting work-related injuries, namely the ED, hospital discharge, and trauma registry data. In addition, we are working to implement and propose potential improvements to the current data collection systems. For example, the currently available ambulance run sheet data were not found to be useful, but we plan to meet with representatives from MIEMSS, who are in the process of implementing a new electronic ambulance run sheet, to advocate for collection of better data on work-related injuries. In addition, these data will be shared with the Chief Medical Examiner, in order to determine how to improve information available on work-related fatalities. Similarly we are holding ongoing discussions to improve the reporting of work-related injuries through the statewide trauma registry, which includes the most serious end of the spectrum of non-fatal injuries. We would also like to include an injury at work variable on the hospital discharge data file similar to that on the death certificate. We plan to work with different agencies in the state to try to implement this recommendation.

Although not mentioned in the grant, an important addition to our study was the addition of a case-crossover component, which was included in the questionnaire administered to the trauma patients. This methodology provides the ability to examine transient risk factors for occupational injuries. Future analyses will determine the usefulness of these questions and whether they provide any insights into possible injury risk. Previously, this technique has been applied primarily with respect to a specific industry or task; thus, it remains to be seen if such questions are effective across a broad range of occupations and jobs.

Outcomes/Relevance/Impact.

The overall findings of the statewide surveillance have been shared with the Department of Health and Mental Hygiene (DHMH) and Maryland Occupational Safety and Health (MOSH), in order to identify high priority areas that need further investigation. Preliminary discussions have also been held with the Maryland Injured Workers' Insurance Fund (IWIF). We are exploring the feasibility of linking their data on workers' compensation claims with our linked data on serious occupational injuries. Future in-depth studies can then be designed regarding specific work-related injuries, such as falls from heights, so that targeted intervention studies can be proposed. Linkage with their data would also provide valuable data on industry and occupation which was not available from any of the data sources we have used.

It is apparent that, despite the fact that medical treatment was required, many of these work-related injuries were seemingly relatively minor and only involve a single body part. However, the implications for long-term outcomes may be quite significant, given the fact that upper and lower extremity injuries were quite frequent. In fact, from other research conducted by the NSC, ankle/foot fractures (which have low injury severity scores) have been shown to be very disabling injuries that, depending upon the severity of the injury and the damage to articular surfaces, can have lifelong consequences. Future research may delve further into those occupations/industries with the more disabling lower extremity injuries. Another example is that of mild head injuries which, despite their "mild" label, frequently result in long-term sequelae with consequences impacting on the ability to return to previous work capacities.

A Comprehensive Surveillance of Occupational Injury in Maryland

Background

Annual estimates of nonfatal work-related injuries in the U.S. range from 5 million to 13 million. Smith et al. (2005) reported that, based on the National Household Interview Survey (NHIS), occupational injuries comprise almost 30% of all medically treated injuries to adults aged 18-64 years. However, despite the fact that injuries to working-age adults represent an important part of the overall economic impact of injury in the U.S. these injuries are often overlooked. One of the major issues identified in this regard is the fact that a large proportion of serious occupational injuries involve motor vehicle crashes, but they are poorly identified as work-related in most databases and there are few data to address this problem. In addition while much is known about work-related fatalities, little is known about the epidemiology of non-fatal injuries requiring treatment in an emergency department (ED) or admission to a hospital.

The National Occupational Research Agenda (NORA) identified traumatic injuries as one of its public health priorities. Priority areas identified by the NORA Traumatic Injuries Team (NORA, 1998) include the need to 1) identify new sources of surveillance data, 2) improve identification of work-related injuries and illnesses in existing databases, 3) link data from existing sources for improved information about injuries, and 4) better assess injury exposures and intervention outcomes.

As reported by Sorock et al. (1997), the public health approach to injury prevention in the workplace must include the elements of assessment, development of prevention strategies, and evaluation. A crucial aspect of this approach is the development of a surveillance system capable of providing essential information for each of these elements. Surveillance has been defined as the "ongoing and systematic collection, analysis and interpretation of health data in the process of describing and monitoring a health event. This information is used for planning, implementing, and evaluating public health interventions and programs" (CDC, 1988a). Since many population-based injury data systems cannot distinguish between work and non-work injuries, a separate work-based surveillance is required.

In the National Occupational Research Agenda report "Traumatic Occupational Injury Research Needs and Priorities" (1998), the importance of the public health model is stressed. The first step is to "identify and prioritize problems." Also, one of the recommended approaches for surveillance at the state level is to "improve state and regional-level occupational injury surveillance by coordinating, improving, and linking existing sources of information, such as workers' compensation data, hospital discharge records, trauma registries, and health care data." Another identified goal was to collect more detailed information on the circumstances of traumatic occupational injury incidents (e.g. types of machines, tools, protective equipment).

As pointed out by Smith et al. (2005), it is important to determine the work-relatedness of all injuries to adults, as the type of injury provides little indication of whether it occurred in the workplace. The characteristics of work-related and non work-related injuries are often quite similar.

There are currently no comprehensive data at a state level on either non-fatal work related emergency department visits or even work-related injury hospitalizations. While some information on ED visits is available from the National Institute for Occupational Safety and Health (NIOSH), which uses the National Electronic Injury Surveillance System (NEISS) for surveillance of nonfatal occupational injuries treated in hospital emergency departments (EDs), most of the injuries do not result in long term sequelae and little information is available on hospitalizations. A major reason for this slight is the fact that it is difficult to determine the work-relatedness for injuries in health databases and thus determine the overall injury burden attributable to occupational injuries. The NEISS data, for example, rely on reporting of work-relatedness in the ED chart.

Developing improved surveillance of these injuries relies upon access to and linkage of, multiple data sources. The State of Maryland has a wealth of resources that provide a rich laboratory for the study of

trauma. The statewide trauma care system includes a network of trauma hospitals and a coordinated EMS system that includes a statewide trauma registry and a central repository of data on ambulance transports throughout the state. In addition, the Health Services Cost Review Commission maintains an administrative database containing detailed diagnostic information on all hospital admissions and ED visits throughout the State. Also, there is a centralized Medical Examiner's Office, which is a repository for information on all autopsies statewide. Death certificates are available from the Health Department's Division of Vital Records.

While there is no clear subset of injury cases which are known to be work-related, each of the aforementioned databases contain some information that may be relevant to occupational injury. By linking the databases together, it would be possible to then compare the extent to which indications of work-relatedness were available, and the extent to which there is agreement between these different sources of data. A precedent for this approach is the NHTSA-funded Crash Outcome Data Evaluation System (CODES), which consists of a linkage between police crash reports, EMS, and hospital records, and is focused on the epidemiology of injuries due to motor vehicle crashes. The NSC has been part of the multi-state CODES Network for many years, and has considerable experience with the linkage of these diverse data sets.

Thus, based on the CODES experience, we wanted to address occupational injuries and determine the incidence of the more serious injuries that required, at a minimum, treatment in an Emergency Department. The goal of the research was to conduct an overall statewide surveillance, using *passive* data collection from multiple state agencies, to determine to what extent these databases were useful in identifying work-related injuries. Data from all available sources were linked, and a person-specific database created; "work-related" cases were defined as those with at least one mention of work-relatedness in any of the data sets.

In addition, for the validation phase of this work, all work-related injuries in the trauma hospitals were identified, as well as a sample of "sentinel" injuries from community hospitals. The types of sentinel injuries chosen were based on previous research on work-related fatalities. Chart reviews were conducted in order to determine false negative and positive rates with regard to work-relatedness.

Finally, we also wanted to obtain more detail about the circumstances associated with work-related injuries. For this *active* surveillance part of the study, a convenience sample of trauma patients admitted to the R Adams Cowley Shock Trauma Center were interviewed to obtain details regarding the nature of their work and the events leading up to their injury, including such factors as use of safety equipment, training, medical conditions, and fatigue.

This study sought to develop a model for comprehensive statewide surveillance of occupational injuries. Available sources of data in Maryland were linked to create an incident-specific database, which allowed estimation of the incidence of occupational injury, including types and severity of injury. In addition, validation studies of the reliability of reporting were conducted. To our knowledge, this is the first attempt to conduct a comprehensive, statewide surveillance of work-related injuries serious enough to require treatment in an ED, admission to a hospital, or resulting in death.

PROJECT AIMS

This project sought to develop and evaluate a model surveillance system to identify specific types of injuries occurring in occupational settings and the circumstances surrounding them. This model encompassed all individuals with work-related injuries in the State of Maryland who were treated and released from an emergency department (ED), admitted to a community hospital and/or trauma center, or fatally injured before treatment. Thus, the only work-related injuries that were not included were those treated in clinics or by private physicians, or those for which no formal treatment was given.
The specific aims of the study **as stated in our original grant application were**:

1. To develop a model system for statewide surveillance of occupational injuries, based on the linkage of available sources of data, including ED records, hospital discharge records, medical examiners records, death certificates, ambulance run sheets, police crash reports, trauma registry records, and emergency medical services communication logs. This will be a passive, retrospective surveillance based on data from 2001, 2002, and 2003. (later included 2004)

2. To conduct a validation study of the reporting of work relatedness by available data sources based on sampled chart reviews of ED patients, inpatients, and deceased workers, in order to determine the nature of the industry and occupation of the patient and circumstances of the injury. In addition, false- positive and false- negative rates for work relatedness will be computed.

3. To collect in-depth information to identify injury circumstances through an active, prospective investigation of trauma patients, including in-depth interviews and screening by trauma nurses during 2003, 2004, and 2005. Data obtained from these sources will be corroborated with information from external sources.

4. To determine the strengths and weaknesses of available sources for identifying work-related injuries for 2003, the only year for which both passive and active surveillance data will be available. (later changed to 2004)

5. To use knowledge resulting from this surveillance to make recommendations for a long-term, sustainable surveillance system for occupational injuries.

6. To identify priority areas for injury prevention within the state of Maryland based on groups of workers at high risk of injury.

RESEARCH DESIGN

Methodology Overview

This section provides a brief overview of the study as it relates to the specific aims. The format of this report follows the specific aims and overview as outlined below. Following the overview we provide much more detail on each aim and as part of this we present the methods and results within each specific section.

1. *To develop a model system for statewide surveillance of occupational injuries based on the linkage of available sources of data, including ED records, hospital discharge records, trauma registry records, death certificates, medical examiners records, ambulance run sheet data, and police crash reports. This was a passive, retrospective surveillance based on data from 2001, 2002, and 2003. Due to delays in funding for the study, 2004 data were also included; as this was the first year we were able to do prospective active surveillance.*

The creation of this comprehensive database to examine the incidence of occupational injury in Maryland required the following steps:

A. Examination of the ability of each data source individually to identify work-related injuries.
B. Linkage of data from the previously mentioned databases to create an incident-specific database
C. Completion of a descriptive analysis of all known severe occupational injuries (deaths, hospitalizations and emergency department visits) in Maryland, describing the number, type, and severity of these injuries, and computation of a population based rate by age, sex, race/ethnicity, urban/rural, industry, and occupation.
D. Examination of the strengths and weaknesses of each data source to identify work injuries based on comparing agreement of reporting work-relatedness across different data sources for cases that link.

2. To conduct a validation study of the reporting of work relatedness by available data sources based on sampled chart reviews of ED patients, inpatients, and deceased workers, in order to determine the nature of the industry and occupation of the patient and circumstances of the injury. In addition, false- positive and false- negative rates for work relatedness were computed.

The validation study of the reporting of work relatedness by available data sources involved comparing the reporting of work-relatedness by available data sources with our assessment of work-relatedness based on reviewing sampled chart reviews of ED patients, inpatients, and deceased workers.

Based on the descriptions of injury circumstances provided in the charts, we also determined for a sample of 16-64 year olds with sentinel injuries (i.e. those likely to be work-related), a) false positive and false negative rates for work-relatedness and b) the nature of the industry and occupation of the patient. The chart review validation was conducted in two parts. First a representative sample of 4 hospitals across the state for 2001-2002 was selected. From the computerized ED and hospital discharge files we identified a sample of cases with sentinel injuries that were also identified as WR from the linked data and a separate sample with no indication that they were work-related. We then worked with the hospitals to locate these records. The descriptions of injury circumstances provided in the charts were reviewed and evidence for work-relatedness assessed. In addition, trauma hospitals were studied prospectively in 2004 using a similar approach (see Aim 4)

3. To collect in-depth information to identify injury circumstances through an active, prospective investigation of trauma patients, including in-depth interviews and screening by trauma nurses during 2003, 2004, and 2005. Data obtained from these sources will be corroborated with information from external sources. Interviews were conducted until March 2007.

The collection of in-depth information to identify injury circumstances using *active* prospective investigation of injury cases involved the following tasks:

A. Collaboration with trauma care nurses at all nine adult trauma centers in the state of Maryland to confirm the work-relatedness of injuries sustained by all trauma patients for 2004. These trauma care nurses facilitated consistent completion of the field in the trauma registry that indicated work relatedness.
B. Identification and interviewing of all patients with work-related injuries admitted to the R Adams Cowley Shock Trauma Center (STC) to determine the circumstances of injury and contributing factors, including the type of work (occupation and industry), safety equipment use, safety training, fatigue, substance use, and any unique hazards. Recruitment for this component began in January of 2004 and continued until March of 2007.
C. Corroboration of the details regarding the injury circumstance obtained by patient interview with those obtained from external sources, including 1) hospital care notes, 2) statewide newspaper articles regarding occupational injury from a newspaper clipping services, 3) First Report of Injury records from the Maryland Workers' Compensation Commission (MWCC) (for those cases with workers' compensation coverage), and 4) data from cases investigated by the Maryland Occupational Safety and Health Program (MOSH).

4. To determine the strengths and weaknesses of available data sources for identifying work-related injuries for 2004, the only year for which both passive and active surveillance data were available. We had originally planned to use 2003 but because of delays in grant funding this had to be delayed to 2004. We used the following methods:

A. Review of medical records for a sample of sentinel injuries in patients admitted to trauma centers statewide to identify work-related injures. (all cases indicated as WR and a 5% sample of non-WR cases)

B. Validation of statewide surveillance data against trauma registry data confirmed by the nurses participating in the study. In addition for STC only, to validation of surveillance data with the interviews of trauma center patients.
C. Comparison of reporting in different databases for the cases we determined were work-related.
D. Determination of the magnitude of the underreporting of such injuries, especially motor-vehicle-related injuries.

5. *To use knowledge resulting from this surveillance to make recommendations for a long-term, sustainable surveillance system for occupational injuries.*

   We sought to develop a system that is cost effective and makes the most efficient use of available data sources. Where necessary, recommendations have been made in the report on ways to improve the value of existing data sources to capture occupational injuries.

6. *To identify priority areas for injury prevention within the state of Maryland based on groups of workers at high risk of injury*

   This process was conducted in collaboration with state injury prevention and occupational health and safety professionals and should serve as a model for the development of such programs in other states.

Table 1 summarizes the years of data that were collected and analyzed.

Table 1 Collection of Serious Injury Data by Calendar Year

Study Components	**Calendar Year**						
	2001	2002	2003	2004	2005	2006	3/2007
Data Linkage	X	X	X	X			
ED Chart Review (4 Community Hospitals)	X	X					
Inpatient Chart Review (4 Community Hospitals)	X	X					
Medical Examiner Chart Review	X	X		X			
Patient Interview				X	X	X	X
Trauma Nurse Evaluation				X			
Trauma Centers Chart Review				X			

We originally planned to use 2003 for the patient interview, trauma nurse evaluation and trauma center chart review; however, the project was not funded until July 10, 2003 eliminating the possibility of using that year's data for prospective data analysis. We elected to start the prospective aspect of the study beginning with 2004 data because we needed one year with common data sources. This also allowed us the opportunity to meet with the trauma nurses and finalize the inpatient interview.

PROCEDURES

Organizational Resources. The research was conducted at the Charles McC. Mathias, Jr., National Study Center for Trauma and Emergency Medical Systems (NSC) of the University of Maryland School of Medicine. The staff of the NSC comprises epidemiologists, statisticians, computer systems analysts, health services researchers, and trauma and ED physicians. The NSC serves as a research support arm of both the STC and the Maryland Institute for Emergency Medical Services Systems (MIEMSS).

Study Population. Maryland's estimated population in the 2000 census was 5,296,486, ranking it 19th in population among the states and 6th in population density. The total employed population in 2000 was 2,404,095. For calculation of injury rates in our study, employed population estimates for the study period were obtained by averaging age and gender employed population estimates for 2000 and 2005 obtained

from the Maryland Department of Planning. The mid-period population was estimated at 2,844,142. The services sector, with 68.8% of the total, was the largest employer in Maryland, government (18.0%), and manufacturing (13.1%). The top manufacturers in the state produce food and kindred products, chemicals and allied products, instruments and related products, printing and publishing merchandise, and transportation equipment. The services sector consists mainly of establishments such as computer firms, hotels, auto repair shops, janitorial services, educational institutions, and hospitals (*Maryland at a Glance*, 2007). Less than 1% of Maryland's income is provided by agriculture. Approximately 2% of employed people are involved in farming, forestry, or fishing, and employment in mining is insignificant. In 2000, 15% of Maryland's workers were unionized (Microsoft Encarta Encyclopedia, 2001).

Clinical Study Site/Patient Population. During the past 15 years, the University of Maryland has built a statewide network of ten academic and community emergency departments (ED). Through these combined resources, 500,000 patients are treated each year by a medical staff numbering 125. As part of the passive surveillance validation effort for 2001-2002, medical records were sampled from four of the seven community hospitals in the University of Maryland network at the inception of the study. Of these seven institutions, four are located in Baltimore City and three in rural settings. The four institutions chosen represented different geographical and population catchment areas in the state. For the active surveillance validation effort for 2004, the nine adult trauma centers in Maryland were utilized. The abstraction of ED and inpatient records was conducted by the Office of Injury Disability and Prevention (OIDP) of the Maryland Department of Health and Mental Hygiene (DHMH) and research staff at the NSC. At the time of the original grant, OIDP was a subcontract and agreed to assist with data abstraction. It was later determined that OIDP could not accept funding but agreed to support this project with data abstraction assistance.

The R Adams Cowley Shock Trauma Center (STC) of the University of Maryland Medical Centers (UMMC) is a free-standing trauma care facility and the hub of Maryland's statewide system of trauma. In November 2003, the Center was designated by MIEMSS as the Primary Adult Resource Center (PARC) in Maryland. The criteria for PARC designation exceed those of a Level I center, the highest trauma center level as outlined by the American College of Surgeons' Committee on Trauma (2006).

Although located in Baltimore, the STC serves two roles: 1) as the primary adult trauma center for the entire state, providing the highest level of care and 2) as a local area-wide emergency center. Most patients are injured outside Baltimore City and as the result of unintentional trauma (vehicular crashes predominate, followed by falls). These patients injured in rural and suburban settings are transported to the center by Med-Evac helicopters. The STC is also the areawide trauma center for the urban communities surrounding the UMMC in southwest Baltimore City. Patients injured in these communities are transported to the center by ambulance. In fiscal year 2007, approximately 98.8% of the 6,247 trauma victims treated at the STC were admitted directly from the scene of injury.

Collaborating Agencies. An important and unique aspect of this study was the ability to bring together data from many different agencies in the state. Collaboration was crucial to conducting this study and was modeled after the CODES project, which is a National Highway Traffic Safety Administration (NHTSA) effort to link data on motor vehicle collision (MVC) injuries. The following describe the agencies with whom we collaborated for this study.

The Maryland Institute for Emergency Medical Services Systems (MIEMSS). MIEMSS, located across the street from the NSC, is mandated by state law to be the lead organization responsible for coordinating all aspects of Maryland's statewide emergency medical services system, including emergency pre-hospital care and designation of trauma centers. Data are collected on all ambulance runs in the state, both trauma and medical. MIEMSS also serves as the coordination point for the statewide trauma registry.

Office of the Chief Medical Examiner of Maryland (OCME). Maryland is one of a few states with a centralized medical examiner's system. A database maintained at the OCME, which is also located across the street from the NSC, includes information on all injury-related deaths. As a result of earlier research, the OCME database has specific data fields for identifying occupational injury fatalities. This

"checkbox" includes driving for work and is part of the standard investigation form. The database is computerized, and each death is reviewed systematically by the investigators to determine work-relatedness

Department of Health and Mental Hygiene, Office of Injury Disability and Prevention. The Office of Injury Disability and Prevention (OIDP) of the Department of Health and Mental Hygiene (DHMH) is the state's lead public health agency for injury prevention and control. Statewide data are used by the OIDP to identify broad-based interventions and to evaluate countermeasure effectiveness. Local health departments in each of Maryland's 24 political jurisdictions have a designated Injury Prevention Coordinator on staff. With the assistance of OIDP and through their own efforts, each local jurisdiction establishes prevention priorities based on local data. The NSC has collaborated with OIDP on numerous studies, including the statewide surveillance of traumatic brain injury. For this project OIDP staff assisted with chart abstractions at 7 of the participating hospitals.

The Maryland Occupational Safety and Health Program (MOSH). MOSH, the agency responsible for enforcing occupational health and safety standards in the private sector, investigates serious workplace injuries that are covered by their legislation. The MOSH program currently receives notification of occupational fatalities and serious nonfatal occupational injuries from a number of sources, including the police, the OCME, and the media. In the instance of workplace fatalities, MOSH conducts a comprehensive investigation of the circumstances involved in the fatality as part of its involvement in the National Census of Fatal Occupational Injury (CFOI) program. MOSH does not investigate injuries occurring on farms, in motor vehicle crashes, or under federal jurisdiction, or those involving self-employed individuals. With regard to the occurrence of non-fatal work-related accidents, MOSH does not have as formal a network for notification. Many incidents reported by the media come to the attention of MOSH from a first responder, or come to MOSH's attention weeks later from the submission of an employer's First Report of Injury.

Maryland State Police Central Records Division (MSPCRD). The Central Records Division is the state's repository for the collection, analysis and timely distribution of motor vehicle accident and crime statistics. This information is mandated under Public Safety Article 2 of the Annotated Code of Maryland. The MSPCRD periodically publishes reports on the incidence of crime and motor vehicle accidents in the State as required by State Law. This Division responds to specific requests for copies of MSP Criminal Investigation Reports, motor vehicle accident reports and other related documents maintained in the repository to legally entitled parties.

Maryland Health Services Cost Review Commission (HSCRC). The Health Services Cost Review Commission (HSCRC) provides hospital inpatient and outpatient Research Level Data for research and analytical purposes. While this data does not contain direct links that may be used to identify individual patients (i.e., medical record number, name, street address, etc.), it does contain data elements that may indirectly be used to identify such individuals (i.e., age, sex, race, zip code, etc.). All of Maryland's acute care hospitals are mandated to report patient discharge data to the HSCRC. There is 100% participation among the mandated hospitals. The HSCRC database is entirely automated, once medical records personnel abstract patients' charts at the time of discharge. Mandatory E-coding in the HSCRC database allows for easy identification of a large portion of admissions resulting from motor vehicle crashes.

The Maryland Workers' Compensation Commission (MWCC). The MWCC, located in Baltimore, administers the Workers' Compensation system and laws for the State of Maryland. The Workers' Compensation law protects workers and their families against hardships by providing compensation for the loss of earning capacity resulting from accidental injury, disease, or death in the course of employment and by providing medical services and vocational rehabilitation. The agency maintains the First Report of Injury records, among other claim-related documents, in electronic form. The Commission also deals with injury prevention and works to ensure safety practices are followed at the workplace.
Institutional Review Boards (IRB). When this grant was originally submitted, DHMH-OIDP was going to conduct the data abstraction at the various hospitals. This was a logical collaboration as we were both very interested in occupational injuries and the Health Department had the formal procedures in place to conduct review of hospital records. OIDP, at that time also had the authority to review hospital records as

described in the original grant. With the implementation of the Health Insurance Portability and Accountability Act of 1996 (HIPAA), the regulations concerning DHMH jurisdiction were reviewed and it was determined that DHMH no longer had the authority to review hospital records for research purposes. As a result IRB approval was needed at each of the nine trauma hospitals and four community hospitals used for the record review component of the study. UMMC served a role as both trauma and community hospital and UMB-IRB approval had been received early in the study implementation process. Each of the facilities had its own set of documents and guidelines in order to obtain IRB approval. One facility even contracted with a private IRB service which required additional fees to both review the protocol and investigate the credentials of the Principle Investigator (PI). Ultimately in this situation, after much communication between the UMB IRB, the NSC and the private IRB it was determined that the UMB IRB could serve as the IRB of record and report to the private IRB. In another facility, all the paper work was submitted and approval contingent on the institutional PI of record completing HIPAA and Collaborative IRB Training Initiative (CITI) training, which was never completed. By the middle of 2006, IRB approval for chart reviews had been received at eight of the nine trauma hospitals and all four of the community facilities, finally allowing NSC and OIDP staff to conduct the chart abstractions. Also, in order to obtain vital statistic data (i.e., death certificate data) we were required to obtain IRB approval from the DHMH.

Methods and Results for Individual Aims

Aim 1. *To develop a model system for statewide surveillance of occupational injuries based on the linkage of available sources of data, including emergency department (ED) records, hospital discharge records, trauma registry records, death certificates, medical examiners records, ambulance run sheet data, and police crash reports.*

This '*passive*' surveillance was retrospective in nature and included the years 2001, 2002, 2003, and 2004. This part of the study involved first an evaluation of each of the available data sources for their ability to provide data on work-relatedness. Once this was done, we conducted our data linkage study. The creation of this comprehensive database to examine the incidence of occupational injury in Maryland, based on available data sources within the state required the following steps:

a. Examination of the ability of each data source individually to identifying work-related injuries.
b. Linkage of data from the previously mentioned databases to create an incident-specific database
c. Completion of a descriptive analysis of all known severe occupational injuries (deaths, hospitalizations and emergency department visits) in Maryland, describing the number, type, and severity of these injuries, and computation of a population based rate by age, sex, race/ethnicity, urban/rural, industry, and occupation.
d. Examination of the strengths and weaknesses of each data source to identify work injuries based on comparing agreement of reporting work-relatedness across different data sources for cases that link

Description of Work-Related Data in Each Database

Since the databases used in this study came from different organizations, varying by record type and format (ASCII, SAS, MS Excel, or MS Access), new files were created from the original files and converted into SAS datasets, according to the study criteria. Table 2 summarizes each file and its sources, selection criteria, and number of records per year.

Table 2 Data Sources for Data Linkage

File Name	Source	Selection Criteria	2001 N	2002 N	2003 N	2004 N
ACD	HSCRC	ICD-9 800-959.99	531,448	544,770	547,192	547,234
HDD	HSCRC	ICD-9 800-959.99	43,575	45,385	47,423	49,340
Trauma Registry	MIEMSS	ICD-9 800-959.99	17,086	17,917	18,292	19,219
Crash	MAARS	All persons driving	264,525	272,376	278,402	264,238
		Commercial Vehicles	13,405	12,672	15,347	14,659
EMS	MAIS	All EMS runs	590,096	615,086	658,607	654,826
		Injury type = farm or, industrial; or Mechanism = fall from 15+ feet	3,144	2,841	2,813	2,642
Death Certificate	DHMH	Injury deaths "at work"	3,566	3,565	3,744	3,618
OCME	OCME	Work related	26	18	47	58

Ambulatory Care Data (ACD). The Maryland Hospital Ambulatory Care Data Set (ACD) is created by the Health Services Cost Review Commission (HSCRC) and contains a record for each outpatient hospital encounter (i.e., emergency department visit) in the state (Appendix A). The HSCRC is the rate-regulating agency for all Maryland acute care hospitals. In this capacity, it collects hospital discharge data and outpatient ambulatory care visits in UB-82 format (U.S. uniform billing-1982) required of all facilities that receive Medicare (federal) reimbursement. Effective January 1998, hospitals were required by the HSCRC regulation to assign a supplementary classification of external cause of injury and poisoning code (E-code) to all primary injury diagnoses in the range 800-999 for outpatient ambulatory care visits. The ACD file contains information on approximately 500,000 visits to Maryland EDs per year but does not provide data on patients treated by private physicians. Through its collaboration with DHMH, the NSC has access to the confidential version of these data provided by the HSCRC.

The ACD has two fields that could indicate work relatedness: expected source of payment as Workers' Compensation and E-codes that may indicate work-relatedness (E849 – place of occurrence). The specific E-codes utilized in the study were place-of- occurrence codes equal to 'industrial', 'farm' and 'mine'. The place of occurrence describes the place where the event occurred and not the patients activity at the time of the event.

The instructions in ICD-9 CM state that place codes are only to be used for codes E850 – E869 and E880 – E928. Thus place codes are excluded for all the transport injuries and all intentional injuries. The following are the definitions given in ICD-9 CM. No other instructions are given.

> *E849.1* Farm includes: farm buildings and land under cultivation. It excludes farm houses and home premises of the farm (E849.0)
>
> *E849.2* Mine and quarry includes: gravel pit, sand pit, and tunnel under construction.
>
> *E849.3* Industrial place and premises includes: building under construction, dockyard, dry dock, Factory building or premises, garage (place of work), industrial yard, loading platform (factory, store), industrial plant, railway yard, shop (place of work), warehouse or workhouse.

As can be seen these describe the location and not all activity occurring on farms, for example, will necessarily be work-related (i.e. visitor/tourist to farm). Most are however likely to be related to farm work, as it excludes farm house and home premises of farm which are considered "home." Similarly most occurring in industrial places are likely to be work-related.

The source of payment is well reported in the ACD (99.6% of the time) as it is a key variable used by the hospitals for reimbursement and accounting purposes (Table 3).

Table 3 Percent Missing Work Related Status Among Data Used for Data Linkage 2001-2004

Data Source	N	Missing Work-Related	
		N	%
ED*	2,151,467	8,505	0.4
Inpatient*	184,877	199	0.1
Trauma Registry **	71,707	1942	2.7

*based on expected source of payment
** based on work related data field

E-codes were a compulsory data field for records with injury diagnosis and were available for 91% of these cases. Place-of-occurrence codes, however, were available for only 17% of cases with injuries, as place (of injury) code is only an option in the diagnostic code fields and much less often completed.

It is known that the expected source of payment field underreports occupational injuries, as not all are covered by Workers' Compensation (Sorock et al, 1993). For the period 2001-2004 there were 2,170,644 cases with an injury diagnosis (ICD-9-CM 800.0 to 959.9) prior to un-duplication and 2,151,467 after un-duplication (final number used in our analysis, see removal of duplicate records for explanation). For the four–year data linkage period of the 2,151,467 ED injuries, 149,138 (6.9%) were work-related cases identified by payor type. Rather than just use expected payor source as WC, we also included three place of occurrence E-codes likely to be work places in our definition. However, place codes were only available for 18% of all injuries. Table 4a shows a cross-tabulation between place-of-occurrence E-code for cases that have them and payor type, as indicated in the ACD file for 2001-2004. It is apparent that the use of the payor type variable alone may underestimate work-related cases. That is, of those coded as "industrial," only 57.3% had an expected payor source of Workers' Compensation. If we include the 42.7% of cases with the place of occurrence E-code for 'industrial', who did not report payor sources as WC, an additional 10,945 cases (6.8% more) were identified as being work-related (Table 4b). Thus, the use of place of occurrence codes for industrial, mine and farm provided an additional 11,170 potential work-related injury cases that were treated in an ED, for a total of 160,308 cases. Only a small proportion of injuries occurring on farms indicated payor source as WC (9.1%), but many farm workers are not covered by WC. Only 16 cases (0.01%) were identified by farm place codes. In the Aim 2 validation section we examine this further.

Table 4a Percent Workers' Compensation as payor source By Place of Injury Occurrence for those case with E-codes for place Ambulatory Care Data 2001-2004*

Place of Occurrence	All Ages		Ages 16-64	
	N	% Workers' Compensation	N	% Workers' Compensation
Industrial	25,640	57.3	25,107	57.8
Mine	51	68.6	50	70.0
Farm	230	9.1	180	11.1
Other/Unspecified	363,449	4.6	229,175	7.1

* For cases with indication of place of occurrence (82% missing)

Table 4b Distribution of **Potential Work-related Injury Cases by sequential means of identification after payor type = WC Ambulatory Care Data 2001-2004**

	N	%
Payor source = Workers' Compensation	149,138	93.0
Place of Occurrence = Industrial	10,945	6.8
Place of Occurrence = Farm	16	<0.1
Place of Occurrence = Mine	209	0.1
Total	160,308	100.0

In theory, if a person is subsequently admitted to the hospital from the ED, his/her data are supposed to be removed from the ED database by the hospital and included only in the inpatient record. However, as indicated later, a few cases may overlap.

Hospital Discharge Data (HDD). For all patients admitted to the 46 acute care hospitals in Maryland, information on diagnoses, length of stay, mechanism of injury, hospital charges and insurance are detailed in an HSCRC database (Appendix B). The HDD are generated in the respective hospital medical records by trained medical records technicians who review the clinical diagnoses and procedural notes contained within the individual patient medical record and assign International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9 CM) codes for admission and discharge diagnoses. By definition, the ACD and HDD files are mutually exclusive data sets; hence, a patient who is admitted to the hospital from the ED is excluded from the ACD file. The NSC has access to the confidential version of the HDD file provided by the HSCRC.

The HDD also contains two fields that could indicate work relatedness: expected source of payment as Workers' Compensation and E-codes (e849 – place of occurrence), that may indicate work-relatedness. The specific E-codes utilized in the study were place-of occurrence codes equal to 'industrial', farm and mine.

The source of payment is also well reported in the HDD (99.9% of the time) as it is a key variable used by the hospitals for reimbursement and accounting purposes (Table 3).

As is in the ACD, E-codes were a compulsory data field for HDD records with injury diagnosis and were available for 92% of these cases. Place-of-occurrence codes, however, were available for only 24% of cases with injuries.

As previously described, it is known that the expected source of payment field underreports occupational injuries, as not all are covered by Workers' Compensation (Sorock et al, 1993). For the period 2001-2004 there were 185,723 cases with an injury diagnosis (ICD-9-CM 800.0 to 959.9) prior to un-duplication and 184,877 after un-duplication (see removal of duplicate records for explanation). For the four year data linkage period there were 7,593 work-related cases identified by payor type (4.1% of all cases). Table 5 shows a cross-tabulation between place-of-occurrence E-code and payor type, as indicated in the HDD file for 2001-2004. It is apparent that the use of the payor type variable alone underestimates work-related cases. That is, of those coded as "industrial," only two-thirds had an expected payor source of Workers' Compensation. If we include the 33.4% with the place of occurrence E-code for 'industrial' but without WC as payor source (Table 5a), an additional 595 cases (7.2% more) were identified as being work-related (Table 5b). Thus, the use of place of occurrence codes for industrial, mine and farm provided an additional 657 potential work-related injury cases that were hospitalized, for a total of 8,250 cases.

Table 5a Percent **Workers' Compensation as expected payor source for cases with place codes By Place of Injury Occurrence, Inpatient Data 2001-2004* (All Age)**

Place of Occurrence	All Ages N	All Ages % Workers' Compensation	Ages 16-64 N	Ages 16-64 % Workers' Compensation
Industrial	1,781	66.6	1,705	68.3
Mine	13	53.9	10	70.0
Farm	66	15.2	44	22.7
Other/Unspecified	46,329	3.4	24,904	6.1

* For cases with indication of place of occurrence (74% missing)

Table 5b Distribution of **Potential Work-related Injury Cases By sequential means of identification after payor type = WC Inpatient Data 2001-2004**

	N	%
Payor source = Workers' Compensation	7,593	92.0
Place of Occurrence = Industrial	595	7.2
Place of Occurrence = Farm	56	0.7
Place of Occurrence = Mine	6	0.1
Total	8,250	100.0

For hospitalizations 15.2% of injuries indicated as occurring on farms had WC as expected payor source (22.7% for ages 16-64 yrs). As mentioned earlier they are less likely to be covered by WC. Including place on farm only added 56 cases or 0.7% more hospitalized work injuries (see also Aim 2 validation).

Maryland Trauma Registry (MTR). Nine designated adult trauma centers, constituting the Maryland Trauma Center Network (TraumaNet), are located throughout the state (see map, Appendix C). Participation in the MTR is an essential component for trauma center designation under Maryland law (COMAR 30.08). Trauma centers have committed resources for data abstraction, entry, and management. In return, their uniform computer-based registry permits extensive self-reporting. Centers upload their patient data monthly to MIEMSS for central collection and reporting.

Each trauma center case must meet specific criteria to be included in the MTR (Appendix D). The criteria of interest for this study include 1) trauma cases managed entirely in the emergency department (ED), which includes those dead on arrival, ED death, ED discharge against medical advice, and ED transfer to another hospital for specialty care, and 2) trauma cases admitted as hospital inpatients, which include those admitted through the ED and those admitted directly to inpatient service.

The trauma registry includes basic information about pre-hospital care, patient status on admission, diagnoses, treatment, and outcome. The trauma nurse coordinator at each trauma hospital is responsible for the quality of the data submitted to the registry. In addition, the registry has built-in validity checks that are activated before central registration occurs.

Table 6 Patients with Work-Related and Non-Work Related Injuries
Maryland Trauma Registry, 2001-2004
(N = 69,765)

	Work-Related (N = 3,640)		Non-Work-Related (N = 66,125)		
	n	%	n	%	p-value
Male	3,336	91.7	44,755	67.7	< 0.001
Admitted from scene	3,355	92.3	57,831	87.6	< 0.001
Age (years)					
0-9	5	0.1	5,079	7.7	
10-15	7	0.2	4,308	6.5	
16-24	572	15.7	16,854	25.5	
25-34	919	25.3	11,386	17.2	
35-44	1,065	29.3	10,847	16.4	
45-54	705	19.4	7,509	11.4	
55-64	281	7.7	3,942	6.0	
65-74	72	2.0	2,598	3.9	
75-84	11	0.3	2,451	3.7	
85-94	1	0.03	989	1.5	
95+	0	0.0	77	0.1	< 0.001
ISS					
1-8	2,435	70.5	42,011	66.6	
9-15	642	18.6	11,237	17.8	
16-25	287	8.3	7,176	11.4	
26-75	90	2.6	2,622	4.2	< 0.001
Mechanism of Injury					
Falls	1,443	39.6	11,101	16.8	
Motor Vehicle/Pedestrian	808	22.2	33,520	50.7	
Struck by Object	523	14.4	5,326	8.0	
Cut/Pierce	121	3.3	4,627	7.0	
Firearm	54	1.5	4,603	7.0	
Other/Unknown	691	19.0	6,948	10.5	< 0.001

*Totals and percentages vary because of missing or unavailable data.

One variable in the statewide registry asks whether the injury was work related (yes/no/missing). This is the only variable in any of the databases that specifically asks about work-relatedness, with the exception of the death certificates. Payor type is not included in the trauma registry. The following instructions are given in the trauma registry manual.

Enter "Y" if you know for sure that the injury was associated with the patient's work activity or employment. Be sure to include: Assault at work; Injury at work in a family business or farm; Automobile and other transportation related to work, but NOT injuries occurring while in transit to or from work.

Enter "N" if the injury is definitely not related to any work or employment activity.

Enter "" if you have any uncertainty.*

Based on the information in the medical record, the trauma registrars answer the question to the best of their ability. Of the 71,707 records in the TR for 2001-2004, 1942 cases or 2.7% had missing work related coding (Table 3). Table 6 compares the characteristics of the 3,640 cases with work-related injuries to those non-work-related cases for 2001-2004. For each case, injuries are scored according to their severity. This score, the Injury Severity Score (ISS), ranges from 1 (minimal injury) to 75 (virtually unsurvivable) (Abbreviated Injury Scale, 1990). Patients with work-related trauma were significantly more likely to be male, be admitted from the scene, be older, have lower ISSs, and have an uncoded cause of injury.

Maryland Automated Accident Reporting System (MAARS). Data on all police-reported motor vehicle crashes as well as pedestrian and motorcycle incidents occurring on roads are included in the MAARS file (Appendix E). Although MAARS does not record work-related incidents specifically, two variables on the form indicate if a "commercial" vehicle was involved. MAARS data will only contain information related to the driver of the commercial vehicle, not any passengers in the commercial vehicle, or other private vehicles involved in the collision. The variable "body type" describes the type of vehicle the person was driving. If the vehicle was a "commercial vehicle" , i.e. a truck with at least dual axels and 6 tires or 2. a bus with 16 or more seats including the driver) then additional information is recorded, including the U.S. DOT number, Interstate Commerce Commission (motor carriers) number, and more specific details on the vehicle type. For the purpose of this study commercial vehicle is defined by:

1. Vehicle body type equal to one of the following:(limousine, single truck 2 axles, single truck 3 axles, truck tractor, farm vehicle, transit bus, cross country bus ,school bus, ambulance emergency or non-emergency, fire vehicle emergency or non-emergency, or police vehicle emergency or non-emergency) or
2. Commercial vehicle body type recorded which comprised one of the following: (bus, van / enclosed box, truck-tractor, cargo tank, flatbed, dump, concrete mixer, auto transporter, garbage / refuse, or other).

MAARS data are compiled by crash, vehicle type and person type (e.g., driver, pedestrian) and encompass a broad scope of information regarding circumstances surrounding the crash and characteristics of the vehicles and occupants involved. Occupant information collected by the police includes age, sex, use of safety equipment (including in the case of motorcyclists, helmet) and police perception of both injury severity and substance use. All of Maryland's approximately 130 police jurisdictions participate (100% compliance) and use the same accident report form. These forms are submitted to the Maryland State Police within one week from the date of crash.

These data probably underestimate the number of work-related crashes, because some workers use their private vehicles; however, it is one more piece of evidence to add to the various sources of data on occupational injury. It also only includes drivers of commercial vehicles as there is not sufficient information on pedestrians and passengers (i.e., date of birth) to include them in the linkage with ACD, HDD or MTR records. However, we assume we are able to identify many such cases in one of the other data sources. In addition not all cases are injured as many police-reported crashes only involve property damage (Table 7a).

In 2000-2004, there were 12,530 police reports for *drivers* involved in commercial vehicle crashes.

For each driver, the police report indicates the severity of injury. The scale used, often referred to as the KABCO scale, categorizes injuries as: 1) none, 2) possible, 3) non-incapacitating, 4) incapacitating, and 5) fatal. Tables 7a and b shows a distribution of commercial driver crashes by vehicle type and police-reported injury. After the complete data linkage was created, it is possible to determine hospital admission rates for each of these groups. As seen in Tables 6a and b, most drivers involved in commercial vehicle crashes had no injuries. These are generally heavier vehicles and more likely to injure occupants of other smaller vehicles. The highest rates of incapacitating or fatal injuries, according to the police report, were noted for drivers of vans and dump/garbage trucks. Cases were only included if they linked to one of the other injury files. Thus cases that did not link were not included in our study as it was assumed they were not injured.

Table 7a Commercial Drivers' Crashes in 2001-2004
Distribution of Type of Vehicle by Police-Reported Injury
All Age (N=12,530)

Police-Reported Injury Severity	Bus (n=1,413) %	Van (n=1,470) %	Truck-Tractor (n=6,654) %	Dump/Garbage Truck (n=1,845) %	Other** (n=1,148) %
None	95.8	84.9	92.4	88.6	90.0
Possible	2.7	6.8	3.3	5.2	5.1
Non-incapacitating	1.1	5.3	2.9	4.1	3.6
Incapacitating	0.4	2.7	1.3	1.9	1.1
Fatal	0.1	0.3	0.2	0.3	0.3

** Including cargo tank, flatbed, concrete mixer, auto transporter, and other body type

Table 7b Commercial Drivers' Crashes in 2001-2004
Distribution of Type of Vehicle by Police-Reported Injury
Age (16-64, N=11,522)

Police-Reported Injury Severity	Bus (n=1,268) %	Van (n=1,317) %	Truck-Tractor (n=6,175) %	Dump/Garbage Truck (n=1,708) %	Other** (n=1,054) %
None	95.6	83.9	92.1	88.5	89.5
Possible	2.8	7.1	3.4	5.2	5.4
Non-incapacitating	1.1	5.7	3.0	4.1	3.8
Incapacitating	0.5	3.0	1.3	1.9	1.0
Fatal	0.1	0.3	0.2	0.2	0.3

** Including cargo tank, flatbed, concrete mixer, auto transporter, and other body type

The Maryland Ambulance Information System (MAIS). The MAIS "runsheet" is used to collect prehospital care data in 21 of the 24 EMS jurisdictions in Maryland; three jurisdictions do not submit their data to MIEMSS. In addition to serving as a standardized prehospital medical record for ambulance calls, the MAIS form also serves as a statistical reference to key system indicators (Appendix F). These data have been used in numerous research studies.

The form allows the recording of optical mark responses associated with patient, provider, and system data parameters. These forms are then optically scanned, and the resulting records are stored in a database. One of the possible reasons for EMS transport indicated on the form is "Injury Type" Industrial or Farm along with "Mechanism" indicating a fall from a height. Multiple options are encouraged so that industrial and fall can both be recorded. The definition of industrial type is not meant to indicate work-

relatedness specifically, but involving industrial equipment (Industrial = industrial equipment/tool or industrial site-related injuries). Farm also indicates equipment involved, not just place of injury (Farm = farm equipment or farm work-related injuries). There is a separate variable that indicates five mechanisms including fall greater than 15 feet (which was changed in 2003 to be "fall greater than 3x height"). For 2001 -2004, there were 5,537 EMS runsheets used for data linkage. Similar to MAARS data, EMS data were only included if they linked to one of the three injury files. The EMS run data does not include details of helicopter transports but there will be still be an EMS run report for the incident as the land based EMS crew that initially handled the case at the scene will fill out the initial EMS run data sheet. The only limitation is that the final place of transport (i.e. hospital) may not be available (John New, Director Quality Management, Maryland Institute for Emergency Medical Services Systems, personal communication December 2007). Apparently helicopter transports are computerized but it is in a separate database.

System Communications data (SYSCOM). The original grant indicated that SYSCOM data on calls to EMS would be used; however, it is no longer available to us and thus could not be included in this project.

Death Certificates (DTHC). Death certificate data were obtained electronically from DHMH for injury related deaths based on either immediate cause of death or underlying cause(s) of death. The Death Certificate has a check box on it to indicate if the injury occurred while at work/not while at work and is a variable in the data file (Appendix G). A separate field indicates the place of injury (at home, street factory, farm, etc.) as a text field. Another field also indicates the location (street, city/town,(country and state) as text fields but the data are not entered by vital statistics. Occupation and industry are text fields on the certificate but are also not entered by vital statistics. The occupation variable is recorded as the ""usual occupation (type of work for most of working life)", which is not necessarily the occupation at the time of the injury. There is also a field for "kind of business or industry." Data elements such as immediate cause of death, underlying cause(s) of death, name, Social Security number, date of birth, age at time of death, sex, date and place of death, marital status, race, education level, and manner of death were also included in the data file. For 2001-2004, 14,491 injury related death certificate were obtained, of which 322 (2.2%) indicated the individual was 'injured at work.

Medical Examiner's Records (OCME). The OCME database includes information on work-related injuries (Appendix H). An investigation report is completed for all fatalities and includes questions on whether the death occurred at work, whether this was the usual workplace, and whether the deceased was driving related to work duties or commuting to or from work. Data was obtained for all injuries indicating a positive response to any of the specific 'work-related' questions. For 2001-2004, 149 work-related deaths were investigated by the OCME. These data and death certificate data will be linked to identify those persons who were transported to a medical facility for the declaration of death versus those declared at the scene of injury and taken directly to the OCME. In our analysis we identified some problems in the OCME data file and are working with their office to improve reporting.

Removal of duplicate records

Occasionally, multiple records in the ED, inpatient, and Trauma Registry files refer to the same incident involving the same person. For example, it may be possible for the inpatient file to contain two records to document a case where a patient was readmitted for the same injury one day following the initial discharge. To create an incident-specific database for this study, and to achieve better linkage results, we needed to identify records referring to the same incident and remove the duplicates before conducting the linkage. The un-duplication process included:

1. defining a duplicate record
2. defining a set of decision rules for selecting a single record from a duplicated pair (see below),
3. preparing input files for the CODES 2000 linkage software
4. using a CODES 2000 software and key variables to locate potential duplicates
5. conducting group meetings to review the duplicate pairs and apply the decision rules to select the correct records for the data linkage
6. storing the unused records in a separate file for future analysis.

The variables used to locate potential duplicate records were: date of birth, gender, date of service, date of admission, date of discharge, race, hospital code, county of residence, disposition, and mechanism of injury. The number of duplicate records and records available for linkage for the ED, Inpatient and Trauma Registry datasets are displayed in Table 8.

Table 8 Identification of Duplicate Records for ED, Inpatient and Trauma Registry Data

File Name		2001 N	2002 N	2003 N	2004 N
Inpatient	ICD-9 800-959.99	43,575	45,385	47,423	49,340
	Duplicate Records	221	218	187	220
	Records for linkage	43,354	45,167	47,236	49,120
ED	ICD-9 800-959.99	531,448	544,770	547,192	547,234
	Duplicate Records	4,780	5,579	4,510	4,308
	Records for linkage	526,668	539,191	542,682	542,926
Trauma Registry	ICD-9 800-959.99	17,086	17,917	18,292	19,219
	Duplicate Records	189	182	188	248
	Records for linkage	16,897	17,735	18,104	18,971

The following decision rules were used for selecting the records to be used for the study from duplicate pairs:

1. For two cases from the same hospital, the earlier case was chosen when the dates were consecutive.
2. For two cases with known mechanism of injury, the case with the higher level of care was selected, given the same date of service.
3. For two cases from the same hospital, the one with the known mechanism of injury was selected over the case with unknown mechanism, given the same date of service
4. For two cases from the same hospital with known mechanism of injury, the first encounter was selected when the dates were consecutive.
5. For two cases from the same hospital, the case with known mechanism of injury was selected over the case with unknown mechanism when the dates were consecutive.

Data Linkage

SAS programming software, Microsoft Access software, and CODES 2000 probabilistic linkage software were used for linking ACD, HDD, MTR, MAARS, MAIS and DTHC data. The steps taken to conduct the probabilistic linkage were as follows:

1. Define the key variables to use for linkage

After all six files were converted into SAS datasets and duplicate records were removed the next step was to determine which key variables were to be used for data linkage. Table 9 lists the variables used in the linkage. These variables can be grouped into three categories:

A. Unmodified or minor modification: Variables that were directly obtained from the databases (e.g., run sheet number, zip code). Most of them were used without any changes; however, some required minor modifications, such as removing the leading zero or space, changing from numeric to character format, etc.

B. Standardized: Codes that were changed to represent the same category for the key variables in all input files. For example, gender equal to "Male" was designated as "1", hospital codes from Trauma Registry were converted into the same codes as in ED or Inpatient files, dates were changed into "month/day/year" format, and missing values were replaced by "9".

C. Created: Variables that were generated based on existing information. For example, mechanism of injury was obtained from the E-code, Injury Severity Score was translated from ICD-9 codes through ICD9Map-90 software, and the "work- related" variable was obtained from source of payment and E-code.

Table 9 Linking Variables

Key Variables	ED	Inpatient	Trauma Registry	Death Certificate	EMS	Crash*
a) Unmodified						
Run Sheet Number		X[1]	X[2]		X	
Crash Report Number			X[3]			X
Medical Record #	X	X	X			
Social Security No			X	X		
Zip Code of Residence	X	X	X	X		
Age	X	X	X	X	X	X
Name			X	X		
First Letter of Last Name			X	X		X[4]
b) Standardized						
Incident Date/Time			X/X		X/X	X/X
ED/Admission Date/Time	X	X/X	X/X		X/X	
Discharge Date		X	X			
Death Date		X	X	X		
DOB	X	X	X	X		X[5]
Sex	X	X	X	X	X	X
Race	X	X	X	X	X	
County of Residence	X	X	X	X		
County of Incident					X	X
Hospital Code	X	X	X		X	
c) Created						
Mechanism of Injury	X	X	X	X	X	X
Injury Severity	X	X	X			X
State of Residence	X	X	X	X		X
Role	X	X	X			X
Place of injury	X	X	X			X
Vehicle Body Type					X	X
Safety Equipment Used					X	X
Work Related	X	X	X	X	X	X
d) From Other Source[6]						
Race						X
County of Residence						X
Zip Code of Residence						X

EMS database undergoing extensive revision, not able to get DOB, county prior to revision

* Driver only

[1] Run sheet number only included in about 5% or hospital records, was higher in previous years

[2] Variable for run sheet number in Trauma Registry but almost always left blank

[3] Crash report number is not always in Trauma Registry

[4] For MD drivers only , has first letter of last name for driver only

[5] Date of Birth only available for driver

[6] Only linking license file with license number can not get race, county residence and zip code.

D. Obtained: Variables that were obtained from another data source. For instance, race, county of residence, and zip code of residence, which were not available in the crash file, were obtained from the Maryland Drivers' License file, using the license number contained in the crash file. The license file was requested from the Maryland Motor Vehicle Administration.

2. Prepare input files

Using SAS programming software, the following steps were taken to prepare the files for data linkage:

A. Translated ICD-9 Codes into Injury Severity Scores: This included:

1) selecting all ICD-9 codes from injury records contained in the ED, Inpatient, and Trauma Registry files
2) changing the codes into the required input format and creating a unique ID to allow for a subsequent merge back to the original files
3) importing data files into ICD9Map-90 software for translation
4) exporting the results into SAS
5) merging back to the original files.

Over 2.4 millions records from the 12 files were processed between the years 2001 and 2004.

B. Standardized the linkage variables: For each input file, invalid characters or spaces were removed, inconsistencies were corrected by regrouping or recoding, and new key variables were created from existing information. Following this process, all key variables were in standardized format. Variables were then imported into Microsoft Access for data linkage.

3. Determine the order of file linkage

Because the six files contained the information from EDs, hospitals, trauma centers, death certificates, ambulances, and police department, the files were linked in the following order:

A. Merged ED, Inpatient, and Trauma Registry files. This step included linking ED to Inpatient, ED to Trauma Registry, and Inpatient to Trauma Registry. All of the linked and unlinked records were then placed into one file (file ***A***).

B. Merged file ***A*** to Death Certificate file. Again, linked and unlinked records were placed into one file (file ***B***). The resulting file included all injured records from the four data sources.

C. Merged EMS file (all work related) to file ***B***. Only linked records from EMS were added to file ***B***.

D. Merged Crash file (commercial driver) to file ***B***. Only linked records from the Crash file were added to file ***B***.

4. Perform the probabilistic data linkage

All of the linkages mentioned in 3 above were processed through the CODES 2000 software in the following order:

A. Prepared data for linkage in CODES 2000: This included:

1) preparing queries to import each candidate file into the CODES 2000
2) calculating frequency tables for all fields to review the patterns of missing and inaccurate data

3) standardizing the fields used for linkage according to the CODES 2000 guidelines and calculating frequency tables for all standardized fields to evaluate the probability of error
4) calculating field dependencies and setting error probabilities for matched fields

B. Defined linked specifications: Used the information from A. to specify the potential number of matched pairs, probability of cut off, blocking variables, matching variables, comparison methods, range of differences, and weight of agreements or disagreements.

Tested the linked specifications and ran CODES 2000 to perform linkage.

5. Validated the Linkage Results:

The first step of validation included a review of the matched pairs from two files using "Review Match Wizard" in CODES 2000. Match probabilities, match weights, and inconsistencies of match fields were checked for all matched pairs. The pairs having a low match probability and large inconsistent values were removed from the linkage results.

After all linkages were achieved, the second step was to perform a validation across all data sources. This included:

A. creating a table of all key variables from six input files
B. importing to SAS
C. comparing values of the same variables in different sources (e.g., value of age in ED file was compared with age from the Inpatient, Trauma Registry, EMS, Crash, and Death Certificate files)
D. removing records having large a disagreement

Imputation

In the proposal we stated that we planned to use multiple imputation as a means of improving estimates of work-relatedness. Successful database linkage is associated with the trade-off between an effective weighting scheme and application of probabilities within the algorithm. However, probabilistic linkage of two unique databases that were created for entirely different purposes may not result in 100% match of corresponding records (Cook et al, 2000). Thus, some data values may be missing. Determining the appropriate analytic approach in the presence of incomplete observations is a major question for data analysts, and the development of statistical methods to address missing data has been an active area of research in recent decades. To improve the completeness and quality of the datasets, multiple imputation is currently being used in the CODES project. It enables them to impute missing cases, links, and values (Horton and Lipsitz, 2001). For example NHTSA has used this approach to address the problem of missing blood alcohol concentration values in the Fatality Analysis Reporting System (FARS) (NHTSA, 1998).

We sought to investigate if this approach would be useful in our study for providing better estimates of work-relatedness. We sought to evaluate the use of multiple imputation techniques to improve estimation of work-relatedness by comparing the counts and rates of occupational injury before and after imputation. We computed counts and rates based on incomplete linkage, due to missing values, and counts and rates accommodated for such missing values to approximate a more accurate total incidence figure. In order to account for missing values, an imputation model that relies upon the approximate normality of missing data and is not affected by minor departures from this assumption was applied to the linked database.

Multiple imputation techniques were used to impute a value for "work-related" when there was no indication as to whether or not the injury had occurred on the job. For ED and Inpatient data, the work related variable was derived from either "Payor Type" or injury place in E-code. Since these data were originally collected for "cost reimbursement" purposes, very few cases were missing "Payor Type."

However, compared to ED and Inpatient data, the Trauma Registry included relative large percentages of missing values for the work related variable yes/no (0.8%, 1.7%, 2.8%, and 5.4% for 2001, 2002, 2003, and 2004, respectively). Therefore, imputation was focused on completing the work related variable, along with key variables, found in the Trauma Registry. The steps included:

1. determining the imputed variables
2. regrouping / creating variables in SAS
3. ranking the percentage of missing values from all potential imputed variables
4. modifying the imputation program according to specifications of each dataset by year
5. creating datasets from the imputation results for further analysis.

As shown is Table 10, there were 71,707 statewide trauma registry records over the four-year linkage period; of those, 5.1% (n=3,640) were work-related and 2.7% (n=1,942) had missing values for this variable. After imputation, the percentage of the combined existing and imputed values of work-related had increased to 5.2%, an increase of only 0.1%. If only those with known WR status were included, the same proportion (5.2%) would have been denoted as work-related. The imputation of WR status for the missing cases increased the number of cases by only 58 over the 4 years. Because of this we elected not to alter our overall calculations of work-related injury incidence.

Table 10 - Variable "Work-Related" in Statewide Trauma Registry Imputation Results

	Work-Related Before Imputation		**Work-Related Imputed**		**Work-Related Combined**	
	N	%	N	%	N	%
Yes	3,640	5.1	58	3.0	3,698	5.2
No	66,125	92.2	1,884	97.0	68,009	94.8
Missing	1,942	2.7	—	—	0	0.0
Total	71,707	100.0	1,942	100.0	71,707	100.0

Final Linkage Results

Table 11 describes for each dataset the number of cases that linked at each step of the data linkage process. Data linkage started with the ED database as it contained the largest number of cases. Table 11 shows the sequential linkage process for the ED database and number of extra cases brought in by each sequential step. For example of the 2,125,398 ED cases, 3479 link also with the inpatient data and only 9 with both inpatient and EMS data. The number of new cases brought in with each sequential step follows. For the inpatient link 549 cases link with the EMS data only, 44 with the police crash data, 2 with both trauma registry and EMS and 2 with trauma registry, EMS and a police crash report indicating a commercial driver. The last linkage was with the death file which brought in 351 cases only linking with death, 6 with death and EMS, and 2 with death and crash. All cells are mutually exclusive to identify work injuries.

Table 11 Final Linkage Results New WR Cases Identified in Sequential Order

Record Type	Year				
	2001	2002	2003	2004	Total
ED Link To:					
ED Only	521,349	532,550	536,260	535,239	2,125,398
Inpatient	755	582	988	1154	3479
Inpatient + EMS	3	3	1	2	9
Inpatient + Crash	0	0	1	0	1
Inpatient + Trauma [1]	38	817	28	533	1416
Inpatient + Trauma + EMS	1	16	0	2	19
Inpatient + Trauma + Crash	0	9	0	1	10
Inpatient + Trauma + Death	1	1	0	14	16
Inpatient + Death	5	1	2	10	18
EMS	957	1,016	938	849	3,760
EMS + Crash	3	2	2	4	11
Crash	441	561	562	514	2078
Trauma	2,849	3,367	3,614	4,308	14,138
Trauma + EMS	45	45	69	64	223
Trauma + EMS + Crash	0	1	0	0	1
Trauma + Crash	18	29	31	26	104
Trauma + Death	105	107	93	112	417
Trauma + Death + EMS	1	3	0	3	7
Trauma + Death + Crash	1	0	1	1	3
Death	95	78	89	89	351
Death + EMS	1	2	2	1	6
Death + crash	0	1	1	0	2
Inpatient Link To: [2]					
Inpatient Only	32,369	34,002	36,498	37,059	139,928
EMS	154	130	136	129	549
Crash	8	6	18	12	44
Trauma	9,302	8,931	8,834	9,462	3,6529
Trauma + EMS	180	167	199	190	736
Trauma + EMS + Crash	0	1	1	0	2
Trauma + Crash	84	65	83	104	336
Trauma + Death	281	240	267	264	1,052
Trauma + Death + EMS	3	5	4	5	17
Trauma + Death + Crash	1	1	0	3	5
Death	169	190	176	176	711
Trauma Registry Link To:					
Trauma	3,820	3,781	4,680	3,699	15,980
EMS	41	40	57	56	194
Crash	21	16	30	25	92

Table 11 Final Linkage Results New WR Cases Identified in Sequential Order

Record Type	Year				
	2001	**2002**	**2003**	**2004**	**Total**
Death	104	91	113	99	407
Death + EMS	1	2	0	0	3
Death Certificate Link To:					
Death Certificate Only	2,796	2,839	2,991	2,833	11,459
Crash	0	4	5	8	17
Total Records	576,002	589,702	596,774	597,050	2,359,528

[1] Not all cases in Trauma Registry are admitted. For STC all cases are considered as admitted but in other hospitals trauma registry cases may have been assessed in ED and discharged or deceased in ED and never admitted

[2] ED cases have already be linked.

Created an Incident-Specific database

After the linkage was accomplished and validation was completed, a final incident-specific database was created. The steps taken to create the final dataset included:

1. creating a key-table from the validation results consisting of all of the unique identifiers from each input file in order to allow a link back to the original files
2. importing the key-table into SAS software
3. selecting variables for analysis from the six original files
4. using the key-table to merge all records from the above data sources
5. creating common variables based on the level of care
6. selecting randomized sample records for the chart review.

Data Analyses

Once the data sources were compared, a descriptive analysis of known occupational injuries in Maryland was completed, describing the types and severity of injuries. Further analyses addressed the age and gender of the patients. In the grant we also proposed to examine the time and place of occurrence of the injuries, but this information was only available on a limited number of cases. Similarly industry and occupation data were not available on any of the data sources we used which prevented examination of rates by this. While the death certificate has text fields for this, they are not entered or coded.

The results of the data linkage and creation of the incident specific database are displayed in Figure 1. There was a total of 2,359,568 records representing individual episodes of injury for either ED visits, hospitalizations, trauma registry cases, or death. Of these, 173,540 (7.4%) were identified as being 16 years of age or older and having a potential work-related injury.

Figure 1 Data Linkage (2001-2004) :
Creation of Incident Specific Database

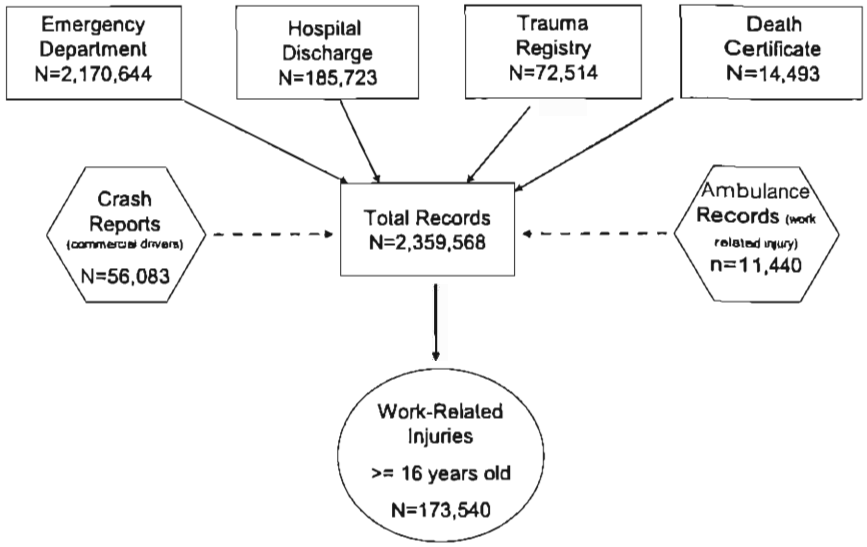


Table 12 shows the proportion of cases by data source before linkage using only work-related variables in that data source and after linkage. The proportion of work-related cases identified in the 4-year linked database varied by data source (Table 12). The ED data, which totaled over 2 million records, had the highest proportion of work-related cases (7.5% prior to linkage and 7.6% after). Smaller, though similar, proportions were identified in the hospital database (4.5% before linkage and 5.3% after). For the trauma registry 8.0% of cases were work-related after data linkage and 5.1% before linkage. The trauma registry showed the largest increase in work-related cases after linkage (a 58.5% increase). Of the four databases comprising the actual linked data, the death certificate data had the fewest total records, fewest identified work-related cases, and the smallest proportion (2.2%) of work-related cases. Only incidents appearing in either the EMS runsheets or police reports that (1) met our selection criteria for being likely to have occurred on-the-job and (2) linked with one of the other injury files were included in the final data linkage. Thus, all EMS and police report incidents were work-related by the selection criteria.

Table 12 Proportion of Work-Related Cases by Data Source

		Before Linkage		After Linkage		% Change
Data Source	**Total Records**	**Work Related Cases**	**WR %**	**Work Related Cases**	**WR %**	
ED Data	2,151,467	160,308	7.5	163,739	7.6	2.1
Inpatient Data	184,877	8,250	4.5	9,847	5.3	19.4
Trauma Registry	71,707	3,640	5.1	5,768	8.0	58.5
Death Certificates	14,491	322	2.2	365	2.5	13.4
EMS Runsheets	5,537	5,537	100.0	5,537	100.0	--
Police reports	2,706	2,706	100.0	2,706	100.0	--

*Total after duplicate records were removed

Further analysis of the proportion of work-related cases occurring within each individual database analyzed individually (not linked) revealed varying trends over the 4-year period (Table 13). Each year, an increasing number of ED records were included in the incident-specific linked data file, yet the number and percent of work-related injuries decreased. Thus, the proportion of ED cases that involved an on-the-

job injury steadily decreased from a high of 7.9% in 2001 to 7.1% in 2004. Similar trends were found in the inpatient data – increasing numbers of linked records as the years passed but decreasing percentages of all injuries that were work-related (from 4.6% in 2001 to 4.3% in 2004). However, unlike the ED trend, the number of inpatient work-related injuries increased slightly over time, but not enough to offset the substantially larger increases in the number of linked records. Only the trauma registry data showed an increasing number of linked records, an increase in the number of work-related injuries *and* an increasing proportion of work-related cases over time (from 4.7% in 2001 to 5.4% in 2004). This is analyzed further under Specific Aim 3 when the effectiveness of increased surveillance in the trauma centers is evaluated. Linked records and work-related proportions remained virtually unchanged between 2001 and 2004 for death certificate data.

Table 13 Proportion of Work-related Cases by Data Source and Year

	2001		2002		2003		2004	
	N	%WR	N	%WR	N	%WR	N	%WR
ED Data	526,668	7.9	539,191	7.5	542,682	7.3	542,926	7.1
Inpatient Data	43,354	4.6	45,167	4.5	47,236	4.4	49,120	4.3
Trauma Registry	16,897	4.7	17,735	5.0	18,104	5.2	18,971	5.4
Death Certificates	3,564	1.9	3,565	2.7	3,744	2.3	3,618	2.0

Mechanism of Injuries

The mechanism of injuries for both non-work related and work-related injuries is show in Table 14. Falls are the leading cause of work injury for inpatient and trauma center admissions but were exceeded by cutting and piercing injuries and struck by object or person for ED visits. These mechanisms are regardless of intent and include assaults and unintentional injuries of the same mechanism together.

Type of Injuries

Comparisons were made between patients treated and released from the ED compared to those treated as inpatients. For those patients with an upper-extremity injury, 21% were forearm fractures for inpatient cases and 28% were lacerations for ED cases. Lower extremity ankle-foot sprains and strains were the most common injury for ED patients as compared to ankle-foot fractures for inpatients. Similar comparisons were made using the body region injured. For inpatients, 21% had injuries to the head, 11% had injuries to thorax and 38% had injuries to abdomen, whereas all patients 4% had injuries to head, 3% had injuries to thorax and 24% had injuries to abdomen.

Table 15 displays the most common mechanism of injury for each body region injured for all work-related injuries. Falls ranked number one for injuries to head, thorax, abdomen and lower extremity. Neck and upper extremity injuries were mainly caused by cut/piercing mechanisms. Overexertion was the main reason coded for injuries to the spine.

Table 14 Mechanism of Injury for Non-work related and Work-related Injuries 2001-2004
Linked Data Defined by ICD-9 E-codes

Mechanism	Emergency Department				Hospital Data				Trauma Registry			
Regardless of intent	NWR	%	WR	%	NWR	%	WR	%	NWR	%	WR	%
Fall from height *	141,571	7.1	8697	5.4	16,721	9.5	1535	18.6	4661	7.0	963	26.5
Fall – other	343,885	17.3	21,910	13.7	53,513	30.3	1126	13.6	6448	9.8	480	13.2
Caught Between objects *	34,639	1.7	7288	4.6	258	0.1	197	2.4	641	1.0	191	5.2
Machinery *	5892	0.3	4577	2.9	445	0.3	658	8.0	46	0.1	20	0.5
Electric Current *	504	0.0	222	0.1	70	0.0	67	0.8	111	0.2	8	0.2
Overexertion *	182,827	9.2	22,327	13.9	2655	1.5	215	2.6	46	0.1	9	0.2
Struck by person/object *	322,011	16.2	27,796	17.4	8054	4.6	661	8.0	4755	7.2	406	11.2
Cut/pierce	172,630	8.7	31,069	19.4	7973	4.5	432	5.2	4627	7.0	121	3.3
Motor Vehicle	341,204	17.2	7508	4.7	30,871	17.5	1128	13.7	35,803	54.1	878	24.1
MVT/Driver	*182,711*	*9.2*	*4514*	*2.8*	*14,639*	*8.3*	*641*	*7.8*	*18,101*	*27.4*	*536*	*14.7*
MVT/Passenger	*89,361*	*4.5*	*1212*	*0.8*	*5798*	*3.3*	*132*	*1.6*	*7820*	*11.8*	*108*	*3.0*
MVT/MC Driver	*6479*	*0.3*	*50*	*0.0*	*2517*	*1.4*	*27*	*0.3*	*2414*	*3.7*	*16*	*0.4*
MVT/MC Passenger	*396*	*0.0*	*4*	*0.0*	*149*	*0.1*	*1*	*0.0*	*155*	*0.2*	*1*	*0.0*
MVT/Pedal cyclist	*1815*	*0.1*	*10*	*0.0*	*478*	*0.3*	*0*	*0*	*737*	*1.1*	*2*	*0.1*
MVT/Pedestrian	*10,191*	*0.5*	*435*	*0.3*	*3131*	*1.8*	*147*	*1.8*	*3906*	*5.9*	*122*	*3.4*
MVT/unspecified	*14,707*	*0.7*	*629*	*0.4*	*1420*	*0.8*	*72*	*0.9*	*387*	*0.6*	*23*	*0.6*
Pedal cyclist	*23,332*	*1.2*	*71*	*0.0*	*1160*	*0.7*	*6*	*0.1*	*796*	*1.2*	*3*	*0.1*
MV/nontraffic	*12,212*	*0.6*	*583*	*0 4*	*1579*	*0.9*	*102*	*1.2*	*1487*	*2.2*	*67*	*1.8*
Other Transport	6347	0.3	258	0.2	925	0.5	62	0.8	634	1.0	42	1.2
Natural/environ	56,827	2.9	2189	1.4	2273	1.3	109	1.3	273	0.4	29	0.8
Poisoning	1222	0.1	168	0.1	969	0.5	14	0.2	492	0.7	41	1.1
Suffocation	2028	0.1	17	0.0	1421	0.8	6	0.1	131	0.2	3	0.1
Human bite	4943	0.2	729	0.5	304	0.2	5	0.1	8	0.0	0	0
Drowning	649	0.0	7	0.0	68	0.0	1	0.0	214	0.3	3	0.1
Fire/flames	4227	0.2	687	0.4	953	0.5	58	0.7	435	0.7	48	1.3
Hot object	20,035	1.0	4073	2.5	1121	0.6	122	1.5	289	0.4	3	0.1
Firearm	3754	0.2	55	0.0	3975	2.3	57	0.7	4603	7.0	54	1.5
Air gun	418	0.0	2	0.0	36	0.0	1	0.0	41	0.1	0	0
Other/Unspecified	216,620	10.9	12,622	7.9	20,660	11.7	1202	14.6	1666	2.5	320	8.8
Unknown	124,176	6.2	7822	4.9	13178	7.5	349	4.2	186	0.3	21	0.6
Adverse Effects Medical care	1634	0.1	34	0.0	6788	3.8	205	2.5	9	0.0	0	0
Adverse Effects Drugs	742	0.0	34	0.0	3396	1.9	40	0.5	6	0.0	0	0
All	**1,988,785**	**100.0**	**160,091**	**100.0**	**176,627**	**100.0**	**8250**	**100.0**	**66,125**	**100.0**	**3640**	**100.0**

* Sentinel injuries

Table 15 Primary Mechanism of Injury by Body Region : All Work Related Injuries 2001-2004			
Body Region	**N**	**Mechanism**	**% of total**
Head	6,827	Fall	33%
Face	19,087	Struck by Object	33%
Neck	110	Cut / Pierce	34%
Thorax	4,821	Fall	39%
Abdomen	2,209	Fall	33%
Spine	21,917	Overexertion	33%
Upper Extremity	66,023	Cut / Pierce	34%
Lower Extremity	39,886	Fall	33%

Number of Body Regions Injured

Table 16 displays the most common mechanism of injury by the number of different body regions injured. For single system injuries (i.e. 1 body region injured), cut/pierce was ranked first (22% of all injuries to one body region). As the number of body regions injured increased, an indication of increased severity, the mechanism of injury also changed. For those with two to five regions involved, falls was the most common mechanism but motor vehicle crash was the mechanism of injury associated with injuries to six or seven body regions for the same event.

Table 16 Primary Mechanism of Injury by Number of Body Regions: All Work Related Injuries 2001-2004			
# Body Regions Injured	**N**	**Mechanism**	**% of total**
1	138,249	Cut / Pierce	22%
2	10,628	Fall	41%
3	2,353	Fall	46%
4	722	Fall	49%
5	283	Fall	49%
6	102	MVC	45%
7	18	MVC	67%

Severity of injury

Severity of injury was analyzed after standardizing the data from the available sources. The MTR includes information on the severity of injury, as coded by both ICD-9-CM and ISS. The ACD and HDD also include ICD-9-CM codes, which can be used to estimate abbreviated injury severity scores. For cases in which the ICD-9-CM codes differ between data sources, information from the ACD or HDD, whichever is applicable was used. Using the ICDMAP-90 program developed by MacKenzie et al (1997), ICD-9-CM codes were translated to Abbreviated Injury Scores and ISS were calculated. Thus, information on injury severity was comparable for all workers who were treated in an ED and released, admitted to a hospital, or fatally injured.

Table 17 Distribution of Injury Severity Score (ISS) Across Data Sources Following Data Linkage 2001-2004

	ED Data		Inpatient Data		Trauma Registry Data		Death Certificate Data	
	% NWR	% WR	% NWR	% WR	% NWR	% WR	%NWR	%WR
ISS								
1-8	99.1	99.2	64.4	74.3	67.1	70.9	18.0	16.2
9-15	0.7	0.7	26.3	16.8	17.9	18.5	19.8	3.8
16-24	0.1	0.1	7.1	6.3	10.9	7.9	31.4	43.8
25-75	< 0.1	<0.1	2.2	2.5	4.1	2.7	30.8	36.2

As expected, the vast majority of ISS scores for ED patients were low, as 99% of ISS scores were between 1 and 8 for both the non-work-related and work-related groups (Table 17). Further investigation indicated that patients presenting with work-related injuries in the ED were more likely to be coded as ISS=1 (78.8%) than were patients with non-work-related injuries (75.0%). Inpatient data and trauma registry information also indicated that ISS scores were slightly lower among patients with work-related injuries as opposed to those sustaining non-work-related injuries (see Table 17). However, death certificate data indicated that higher ISS scores were more prevalent among fatalities who sustained work-related injuries.

Calculation of injury rates

For calculation of injury rates, cases of work-related injury identified as a result of the data linkage process served as the numerator, with population estimates constituting the denominator, to compute crude and adjusted rates of occupational injury per 100,000 workers. We used the current estimate of the employed workforce population in Maryland for the mid-year study period of 2,844,142 as discussed earlier under procedures, study population. In the future, age will be directly standardized to the distribution of the Maryland employed workforce 2001-2004 for ED, HDD and TR.

Table 18 Rate of Work-Related Injuries by Data Source 2001-2004							
Age	4 Year Labor Force Estimate	Emergency Department Data		Hospital Data		Trauma Registry Data	
		# WR	Rate / 100K	# WR	Rate / 100K	# WR	Rate / 100K
16-24	1,625,424	33,319	2049.9	1,141	70.2	879	54.1
25-34	2,344,640	42,989	1833.5	1,971	84.1	1,384	59.0
35-44	2,999,536	43,481	1449.6	2,625	87.5	1,593	53.1
45-54	2,640,448	28,715	1087.5	2,220	84.1	1,067	40.4
55-64	1,372,660	11,663	849.7	1,166	84.9	458	33.4
65+	393,864	2,683	681.2	640	162.5	235	59.7
Total	11,376,572	162,850	1431.5	9,763	85.8	5,616	49.4

Analysis of the 4-year rate of work-related injuries per 100,000 workers is displayed in Table 18. For persons presenting to the ED, rates declined as the workforce aged, from a high of 2,049.9 per 100,000 for ages 16 to 24, to a low of 681.2 per 100,000 for ages 65 or older. The average decrease per 10-year age group was 19.6%. The age group pattern differed substantially for hospitalized patients; however the counts and rate are much lower. In addition, the work-related injury rate increased 19.8% between the 16-24 year age group (70.2 per 100,000) and the 25-34 year age group (84.1 per 100,000) before remaining virtually unchanged through age 64. Unlike the decreasing pattern found among ED patients, the work-related rate nearly doubled for hospitalized patients over age 64 (162.5 per 100,000).

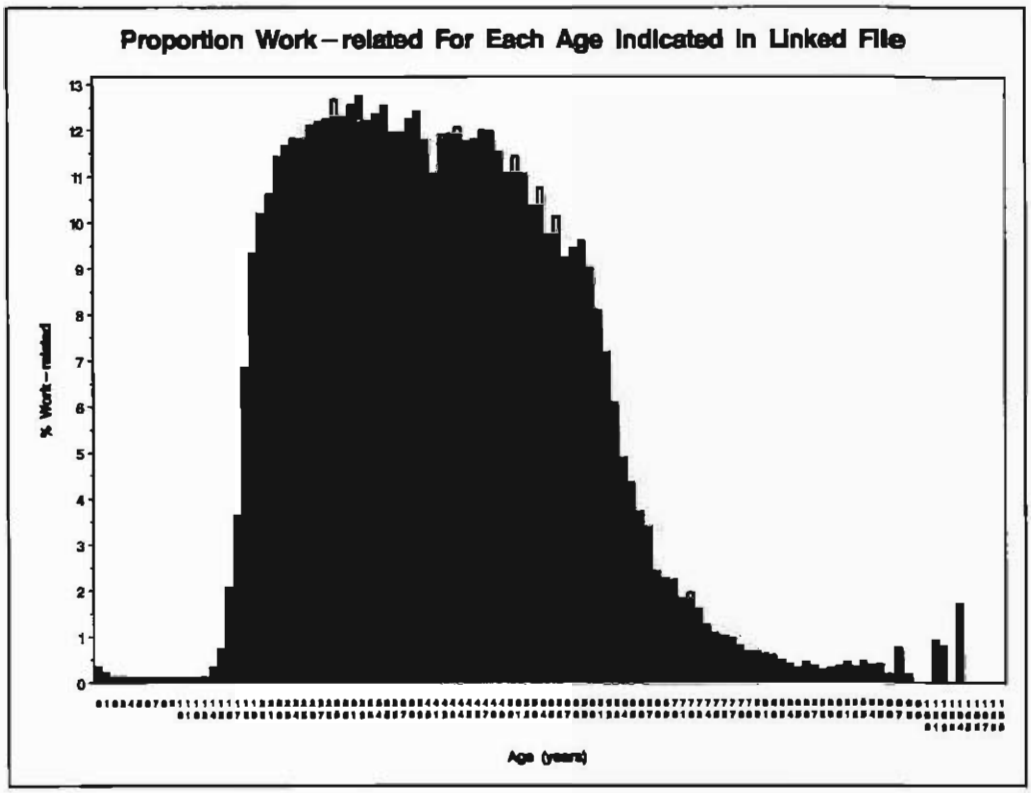
Patterns of the 4-year work-related injury rates among trauma center patients turned out to be a combination of those detected in the ED and hospital data. These rates, while closer in magnitude to the hospital rates, were lower than those calculated for both ED and hospital patients. Rates for the 25-34 year age group increased by only 9.1% over the youngest age group, and then declined on average 17.3% per 10 years to a low of 33.4 per 100,000 for the 55 to 64 year age group. Older trauma center patients, however, experienced a 78.7% increase in the work-related injury rate (59.7 per 100,000) over the 55-64 year group.

Work-related injuries by age

The proportion of all injuries in the linked dataset (ED, hospital and trauma registry combined) that are work-related varies dramatically by age (Figure 2). The proportion that are work-related first begins to rise at age 14 (0.34%), 15 (0.73%) and steadily rise by each year of age with the largest jumps from 17-18 (3.64 vs. 6.84) and 19 (9.32). The highest proportions of injuries that are WR are in ages 29 and 32 (12.66 and 12.73% respectively). From age 60 on the proportion work-related also begins to fall off dramatically from 9.01% at age 60 to 4.88% at age 64 and 2.23% at age 70.

The graph also shows that there are still some cases at the extremes of age that the data linkage identified as being work-related although the numbers are very small. It is highly unlikely that those less than age 14 are injured at work. From 0-13 years work injuries are only about 0.1% but as it turns out this is largely due to false positives for work-relatedness identified through the falls from a height in the EMS data. If we remove cases that were only identified by falls in the EMS data, then the proportion of work-related cases in the ages 0-13 and 85 and over drops considerably (Graph 2 – Appendix H).

Figure 2



Percent Agreement between Data Sources

Upon creation of the incident-specific linked database, the percent agreement between data sources of reporting work-related and non-work-related injuries and deaths was investigated. Table 19 displays the percent agreement between linked data sources for identifying *work-related* cases. Entries in each cell of the table represent the percent agreement between the column data source, in which the injury was initially identified as being work-related, and the row data source. For instance, looking at the data in column 1, of all of the injured cases that were (a) *initially identified as being work-related* in the ED data and (b) also found in the trauma registry, 71.3% were then reported as being work-related in the trauma registry. However, examination of inpatient data indicates that only 58.0% of the injured cases that were reported as being work-related in the inpatient data and linked to the trauma registry were actually reported as being work-related in the trauma registry. Note that the percent agreement between two databases depends upon the source of the work-related information. For example, among the work-related cases identified in the trauma registry, only 52.3% of the ED cases that linked to those work-related trauma cases were also reported as having occurred on the job in the ED data.

While agreement of work-relatedness for each data source with the ED data occurred approximately three-quarters of the time (column 1), much lower work-related agreement rates were found with death certificate data (column 4), police reports (column 5) and ambulance runsheets (column 6). Nevertheless, looking across the rows in Table 19, it is apparent that death certificate data were more likely to agree with the work-related assessment derived from the other data sources (ranging between 75% and 89%) with the exception of ambulance runsheet information. The police report data identified the drivers of commercial vehicles, most of which are likely to be work-related. The relatively low identification of these as work-related in the ED, inpatient and trauma registry databases illustrates the problem of identifying motor vehicle injuries that are work-related.

Table 19 Percent Agreement of Work-related Injury Cases Among Databases 2001-2004

	Injuries Identified as Work-related in					
	ED Data %	Inpatient Data %	Trauma Registry %	Death Certificates %	Police Reports %	Ambulance Runsheets %
% Agreement in ED Data	100.0	71.6	52.3	40.0	51.9	51.8
Inpatient Data	80.5	100.0	68.5	55.3	65.3	40.0
Trauma Registry	71.3	58.0	100.0	60.0	48.5	37.2
Death Certificates	75.0	83.9	76.5	100.0	88.9	33.3

The percentages of agreement regarding work-related deaths among the databases are displayed in Table 20. Approximately two-thirds of the deaths identified as being work-related in the ED data that later linked to the trauma registry were also reported as being work-related in the registry. However, if a death that was initially identified as being work-related in the trauma registry was found to have linked to the ED data, it was reported as being work-related in the ED database only 30% of the time. With the exception of death certificate data, the linked data sources only agreed with the OCME assessment of work-relatedness about 55% to 60% of the time. Death certificate data, however, agreed with the OCME evaluation for 87% of the work-related deaths. Similar to the agreement results found for work-related injuries in Table 19, very low agreement rates for work-related deaths were found with ambulance runsheets, while death certificate data had the highest agreement rates. Ambulance runsheets have the poorest agreement with the other data sources, suggesting that we may be over-reporting work-related using the proxy criteria derived from the ambulance runsheet database.

Table 20 Percent Agreement of Work-related Deaths Among Databases 2001-2004

	Deaths Identified as Work-related in						
	ED Data %	Inpatient Data %	Trauma Registry %	Death Certificates %	Police Reports %	Ambulance Runsheets %	OCME %
% Agreement in ED Data	100.0	0.0	30.0	40.0	16.7	42.9	58.8
Inpatient Data	0.0	100.0	70.0	55.3	83.3	0.0	55.6
Trauma Registry	66.7	65.6	100.0	60.0	37.5	18.2	60.7
Death Certificates	75.0	83.9	76.5	100.0	88.9	36.7	87.0

Table 21 Percent Agreement of Non-work related Injury Cases Among Databases 2001-2004

	Injuries Identified as Non-work related in ED Data %	Inpatient Data %	Trauma Registry %	Death Certificates %
% Agreement in ED Data	100.0	98.7	98.8	99.5
Inpatient Data	97.9	100.0	97.1	99.7
Trauma Registry	97.3	98.1	100.0	99.3
Death Certificates	97.8	98.8	98.6	100.0

Agreement results increased dramatically when investigating the identification of non-work-related cases by data source. As shown in Table 21, at least 97% of cases identified as being non-work-related in each database and linking to a second database were reported as not being work-related in that second data source. Table 21 does not contain information regarding EMS data or police reports since non-work-related cases were not selected from these data sources.

Table 22 Percent Agreement of Non-work related Deaths Among Databases 2001-2004

	Deaths Identified as Non-work related in ED Data %	Inpatient Data %	Trauma Registry %	Death Certificates %
% Agreement in ED Data	100.0	100.0	99.4	99.5
Inpatient Data	100.0	100.0	99.2	99.7
Trauma Registry	97.2	99.3	100.0	99.3
Death Certificates	97.6	98.8	98.5	100.0

Results shown in Table 22 for non-work-related deaths mirror those found in Table 21 for non-work-related injuries. That is, at least 97% of cases identified as being non-work-related in each database and linking to a second database were reported as not being work-related in that second data source.

Comparison of Data Linkage

Additional cases identified as work-related.

Data linkage increased the number of serious injuries that were work-related by 2.1% for ED cases, 19.4% for hospitalized cases and 58.5% for the trauma registry data (Table 23). The increase was more among women for hospitalization and trauma registry data (26.8 and 140.6%). For hospitalization the largest numerical increase was in the age groups 16-64 years although the largest percent increase was in the younger and older age extremes. In fact, it was over 200% for those age 0-9 and 85-95 years. This finding stimulated us to explore in more detail possible factors responsible for the dramatic increase in bringing in WR cases in younger and older persons.

Table 23 Comparison of Serious Occupational Injury Proportions Before and After Data Linkage by Data Source 2001-2004

	Emergency Department Data				Hospital Data				Trauma Registry Data			
	N	Before Link % WR	After Link % WR	% Change	N	Before Link % WR	After Link % WR	% Change	N	Before Link % WR	After Link % WR	% Change
Total	2,151,467	7.5	7.6	2.1	184,877	4.5	5.3	19.4	71,710	5.1	8.0	58.5
Gender												
Male	1,153,054	9.4	9.6	2.3	98,018	6.9	8.2	17.8	49,413	6.8	10.2	51.0
Female	998,160	5.2	5.3	1.8	86,760	1.7	2.1	26.8	22,288	1.4	3.3	140.6
Age (years)												
0-9	282,943	0.05	0.11	140.9	5,486	0.20	0.91	354.50	5,102	0.10	1.9	1860.0
10-15	230,926	0.20	0.25	24.5	4,844	0.33	0.70	112.50	4,337	0.16	1.2	642.9
16-24	381,096	8.6	8.7	1.4	20,723	4.5	5.5	21.1	17,911	3.2	4.9	53.7
25-34	345,100	12.3	12.5	1.6	18,289	9.4	10.8	14.9	12,726	7.2	10.9	50.6
35-44	357,318	11.9	12.2	2.0	23,598	9.7	11.1	15.1	12,305	8.7	12.9	49.6
45-54	247,220	11.4	11.6	2.1	21,738	9.0	10.2	13.7	8,521	8.3	12.5	51.3
55-64	130,446	8.8	8.9	2.2	17,467	5.7	6.7	18.0	4,373	6.4	10.5	63.0
65-74	75,660	2.5	2.7	7.7	19,487	1.3	1.7	36.9	2,750	2.6	5.0	91.7
75-84	67,767	0.57	0.75	30.9	31,182	0.28	0.68	144.80	2,506	0.44	3.0	590.9
85-94	29,961	0.12	0.32	174.3	19,920	0.06	0.40	618.20	1,001	0.10	2.0	1900.0
95+	2,995	0.03	0.17	400.0	2,134	0.19	0.66	250.00	81	0.0	1.2	INF

"Before Link" column includes work-related proportion derived from single data source.
"After Link" column includes work-related proportion of single data source augmented by work-related indication made in other linked sources.

Additional cases added by each data source.

There were a total of 9,847 cases of hospitalization identified as WR. For inpatient cases, as expected, the payor source as WC identified 77.1% of the cases identified by linkage as work-related (Table 24). A further 6% were identified by place as industrial. Only 56 additional cases were identified by farm as the place. EMS falls from 15 feet brought in an additional 499 cases, or 5/1% of cases. Linkage with the trauma registry then brought in 6% of cases illustrating the value of asking a specific work injury yes/no question. Trauma registry cases, however, only comprise 39.0% of all hospitalized injuries.

Table 24 – Sequential Identification of All Data Sources for Work-Related Inpatients by Method of identification in Predetermined Hierarchical Order Year 2001 to 2004 (N=9,847)

Hierarchical Order	Source of Work-Related	N	%
1	Inpatient Workers' Compensation	7,593	77.1
2	Inpatient Injury Place – Industrial	595	6.0
3	Inpatient Injury Place – Farm	56	0.6
4	Inpatient Injury Place – Mine	6	0.1
5	EMS – Industrial	132	1,3
6	EMS – Farm	168	1.7
7	EMS – Fall From 15 feet	499	5.1
8	Police – Commercial Vehicle Driver	136	1.4
9	Trauma Registry – Work-Related	595	6.0
10	Emergency Department – Work-Related	53	0.5
11	Death Certificate – Work-Related	14	0.1

AIM 2. *To conduct a validation study of the reporting of work relatedness by available data sources based on sampled chart reviews of ED patients, inpatients, and deceased workers, in order to determine the nature and occupation of the patient and circumstances of the injury. In addition, false- positive and false-negative rates for work relatedness will be computed.*

The validation study of the reporting of work relatedness by available data sources involved:

a. Comparing the reporting of work-relatedness by available data sources with our assessment of work-relatedness based on reviewing sampled chart reviews of ED patients, inpatients, and deceased workers. A representative sample of 4 hospitals across the state for 2001-2002 were selected and a sample of sentinel injures from each hospital was selected from the ED and hospital discharge files. We then worked with the hospitals to locate these patient charts. Based on the descriptions of injury circumstances provided in the charts, we determined, for the sample of sentinel injures, a) the nature of the industry and occupation of the patient and b) false positive and false negatives for work relatedness. In addition trauma hospitals were studied prospectively using the same approach (see **Aim 4**).

b. Once the total number of merged cases was determined, tabulations were made to ascertain the completeness of key variables. For individuals requiring treatment in an ED or admission to a hospital, (i.e., those found in the ACD or HDD), the percent agreement between "occupational injury" fields was determined for the patients found in more than one database. Thus, the probability of identifying a work-related injury in one database given notation of the injury in another database was calculated. For prehospital deaths (those in either the DTHC or OCME database), similar calculations were made. Based on Workers' Compensation as payor source (acknowledged to be an undercount) and place-of-occurrence code, our initial estimates were that work-related injuries in Maryland accounted for 8.7% of injuries to patients treated in EDs (2000 data) and 4.8% of injuries to hospitalized patients (1999 data). The following describes our updated results from our study.

Validation using hospital records

The surveillance data for sentinel injuries was validated using 2001 and 2002 data. Calendar year 2001 was chosen because the linked data became available during the first year of the study.

Nonfatal Injuries. After the data linkage was completed, incident-specific records were divided into two groups, work-related and non-work-related, for all patients aged 16-64 (i.e., those most likely to constitute the work force). As part of the validation of the surveillance part of the study, we were interested in determining the ability of each data source to detect work-related injuries, including estimating the magnitude of false positives (i.e., work-related injuries that are really non-work-related), and false negatives (i.e., non-work-related injuries identified as being work related). In addition, it was important to obtain information on the industry and occupation of the injured patient according to false-positive and false-negative status. This validation was conducted to evaluate, in a sample of hospitals and their EDs, the indication of work relatedness from the 2001 and 2002 linked data compared with an extensive chart review to determine if there is evidence of an occupational injury. Our experience has been that there is sufficient information in the chart describing injury circumstances, including where the injury occurred. A similar study of trauma centers was done using 2004 data (see below).

Sentinel injuries

We proposed to use a series of "sentinel injuries" as a means of evaluating which injuries are work related. Sentinel or indicator diseases have been used in a number of other studies as a surveillance tool and as a more efficient alternative to routine surveillance or case-finding methods. Rutstein et al (1976) defined a sentinel health event as "the occurrence of an unnecessary disease, disability, or untimely death that justifies carefully controlled scientific search for remediable underlying causes." Occupational sentinel health events have been used in many states to develop better methods to control these specific diseases and as indicators of the overall status of occupational disease control in a state (Baker, 1989). Cormack et al (2000) identified Maryland deaths from three sentinel injuries (falls from elevations, machinery, and electrocutions) using multiple sources of data, including death certificates, MWCC first reports, MOSH reports, and medical examiner records. They demonstrated that using sentinel injuries in occupational settings is a useful and efficient means of evaluating reports from a variety of sources of occupational injury data. We are using a similar method.

The sentinel injuries for this study have been chosen from among those most likely to be work related and were classified as follows:
1) falling from a height,
2) commercial vehicle/pick-up truck drivers' injuries, and
3) other less frequent injuries highly associated with injuries at work (i.e., overexertion, struck by an object/caught in an object or between objects, caused by machinery, and caused by electric current).
Sampled charts for injuries resulting from falls were chosen from those with an E-code for "falls from heights" (E-codes 880.0-.9, 881.0-.1, 882, 883.0-.9, 884.0-.9). For commercial vehicle/pick-up related injuries, incidents were selected from those identified by MAARS as involving a commercial vehicle driver. Sample charts for "other injuries" were also based on E-codes (E-codes 916, 917.0-.9, 918, 919.0-.9, 925.0-.9, 927, 960.0, 968.2, 973, 975).

The proportion of sentinel injuries of hospitalized patients that were work related (defined as Workers' Compensation payor status or place of occurrence as "industrial," "farm," or "mine" in HDD) in the linked data for (a) all ages and (b) ages 16-64 are shown in Table 25. In both groups, between 43% and 64% of sentinel injuries involving machinery, electric current and being caught between objects were flagged as being work-related in the hospital data. However, many fewer cases involving being struck by an object, falling from a height or overexertion were classified as being work-related. While the vast majority of the sentinel injuries chosen for our study turned out to involve a fall from height (N=18,256 for all ages combined), only 8.4% of those cases were indicated in the hospital data to have occurred on the job (17.3% in ages 16-64). Falls are one of the most common causes of injury hospitalization.

Table 25 Sentinel Injuries of Hospitalized Patients 2001-2004						
	All-Ages			Age 16-64		
	All Cases	Work-related		All Cases	Work-related	
	N	N	%	N	N	%
Machinery	1103	658	59.7	996	641	64.4
Electric Current	137	67	48.9	118	67	56.8
Between Objects	455	197	43.3	349	191	54.7
Struck by Object	4425	610	13.8	2911	595	20.4
Fall from Height	18256	1535	8.4	8535	1475	17.3
Overexertion	2870	215	7.5	1891	211	11.2

Chart Abstraction – Sample Hospitals

Community Hospitals:

As part of the validation effort, medical charts of a) individuals seeking care in an ED and b) patients requiring hospitalization were sampled from four hospitals chosen from within the University of Maryland Medical System. By selecting UMMS affiliated hospitals it was hoped that the ED Director could be of assistance in facilitating the chart review process at each hospital. One hospital represented western Maryland, one represented the Eastern Shore, and two hospitals were chosen from central Maryland. These regions were chosen to distinguish the more urban/industrialized center of the state from the rural/agrarian areas of mountainous western Maryland and the coastal Eastern Shore. The four hospitals thus represented a broad cross-section of the workforce in order to conduct a sample chart review of specific "sentinel injuries" occurring in the state.

Chart reviews were based on *sentinel injuries* and were grouped as follows: a) work-related, treated in ED; b) non-work related, treated in ED; c) work-related, hospitalized; d) non-work related, hospitalized.

Chart Abstraction procedure

1. Charts to be reviewed were generated from the linked data for each institution selected according to the following criteria: a) work-related, treated in ED (10% sample); b) non-work related, treated in ED (1% sample); c) work-related, hospitalized (all); d) non-work related, hospitalized (10% sample).
2. A contact person was identified in each institution's Medical Records Department and the list sent via encoded file.
3. For institutions with electronic records, temporary access was generated to the institutions system for a designated abstractor who traveled to the facility at a mutually convenient time to complete the abstraction
4. For institutions with hard-copy records charts were pulled by the facility and abstractors traveled to the facility once charts had been retrieved. In several cases multiple trips were required to complete the process either due to the number of charts being requested, or due to missing charts in the first request
5. Charts were reviewed and as much information as possible abstracted. There was a learning curve associated with reviewing the records at the different hospitals, due to local differences in documentation and chart content. Key information was ultimately noted to be located in particular sections of each facilities records. For example, employer was rarely found in any location other than the hospital registration information. See Appendix J for copy of abstraction form.
6. The History and Physical (H&P) section frequently included a description of the injury and occasionally the occupation. For example, "construction worker fell from ladder". Other

consulting services usually repeated the H&P information and rarely provided additional detail. The nursing intake forms in some facilities were also useful in identifying the injury circumstances. Unfortunately, injuries related to roofs, trees and vehicles frequently lacked the detail to clearly identify if the injury was work or non-work related.

7. Expected payor source – completed by the admission office personnel who come to the bedside to get patient contact and insurance information. It is unclear when and how regularly this information is updated after all the injury circumstances are known.

Chart abstraction was completed by NSC and DHMH staff for the years 2001, 2002 and 2004. A copy of the data collection tool is included in Appendix J. Reviewers were trained to code work-status according to the following criteria:

1). work related
2). not work related
3). chart reviewed but could not determine work-relatedness (unclear)
4). chart found but no information available
5). chart not found

The category "unclear" indicates that the case could possibly be work-related based on the descriptions in the chart but it was not possible to definitively decide. For example, one case was a 64 year old hair dresser where it mentioned she was retired but the chart described that the injury was due to a fall in a beauty parlor. In addition, the reviewers obtained as much detail about industry and occupation for those cases determined to be work-related. Industry and occupation coding was performed by a single designated NSC staff member after chart abstraction was completed, utilizing the 1997 North American Industry Classification System (NAISC) and the 2000 Standard Occupational Classification SOC coding books and web sites. Table 26 displays the number of charts requested and percent reviewed by year and institution. The review rates ranged from 88.6% to 100% over the course of the study.

Table 26 Chart Review Summary by Institution and Year

	A	B	C	D	E	F	G	H	I	J	K	L
2001												
Requested	222	515	105	168								116
% Reviewed	99.1	91.3	88.6	96.4								99.1
2002												
Requested	187	527	62	223								135
% Reviewed	97.7	98.9	95.2	99.1								94.8
2004												
Requested	68	402			125	41		37	78	29	84	154
% Reviewed	97.1	100.0			93.6	87.8		100.0	100.0	100.0	97.6	89.6

False-Negative Rate. Cases that 1) were identified as *not work related* in the linked database and 2) involved any of the above-defined sentinel injuries, served as the population for this component of the validation effort. Using medical record numbers, a 1% sample of ED charts and a 10% sample of inpatient charts from this population were identified at each of the four hospitals. Charts were then reviewed in order to determine whether the injury was, in actuality, *work related* (yes/no/possible). As discussed earlier, there is considerable information in the chart on injury circumstances, including information to determine work relatedness. If there was an indication in the chart that the injury was work related, then the event was defined as a false negative. From the linked database, we were able to determine the total number of non-work-related injuries in each of the sampled hospitals. For each analysis year, the false-negative rate for that particular region of the state was calculated by dividing the number of *falsely negative non-work-related injuries in the sampled hospital(s)* (found by chart review) by *the total number of non-work-related injuries in the sampled hospital(s)* (indicated in the linked database).

Case Review

Tables 27 and 28 describe the results of our chart abstraction for those patients where we selected a sample of non-work related sentinel injuries of ED cases and inpatient cases for 2001-2002 Community Hospitals. Of the 169 ED cases and 236 inpatient cases selected, we found charts for 164 (95%) and 225 (97%) respectively. For the cases linked with the hospital data, 15.6% of the ED cases and 4.3% of the inpatient cases were determined to be work-related (false negatives); 10.8% for ED and hospital combined. In both groups there were very few cases where a determination could not be made, three in the ED cases and four in the inpatient cases. Similar information is provided for the 2004 trauma center case review (See Aim 4 Table 48).

These results varied somewhat by hospital, as no false negative cases were found among the 85 charts reviewed at Hospital D. The highest numbers of false negative cases were reviewed at Hospital C, where 35% of the 40 charts indicated that the patient had sustained a work-related injury.

If we apply the 15.6% proportion of false negative cases calculated by chart review for sentinel injuries to the total number of non-work-related sentinel ED cases found in the linked data for 2001 and 2002 combined (n=312,542), we would expect approximately 48,757 *more work-related ED cases* which were erroneously coded as non-work-related to have been provided ED care over a 2-year period.

A similar calculation can be made using the 2001 and 2002 linked inpatient data as described earlier. If we apply the 4.3% proportion of false negative cases calculated by chart review for sentinel injuries to the total number of non-work-related sentinel inpatient cases found by linkage for 2001 and 2002 combined (n=12,335), we would expect approximately 530 *more work-related cases* that were erroneously coded as non-work-related to have been hospitalized over a 2-year period. Thus, approximately 49,287 more work-related cases would have been provided care over the two years in either an ED or hospital setting. We did not review charts for non-sentinel injuries so cannot make overall estimates of undercounting of work-relatedness.

Table 27 Chart Review for ED Patients with Sentinel Injuries that were Not Work-related in the Linked Data 2001-2002 Community Hospital Data (N=225)

Hospital N (%)	Chart Review Determination: Work-related	Not Work-related	Not Clear	No information in chart	Hospital Total
A	10 (13.5)	62 (83.8)	1 (1.4)	1 (1.4)	74 (100.0)
B	11 (26.8)	26 (63.4)	1 (2.4)	3 (7.3)	41 (100.0)
C	14 (40.0)	18 (51.4)	1 (2.9)	2 (5.7)	35 (100.0)
D	0 (0.0)	73 (97.3)	0 (0.00)	2 (2.7)	75 (100.0)
All Hospitals	35 (15.6)	179 (79.6)	3 (1.3)	8 (3.6)	225 (100.0)

Table 28 Chart Review for Inpatients with Sentinel Injuries that were Not Work-related in the Linked Data 2001-2002 Community Hospital Data (N=164)

Hospital N (%)	Chart Review Determination: Work-related	Not Work-related	Not Clear	No information in chart	Hospital Total
A	1 (4.2)	23 (95.8)	0 (0.0)	0 (0.0)	24 (100.0)
B	6 (4.8)	102 (81.6)	4 (3.2)	13 (10.4)	125 (100.0)
C	0 (0.0)	5 (100)	0 (0.0)	0 (0.0)	5 (100.0)
D	0 (0.0)	9 (90.0)	0 (0.0)	1 (10.0)	10 (100.0)
All Hospitals	7 (4.3)	139 (84.8)	4 (2.4)	14 (8.5)	164 (100.0)

False-Positive Rate. The procedure for estimating the false-positive rate of work-related injuries for the sentinel injuries was similar to that used to estimate the false-negative rate. Cases that 1) were identified as *work related* in the linked database and 2) resulted from any of the above-defined sentinel injuries, served as the population for this component of the validation effort. Using medical record numbers, a 10% sample of ED charts and all inpatient charts from this population were identified at each of the four hospitals. (All work-related inpatient cases were studied, including those for which only one data source gave an indication that the injury occurred at work, because the numbers are small relative to the number of non-work-related cases.) Chart reviews were then conducted to determine whether the injury was actually *not work related* (yes/no/possible). If there was an indication in the chart that the injury was not work related, then the event was defined as a false positive. From the linked database, we were able to estimate the total number of work-related injuries for the sentinel injuries studied in each of the sampled hospitals. For each analysis year, the false-positive rate for that particular region of the state was calculated by dividing *the number of falsely positive work-related injuries in the sampled hospital(s)* (found by chart review) by *the total number of work-related injuries in the sampled hospital(s)* (indicated in the linked database). We also examined the sources of the discrepancy within the linked data sources.

Medical charts were reviewed for 1539 patients who were indicated by the linked data in years 2001 and 2002 to have suffered *work-related* injuries (646 ED charts and 893 inpatient charts). Chart review indicated that 14.7% of these individuals did not have evidence in their chart to determine if the injury was work-related. However, unlike the proportion of false negative cases, which differed a great deal between the ED and hospital samples, the proportion of the false positive cases did not differ much between those found in the ED (13.6%) or in the hospital (15.6%). These results also did not vary much by hospital, ranging from a low of 12.5% in Hospital C and a high of 17.7% in Hospital A.

If we apply the 13.6% proportion of false positive cases calculated by chart review for sentinel injuries to the total number of work-related sentinel ED cases obtained by linkage for 2001 and 2002 combined (n=35,760), we would expect approximately 4,863 *fewer work-related cases* to have been provided ED care over a 2-year period.

A similar calculation can be made using the 2001 and 2002 linked inpatient data as described earlier. If we apply the 15.6% proportion of false positive cases calculated by chart review for sentinel injuries to the total number of work-related sentinel inpatient cases obtained by linkage for 2001 and 2002 combined (n=1,915), we would expect approximately 299 *fewer work-related cases* to have been hospitalized over a 2-year period. Thus, approximately 5,162 fewer work-related cases would have been provided care over the two years in either an ED or hospital setting.

In summary, by extrapolating our findings to the 2001 and 2002 linked data, the chart review exercise would potentially yield 49,287 more work-related sentinel injury cases by analysis of false negatives and 5,162 fewer work-related sentinel injury cases by analysis of false positives, for a total of 44,125 more work-related cases. However, the 2001-02 linked ED and inpatient data only indicated that 88,411 had occurred on the job. Thus, the addition of 44,125 work-related sentinel injury cases represents a 50% potential increase to the number of individuals whose injury had occurred at work.

Hospital data.

Tables 29a and 29b describe the results of our chart abstraction for those patients where we selected all work-related sentinel injuries. There are two tables for hospital data because some cases from Hospital B had been identified by the trauma registry but could not be linked with the hospital data to determine expected payor source (Table 29b). We are investigating possible reasons for the failure to link them.

Of the 941 cases that link with hospital data, we found charts for 893 (94.9%). These charts form the basis for Table 29a (N = 811) and Table 29b (N = 82). For the cases that linked with the hospital data, 56 of the 811 charts (6.9%) gave no evidence of the injury being work-related and for another 30 (3.7%) there was insufficient information in the chart to be able to judge whether or not the injury could have been work-related (Table 29a). The left column indicates the linked data source identifying cases as work-related. For instance, of the 604 cases where payor source = "Workers' Compensation," 581 (96.2%) were confirmed as work-related in the chart and a further 15 (2.5%) were possibly work-related. Only 4 (0.7%) clearly had information in the chart suggesting the case was not work-related. However, as shown in Table 29a, the 581 cases represent 84.3% of all 690 cases confirmed by the medical chart to have occurred at work. On the other hand, 25 of the 56 cases for which the chart gave no indication of work-relatedness (44.6%) were identified in the EMS report as involving a fall from at least 15 feet. Similar information is provided for the 82 cases in the trauma registry that did not match with the hospital data in Table 29b. For this group, the majority of the 7 charts that gave no evidence of work-relatedness (57.1%) were identified on the EMS runsheet as being a fall from 15 feet.

Table 29a Comparison of Work-relatedness Determined by Chart Review With Cases Identified as Work-related by Each Data Source Among Patients with Sentinel Injuries that were Work-related in Linked Data Cases that Linked with Hospital Data 2001-2002 Community Hospital Data (N = 811)

	Total	Chart Review Determination							
	Reviewed (N = 811)	Work-related (N = 690)		Not Work-related (N = 56)		Not Clear (N = 30)		No Information in Chart (N = 35)	
		n	%	n	%	n	%	n	%
Inpatient Data									
Workers' Compensation	604	581	84.3*	4	7.1	15	50.0	4	11.4
Industrial	225	213	30.9	7	12.5	2	6.7	3	8.6
Farm	6	2	0.3	2	3.6	2	6.7	0	0.0
Mine	1	1	0.1	0	0.0	0	0.0	0	0.0
EMS Data									
Fall from 15 feet	66	34	4.9	25	44.6	1	3.3	6	17.1
Industrial	69	66	9.6	2	3.6	0	0.0	1	2.9
Farm	1	0	0.0	1	1.8	0	0.0	0	0.0
Police Reports									
Commercial Driver	111	93	13.5	8	14.3	5	16.7	5	14.3

* 84.3% = proportion of all work-related injuries confirmed by chart review that were identified by Inpatient payor source = WC

Table 29b Comparison of Work-relatedness Determined by Chart Review With Cases Identified as Work-related by Each Data Source Among Patients with Sentinel Injuries that were Work-related in Linked Data Cases that Did Not Link with Hospital Data 2001-2002 Community Hospital Data (N = 82)

	Total Reviewed	Chart Review Determination: Work-related (N = 64)		Not Work-related (N = 7)		Not Clear (N = 4)		No Information in Chart (N = 7)	
	(N = 82)	n	%	n	%	n	%	n	%
EMS Data									
Fall from 15 feet	9	2	3.1*	4	57.1	1	25.0	2	28.6
Industrial	2	2	3.1	0	0.0	0	0.0	0	0.0
Farm	0	0	0.0	0	0.0	0	0.0	0	0.0
Police Reports									
Commercial Driver	17	16	25.0	0	0.0	0	0.0	1	14.3

* 3.1% = proportion of all work-related injuries confirmed by chart review that were identified by EMS Fall from 15 feet

ED data.

Table 30 describes the results of our ED chart abstraction for those patients selected with work-related sentinel injuries. Of the 663 cases that were sampled from the linked data, we found charts for 646 (97.4%). These charts form the basis for Table 30. As listed in the column headings of the table, 31 of the 646 charts (4.8%) gave no evidence of the injury being work-related and for another 15 (2.3%) there was insufficient information in the chart to be able to judge whether or not the injury could have been work-related. The left column indicates the linked data source identifying cases as work-related. For instance, of the 537 cases where ED payor source = "Workers' Compensation," 485 (90.3%) were confirmed as work-related in the chart and another 10 (1.9%) were possibly work-related. Nineteen records (3.5%) clearly had information in the chart suggesting the case was not work-related. However, as shown in Table 30, the 485 cases represent 86.9% of all 558 cases confirmed by the medical chart to have occurred at work. In addition, 239 of the 558 confirmed work-related cases were identified in the ED data as being industrial related.

Table 30 Comparison of Work-relatedness Determined by Chart Review With Cases Identified as Work-related by Each Data Source Among Patients with Sentinel Injuries that were Work-related in Linked Data 2001-2002 Community Hospital Emergency Department Data (N = 646)

	Total Reviewed (N = 646)	Chart Review Determination: Work-related (N = 558)		Not Work-related (N = 31)		Not Clear (N = 15)		No Information in Chart (N = 42)	
		n	%	n	%	n	%	n	%
ED Data									
Workers' Compensation	537	485	86.9*	19	61.3	10	66.7	23	54.8
Industrial	269	239	42.8	7	22.6	4	26.7	19	45.2
Farm	0	0	0.0	0	0.0	0	0.0	0	0.0
Mine	0	0	0.0	0	0.0	0	0.0	0	0.0
EMS Data									
Fall from 15 feet	2	1	0.2	1	3.2	0	0.0	0	0.0
Industrial	14	10	1.8	1	3.2	2	13.3	1	2.4
Farm	3	1	0.2	2	6.4	0	0.0	0	0.0
Police Reports									
Commercial Driver	17	12	2.2	2	6.4	0	0.0	3	7.1

* 86.9% = proportion of all work-related injuries confirmed by chart review that were identified by ED payor source = WC

The biggest potential problem with the proxy indicators of work-relatedness was the potential over inclusion of the cases identified by the EMS system mechanism "falls over 15 ft". Many of these were not identified as WR by any other source. In the chart review of community hospitals there were 56 cases where the chart review could not confirm work-relatedness (false positives) based on what was written in the chart. MAIS Fall > 15 ft was the source with the highest proportion of false positives (46%). In addition, for another 30 cases it was unclear if they were work-related from the information and we could not rule one way or the other. Table 31 describes the false positives by how they had been identified as work-related cases.

Table 31 Chart Review of False Positive Work-related Cases from Community Hospitals

Source WR Info	Chart No Evidence of WR	Unclear if WR
MAIS Fall > 15 ft	25	1
Commercial Driver	8	2
HS Industrial Place	5	2
HS Ind + Fall EMS	1	-
HS Farm Place	2	2
WC Only	3	15
WC + Ind Place	1	-
WC + Com Driv	-	3
MAIS Farm	1	-
MAIS Ind	2	-
Trauma Registry	8	5
Total	**56**	30

For those where the work status was not clear (N=30) the largest single identifying source was WC expected payor source, suggesting that the chart does not contain sufficient information to determine if the injury was work-related. It depends on the clinical staff to record this and is not consistently reported. This information is best gathered as part of the admission process before there is a likelihood of legal or other mitigating factors involved.

OCME data

Medical examiner records were reviewed for 171 fatalities who were indicated by the linked data in years 2001, 2002 and 2004 to have suffered *non-work-related* sentinel injuries. Record review indicated that only 2 (1.2%) of these individuals had actually sustained *work-related* injuries. This false negative rate was much lower than the false positive rate of fatal injuries found among non-hospitalized patients. The false positive rate was ascertained by examining 127 medical examiner records of fatalities who were indicated by the linked data in years 2001, 2002 and 2004 to have suffered *work-related* injuries (sentinel or otherwise). This analysis was not limited to sentinel injuries because of the relatively small number of deaths that were documented as having occurred on the job. Record review indicated that 25 (19.7%) of these individuals did not have evidence in their chart to determine if the injury was work-related. These results varied somewhat by year, ranging from 25.0% in 2001 and 24.0% in 2002 to 12.2% in 2004. Thus, our examination of actual medical examiner records did not turn up a potential increase to the number of individuals whose injury had occurred at work, as was found earlier in our chart review of non-work-related sentinel *injuries*. We are conducting further investigations to determine why medical examiner records had no information indicating work-relatedness for some cases yet other sources had indicated they were work-related, including death certificates which are actually completed by medical examiners.

AIM 3: *To collect in-depth information to identify injury circumstances through an active, prospective investigation of trauma patients, including in-depth interviews and screening by trauma nurses 2004-2007. Data obtained from these sources will be corroborated with information from external sources.*

The collection of in-depth information to identify injury circumstances using *active* prospective investigation of injury cases involved the following tasks:

a. Collaborated with the trauma nurse coordinators (TNC) at all nine adult trauma centers in the state of Maryland to confirm the work relatedness of injuries sustained by all trauma patients for 2004. These TNCs facilitated consistent completion of the field in the trauma registry that indicated work relatedness.

b. Identified and interviewed patients with work-related injuries admitted to the R Adams Cowley Shock Trauma Center (STC) to determine the circumstances of injury and contributing factors, including the type of work (occupation and industry), safety equipment use, safety training, fatigue, substance use, and any unique hazards. Recruitment for this component began in January of 2004 and continued until March of 2007.

c. Corroborated the details regarding the injury circumstance obtained by patient interview with those obtained from external sources, including 1) hospital care notes, 2) statewide newspaper articles regarding occupational injury from a newspaper clipping services, 3) First Report of Injury records from the Maryland Workers' Compensation Commission (for those cases with workers compensation coverage), and 4) data from cases investigated by the Maryland Occupational Safety and Health Program.

Surveillance by Trauma Nurses. As mentioned under Specific Aims, an integral part of our study was the establishment of a proactive system to review all trauma center admissions for work relatedness at the nine Maryland adult trauma centers for calendar years 2004, 2005 and 2006. In mid to late 2003, a training session with the trauma nurse coordinators was held at their monthly meeting, to discuss the details of the research project. We asked that the field in the Statewide Maryland Trauma Registry (MTR) indicating whether a patient's injury was incurred at work be answered for all cases. The definition of work-relatedness and a copy of the data abstraction form that included the "Operational Guidelines for Determination of Injury at Work" developed by the Association for Vital Records and Health Statistics, NIOSH, and other agencies was distributed. As stated in the guidelines, an injury may be defined as "work related" if it occurred *on* or *off* employer premises. Injuries occurring *on* employer premises include those incurred while engaged in work activity, apprenticeships, or vocational training. In addition, injuries occurring in locations such as hallways or restrooms are included, as well as those in parking lots while working, arriving, or leaving. Injuries occurring *off* employer premises include those incurred while working for pay or compensation, or working as a volunteer, EMS firefighter, or law enforcement officer. Other categories include working in a profit-oriented family business, including a family farm, as well as travelling on business or engaged in work activity where a vehicle is considered a work environment (e.g., taxi driver). The TNC agreed to pass this information on to the person responsible for chart abstraction, namely the trauma registrar. Research staff offered to meet with the persons responsible for collecting the information and review the research project and answer any questions. Meetings occurred with the staff at three of the nine trauma centers. We tried to coordinate meetings at the other institutions but to no avail. After the data collection had begun, the suggestion was made to hang posters in the emergency departments to assist with enhanced data collection. The TNC indicated that the emergency departments contained many informational signs and ours may not get the attention desired; so, this was not pursued. Updates were provided at the monthly meetings acknowledging our appreciation of each institution's efforts and encouraging the continued data collection and offering assistance. In addition, updates at the bi-monthly TraumaNet meetings were given. TraumaNet is the coalition of trauma directors, trauma nurses, MIEMSS and the NSC throughout the state of Maryland that meet to discuss issues related to the trauma system. Although the work-relatedness of injuries was analyzed for 2004 the trauma centers continued data collection to support the on going surveillance effort. Table 32 displays the percent work-related report in the trauma registry pre- (2001 and 2002) and post-study implementation. In 2001, 4.7% of all injuries were reported as work-related and this increased to 5.7% by 2004. The proportion of motor vehicle crashes coded as work-related also increased from 1.9% in 2001 to 2.6% in 2004.

It is interesting to note that the proportion of all cases in the trauma registry with missing data in the WR field increased over this period (0.8%, 1.7%, 2.8%, and 5.4% from 2001 to 2004 respectively). This however may actually indicate more attention to considering work-relatedness as the instructions to trauma registrars state that if "you have any uncertainty" the field should be left blank.

Table 32 Percent Work-Related by Injury Mechanism
Trauma Registry 2001-2004

Injury Mechanism	2001		2002		2003		2004	
	N	%	N	%	N	%	N	%
All	16,774	4.7	17,435	5.1	17,606	5.4	17,950	5.7
Sentinel	1,875	18.7	1,874	20.3	2,078	19.5	2,074	19.6
MVC	8,881	1.9	9,152	2.3	9,228	2.7	9,420	2.6

Surveillance at the STC (based on trauma registry data)

The following describes the trauma admissions to STC over the 4 year surveillance period (Table 33). It provides an overview of the types of patients seen at the STC and the proportion indicated as WR in the trauma registry database. Work-related cases were significantly more likely to be male than non-WR, and admitted from the scene. As expected, work-related injuries were concentrated in ages 16-64. Only 15.6% of the WR injuries had an injury severity score above 15 compared to 23.1% of non-work-related

injuries, reflecting the lower proportion of injuries from motor vehicle injuries among WR cases (23.2% vx 52.6% for non-WR cases). The largest proportion of WR cases was for falls (35.3%).

Table 33 Patients with Work-Related and Non-Work Related Injuries Shock Trauma Center Data, 2001-2004 (N=23,871)

	Work-Related (N=1,285)		Non-Work Related (N=22,586)		p-value
	n	%	n	%	
Male	1,184	92.1	15,731	69.6	< 0.001
Admitted from scene	1,154	89.8	19,190	85.0	< 0.001
Age (years)					
0-9	0	0.0	112	0.5	
10-15	1	0.1	610	2.7	
16-24	199	15.5	6,365	28.2	
25-34	366	28.5	4,384	19.4	
35-44	361	28.1	4,265	18.9	
45-54	245	19.1	2,976	13.2	
55-64	89	6.9	1,517	6.7	
65-74	20	1.6	985	4.4	
75-84	4	0.3	919	4.1	
85-94	0	0.0	393	1.7	
95+	0	0.0	27	0.1	< 0.001
ISS					
1-8	745	64.1	11,795	54.6	
9-15	239	20.5	4,816	22.3	
16-25	129	11.1	3,656	16.9	
26-75	50	4.3	1,344	6.2	< 0.001
Mechanism of injury					
Falls	454	35.3	3,847	17.0	
Motor vehicle/Pedestrian	298	23.2	11,879	52.6	
Struck by Object	203	15.8	2,038	9	
Cut/Pierce	30	2.3	1,405	6.2	
Firearm	15	1.2	1,685	7.5	
Other/Unknown	285	22.2	1,732	7.7	< 0.001

Surveillance and Patient Interviews at the STC. An important aspect of this research project involved identifying and interviewing patients with work-related injuries admitted to the R Adams Cowley Shock Trauma Center (STC) to determine the circumstances of injury and contributing factors, including the type of work (occupation and industry), safety equipment use, safety training, fatigue, substance use, and any unique hazards.

The following steps were undertaken to identify patients with work-related injuries and to identify potential study subjects:

1. On a daily basis, the admission log (called the violence log by trauma center staff) was printed and reviewed for any potential work-related cases (ie. police officer in mvc, electrocution, fall, lawn mower, industrial). The admission log provided a brief description of the patient

demographic and diagnostic information {*name, internal ID number, admit date and time, discharge date and time (if appropriate), length of stay (at the time of report generation), hospital location, age, sex, race, admission Glasgow Coma Score (GCS) and loss ofcConsciousness, address, phone, mode of arrival, county of injury, injury description (from nursing assessment), injury description by team and consulting service and team of doctors including major consulting services*} which allowed the recruiter to determine if the patient would potentially meet the interview study criteria. It does not contain a specific variable indicating work-relatedness. The WR variable in the trauma registry is not completed until after discharge. If a patient was determined to be 'potentially' work-related, patient registration and nursing assessments were reviewed to verify information.

2. For cases identified as highly likely or potentially work-related, the recruiter then reviewed the bedside chart (including EMS data for patient address and injury location/address) and talked to the bedside nurse to verify work-relatedness. Often the nurse would provide the information needed to make a determination of work-relatedness; if not, the recruiter would be allowed to talk to the patient. In some instances through chart review, the patient's home address and injury address would be the same providing the recruiter with a strong indication that the injury was not work related. Details were entered on the "Enrollment Screening Tool" (Appendix K). In the beginning, this information was verified through the patient and the vast majority (of those occurring at the home address) were found not to be work-related and thus this aspect of screen was discontinued unless it was determined the patient was self-employed.
3. If the injury was determined to be work-related, the recruiter approached the potential subject about possible participation in the study and proceeded with the following steps:
    a. The recruiter inquired as to whether the bedside nurse felt the potential subject was capable of giving informed consent. If the subject was not able to provided informed consent, he was followed until his status changed and consent could be obtained, he was discharged or there was no change and became ineligible.
    b. Using the Mini Mental State Examination (a test for mental competence), the recruiter evaluated the subject to determine if he was able to give informed consent (scoring 8/10 on the orientation section) (Appendix K). If the person was unable to sign the consent forms because of cognitive issues, then he was ineligible to participate in the study and recruitment was stopped.
    c. For those persons capable of giving informed consent, the recruiter provided an overview of the study using the consent forms for guidance. The subject was offered the consent forms to read and review or to have the consent forms read aloud. In addition, the subjects were given the opportunity to ask questions before signing the consent forms.
    d. Subjects agreeing to participate in the study signed the consent forms as did the recruiter. Copies of the forms were added to the medical record and given to the study subject and the interviewer was notified. Those persons declining participation were thanked for their consideration and offered well wishes.
    e. For those cases where work-relatedness was not immediately apparent and the patient was unable to provide information, the chart was reviewed, the bedside nurse was asked and ultimately the family was approached to confirm work-relatedness. Recruitment usually occurred prior to visiting hours and therefore the families were not available. We attempted to return and talk to the families but this proved to be labor intensive with little results. The recruiter would attempt to speak to the family and the family had not arrived or their loved one was too sick and there were care issues the family needed to address. Approaching family members was stopped early on because the ones which were approached and were able to identify work-relatedness were unable or reluctant to provide details about the injury circumstances.
4. In the beginning the recruiter and the interviewer were the same person and the interview could often be completed in close proximity to recruitment. Later there was one recruiter and three interviewers (two research associates and a social worker) providing coverage. This type of coverage allowed for a delay between recruitment and interview. There were times when the subject was unable to be interviewed prior to discharge. In an effort not to lose these subjects, the study protocol was amended to include phone interviews (a shortened version of the in-person interview). Attempts were made to contact those subjects who were discharged but often

the subject was unwilling to participate or could not be contacted. Also, midway through the project, Spanish speaking (primary language) subjects were recruited for a short period of time but because of staffing changes, this was discontinued due to lack of fluent Spanish-speaking staff. The study coordinator and one of the research associates provided back-up coverage for both the recruiter and the interviewers.

5. The interview session lasted approximately 20 to 25 minutes and was the only subject contact. Phone interviews contained a subset of items from the full interview and took less than 10 minutes to complete. At the discretion of the interviewer, based on subject needs, the phone interview was used instead of the full interview. The components of the interview included information on personal characteristics, occupation, industry, work history, environmental factors, mechanism-specific factors and human factors. A copy of the final interview forms may be found in Appendices L and M (phone interview).
    a. Personal characteristics included age, gender, race, marital status, education, income, injury episodes in the past five years and their associated work relatedness, current/past medical status, physical disability, and medical history (e.g., heart disease, diabetes, fatigue, chronic pain, depression, and ambulatory problems). Health-related habits such as sleep habits, smoking and substance use were also included.
    b. Work history included questions related to occupation/job title, years of experience, years on current job, shift work, safety training, and specific job-related training. Data on industry and occupation were coded according to the 1997 North American Industry Classification System and the 2000 Standard Occupational Classification (SOC), respectively.
    c. Environmental factors included a self-reported description of what happened, time of day, day of week, weather conditions (when appropriate), location of incident (indoor/outdoor), lighting conditions, and protective clothing and/or equipment.
    d. Mechanism-specific questions were also included. For example victims of falls were asked about the height of fall, type of fall (e.g., off ladder or scaffolding), surface struck, protective equipment, and safety training.
6. For patients discharged prior to recruitment, the study coordinator was responsible for reviewing the electronic and paper records to determine work-relatedness.

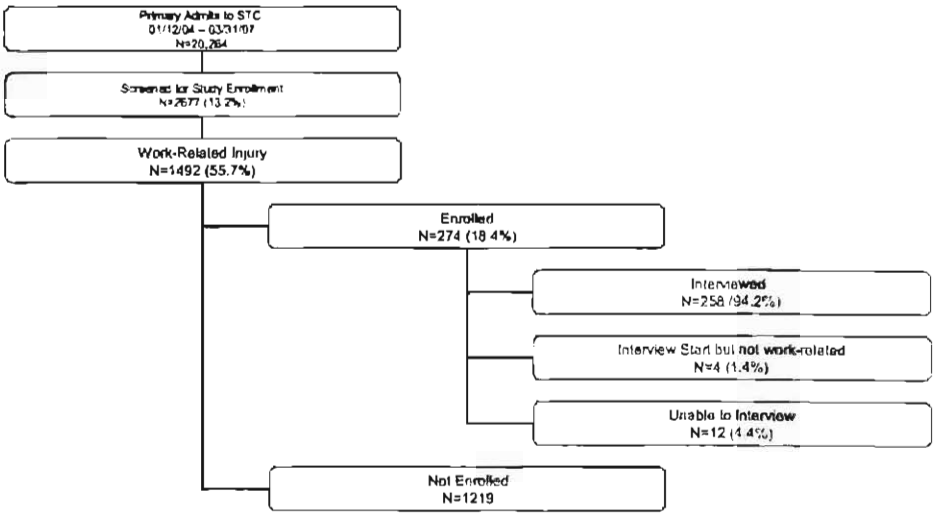
Throughout the interview aspect of the project, the strategies used to determine work-relatedness were evaluated and modified when necessary. For example, in the beginning every gunshot victim was being evaluated for work-relatedness. This too was labor intensive without many positive results so the electronic records were reviewed to determine if the victim was employed; if so, then the case was investigated further. There were also cases were it was difficult to determine work-relatedness (ie, home repair work, fall from roof with no additional details, unemployed person doing odd jobs for friends and family, apprentice type programs and farm-related injuries) In these cases, the recruiter would consult with the study coordinator and the PI and the Operational Guidelines for Determination of Injury at Work" developed by the Association for Vital Records and Health Statistics, NIOSH would be reviewed and a determination made.

Inpatient interview summary

There were 20,264 primary admissions to the STC between January 12, 2004 and March 31, 2007 (Figure 3). We screened all admissions for potential work-relatedness as described earlier and then checked 2,677 (13.2%) potential cases to determine work-relatedness. As described earlier, we selected injury mechanisms highly suspected of being work-related. We identified 1,492 admissions that met our criteria as being work-related. There were 1,219 that we were unable to enroll for the following reasons: 61% were discharged prior to screening; 18.3% were found to be to ill (this usually required several trips to the patient care areas to make the determination); 10.1% there was a language barrier; 8.4% refused (for various reasons such as they were too tired or fear of job loss). Many times it took several trips to a patient's bedside before he would agree to participate. There were many reasons for the delay in participation: a) tired, b) pain issues; c) care needs come first; and d) time to read the consent and make a decision. We enrolled 274 subjects. Four were found not to be work-related after the interview was

started and were dropped from analysis. An additional 12 subjects consented to participate but were discharged prior to being interviewed. We tried to reach these subjects at home but they were unwilling to complete the interview; thus we were able to conduct interviews for 258 of the 274 recruits. After much effort and determination on the part of the recruiters, we were able to conduct interviews for 17.3% of patients identified as being injured at work through chart review.

Figure 3 Study Subject Tracking



The STC Trauma Registry indicated that a total of 1,285 patients had work-related injuries from 2001-2004, an average of 321 cases per year. Extrapolating to the 3.25 years the interview was conducted, 1044 work-related cases could have been admitted based on STC data for 2001-2004. Thus interviews were conducted on 24.7% of the estimated work-related admissions. Table 34 is a comparison between work-related cases identified in the trauma registry and those actually interviewed. Subjects interviewed were older and more severely injured.

Throughout the course of the study, we had five versions of the inpatient interview. We also had an abbreviated interview that was administered over the phone or when the interviewer realized that the subject was either going to be discharged before the interview could be completed or the subject was unwilling to complete the full interview (Appendix M). The majority of the subjects were given Version Five (Table 35). Some of the tables described below do not contain data on 258 subjects because the questions were not available in the different versions of the interview and are so noted. The interview obtained demographic, injury circumstances, injury specific data, employment, insurance, health related, and compensation information.

Table 34 Trauma Registry Identification of Work-Related Injury Compared with Subjects Interviewed

	Work-Related (2001-2004) (N=1,285)		Interviewed (2004-2007) (N=250)*	
	n	%	n	%
Male	1,184	92.1	230	89.1
Admitted from scene	1,154	89.8	195	78.3
Age (years)				
0-9	0	0.0	0	0.0
10-15	1	0.1	0	0.0
16-24	199	15.5	31	12.0
25-34	366	28.5	62	24.0
35-44	361	28.1	70	27.1
45-54	245	19.1	55	21.3
55-64	89	6.9	35	13.6
65-74	20	1.6	5	1.9
75-84	4	0.3	0	0.0
85-94	0	0.0	0	0.0
95+	0	0.0	0	0.0
ISS				
1-8	745	64.1	92	37.9
9-15	239	20.5	99	40.7
16-25	129	11.1	39	16.1
26-75	50	4.3	13	5.3
Mechanism of injury				
Falls	454	35.3	106	41.1
Motor vehicle/Pedestrian	298	23.2	74	28.7
Struck by Object	203	15.8	25	9.7
Cut/Pierce	30	2.3	9	3.5
Firearm	15	1.2	2	0.8
Other/Unknown	285	22.2	42	16.3

Table 35 Number Interviewed by Interview Version		
Interview Version	**N**	**%**
One	20	7.7
Two	17	6.6
Three	11	4.3
Four	19	7.4
Five	191	74.0

The demographic characteristics can be found in Table 36. Nearly 75% of the subjects were between the ages of 20 and 49. Males comprised 89% of the respondents interviewed; 72.5% were white. Over one-half (53.5%) of the respondents reported being married or living as married. Greater than high school education was reported in 46.1% of the cases.

Table 36 Inpatient Interview Demographics		
Age	**N**	**%**
under 20	5	1.9
20 - 29	58	22.5
30 - 39	66	25.6
40 - 49	68	26.4
50 - 59	42	16.3
60 - 69	19	7.4
Sex		
Male	230	89.1
Female	28	10.9
Race		
White	187	72.5
Black or African American	44	17.1
Other	24	9.3
Refused	3	1.2
Marital Status		
Married / Living as Married	138	53.5
Widowed/Divorced/Separated	42	16.3
Never Married	76	29.5
Refused	2	0.8
Education		
< High School	46	17.8
High School / GED	91	35.3
> High School	119	46.1
Refused	2	0.8

The only variable that we can directly compare between the interviewed and screened but not enrolled groups is age, based on the admission report (Table 37). Those who were not enrolled were significantly younger, by 2.6 years, as compared to those who were enrolled and interviewed

Table 37 Age Comparison Enrolled vs. Not Enrolled		
	N	Age (in years)
Enrolled and Interviewed	254	40.1
Not Enrolled	1198	37.5
	p= 0.0020	

Injury circumstances are described in Table 38. Falls occurred 41% of the time followed by transportation related injuries (28.7%). Nearly one-third of the injuries occurred in an industrial setting. Over 75% of the subjects reported being the only one injured and two-thirds (66.7%) reported not being alone when the injury occurred. The direct action of someone else contributing to the injury was reported 26.1% of the time.

Table 38 Injury Circumstances for Interviewed Subjects		
Mechanism Of Injury	**N**	**%**
Fall	106	41.1
Transportation	74	28.7
Crush	30	11.6
Struck/hit by object/person	25	9.7
Stab or cut (Cut/pierce), Unintentional	9	3.5
Animal or insect	8	3.1
Electrocution	3	1.2
Gun shot (Firearm), Intentional	2	0.8
Other	1	0.4
Place Of Occurence		
Industrial place/premises	82	31.8
Street / Highway	70	27.1
House	37	14.3
Public building	33	12.8
Farm	16	6.2
Place for Recreation and Sport	4	1.5
Residential Institution	2	0.8
Other specified place	12	4.7
Refused	2	0.8
Other People Injured		
Yes	37	14.3
No	201	77.9
Don't Know / Refused (n=2)	20	7.8
Alone When Injury Occurred		
Yes	80	31.0
No	172	66.7
Don't Know / Refused (n=3)	6	3.3
Direct Action Of Someone Contribute To Injury		
Yes	67	26.0
No	175	67.8
Don't Know / Refused (n=2)	16	6.2

Employment Details

Employment and Industry and Occupation information can be found in Tables 39 and 40 respectively. Nearly 9 out of 10 respondents were working at their main or only job at the time of injury. Seventy-five

percent were employed in the private sector and only 13% reported being a union member. Industry and Occupation were coded using the North American Industry Classification System (NAICS) and Standard Occupational Classification System (SOC) respectively. For purposes of this analysis we used the two digit categorization for both NAICS and SOC. Construction ranked first for both industry and occupation.

Table 39 Employment Information for Interviewed Subjects

Job Where Injury Occurred	**N**	**%**
Main/Only Job	198	89.6
Other Job	10	4.5
Don't Know	1	0.5
Refused	12	5.4
Type Of Employer		
Private Sector	194	75.2
Federal Government	6	2.3
State Government	2	0.8
Local Government	24	9.3
Own Business	27	10.5
Work W/O Pay For Family	1	0.4
Volunteer	2	0.8
Refused	2	0.8
Union Membership		
Yes	34	13.2
No	165	64.0
Don't Know	5	1.9
Refused	54	20.9

Table 40 Employment By Industry And Occupation for Interviewed Subjects		
NAICS - North American Industry Classification System	**N**	**%**
Construction	93	36.1
Transportation And Warehousing	38	14.7
Administrative/Support/Waste Management/Remediation Services	25	9.7
Public Administration	23	8.9
Agriculture, Forestry, Fishing, Hunting	12	4.7
Retail Trade	12	4.7
Wholesale Trade	11	4.3
Manufacturing	8	3.1
Other Services	8	3.1
Arts, Entertainment And Recreation	7	2.7
Accommodation And Food Services	6	2.3
Professional, Scientific And Technical Services	3	1.2
Utilities	2	0.8
Educational Services	2	0.8
Health Care And Social Assistance	2	0.8
Information	2	0.8
Finance And Insurance	1	0.4
Real Estate/Rental/Leasing	1	0.4
Not Coded	2	0.8
SOC– Standard Occupational Classification System		
Construction & Extraction	70	27.1
Transportation & Material Moving	51	19.8
Installation, Maintenance & Repair	29	11.2
Protective Service	24	9.3
Management	18	7.0
Building & Grounds Cleaning & Maintenance	15	5.8
Office & Administrative Support	13	5.0
Sales And Related	10	3.9
Personal Care & Service	6	2.3
Production	6	2.3
Food Preparation And Serving Related	4	1.6
Architecture And Engineering	3	1.2
Arts, Design, Entertainment, Sports, Media	2	0.8
Healthcare Practitioners & Technical	2	0.8
Healthcare Support	1	0.4
Computer And Mathematical	1	0.4
Military Specific Occupations	1	0.4
Not Coded	2	0.8

Nearly 70% of the respondents reported having some type of health insurance coverage and 87% of those indicated that it was a private plan provided by an employer (Table 41). (Note: If a respondent reported having insurance through his/her spouse's insurance at work then we coded type of insurance accordingly.) The majority reported that health insurance was available through their employer.

Table 41 Insurance Information for Interviewed Subjects		
Covered By Insurance (N=236)	**N**	**%**
Yes	163	69.1
No	60	25.4
Don't Know	4	1.7
Refused	9	3.8
Type Of Insurance		
Private Plan From Employer	142	87.1
Private Plan Purchased Directly	9	5.5
Private Plan Through State Or Local Gov.t	2	1.2
Medicare	1	0.6
Military Health Care Or VA	2	1.2
Other Government Program	1	0.6
Other	3	1.8
Refused	3	1.8
Insurance Offered By Employer		
Yes	153	64.8
No	62	26.3
Don't Know	11	4.7
Refused	10	4.2

Table 42 is a summary of compensation related questions. Being an hourly employee was reported by 61.6% of the participants. Only 37% reported any type of sick leave benefit offered by the employer. Over one-third did not know if they would be able to receive any disability income through their employer. Nearly two-thirds (63.4%) believed that a workers' compensation claim would be filed on their behalf.

Table 42 Compensation Information		
Paid Hourly (N=258)	**N**	**%**
Yes	159	61.6
No	88	34.1
Don't Know	5	1.9
Refused	6	2.3
Paid Sick Leave (N=258)		
Yes	96	37.2
No	139	53.9
Don't Know	17	6.6
Refused	6	2.3
Receive Disability From Employer (N=221)		
Yes	90	40.7
No	38	17.2
Don't Know	81	36.7
Refused	12	5.4

Supplementary Data Sources

Maryland Workers' Compensation Commission Summary

The subjects interviewed (n=258) at the STC provided the population for which Workers' Compensation claim forms were reviewed. In the process of requesting cases we inadvertently did not submit 2 cases. As a result we only submitted 256 cases to check WC claims. Maryland Workers' Compensation's "First Report of Injury" reports were requested for the cases interviewed at the STC. This database tracks all claims of Workers' Compensation injuries and codes according to industry, occupation, injured body part, and nature and cause of injury. Also included are the specific activities in which the employee was engaged at the time of injury and the equipment, the work process, and the materials involved. The search for compensation records was delayed for at least a month or two post-injury, allowing for the claim to be processed. The database, which is public information, was accessed on-line, at the Maryland Workers' Compensation Commission Office, by an NSC staff member, using study subjects' Social Security number. Each name and injury date was verified to insure the claim associated with the STC admission was captured. We requested and received hard copies of the First Report of Injury. An NSC staff member coded the occupation, according to the Standard Occupation Classification System and North American Industry Classification System. It was decided to collect some prior claim data after searching the WCC database and finding that several study participants had prior claims. These data along with the SOC and other data points from the 'First Report of Injury' were entered into a database for analysis. (See Appendix H for data elements)

An important part of this study was to determine the proportion of the cases identified from the interviews that were recorded by the Workers' Compensation Commission. WCC data was obtained on 256 of the 258 interviews. We found that 136 (53.1%) had a current claim on file. Ninety-three (36.3%) of participants only had a current claim with no prior claims. Forty-three (16.8%) of the subjects had a current claim and one or more prior claims. Fifteen (5.9%) had a prior claim but no current claim and 105 (41.0%) of the study subjects had no registered claims.

A Summary of Workers' Compensation Claim Status may be found in Tables 43a and b. Using the question on the interview 'Do you plan/expect to have a workers' compensation claim submitted on your behalf', it was determined that 62.3% who indicated yes actually had a report filed. Of those indicating no, 23.7% had a reported claim. Of those reporting that they did not know if a claim was going to be filed, 45.7% had a claim identified and 50.0% of those not answering the question had a claim filed. More claims were filed in the younger age groups as compared to the older groups. A comparison of Industry and Occupation versus Workers' Compensation Claims was also conducted. Construction was the SIC (industry) and SOC (occupation) with the highest number of injured workers interviewed; however only 53.8% and 52.6%, respectively had claims on file.

Table 43a Comparison of Injured Persons Expectation of Filing a Workers' Compensation Claim vs Actual Claim Status N=256*

		Yes		No	
Will a Workers' Compensation Claim be Submitted	**Total**	**N**	**%**	**N**	**%**
Yes	162	101	62.3	61	37.7
No	38	9	23.7	29	76.3
Don't know	46	21	45.7	25	54.3
Refused	10	5	50.0	5	50.0

* 2 cases were not submitted to WC for claim status

Table 43b Workers' Compensation Claim Status for Interviewed Subjects
N=256

Plan or Expect Workers' Compensation Claim to be filed	N	%
Yes	162	62.3
No	38	23.7
Don't know	46	45.7
Refused	10	50.0
Age Group		
16-24	31	67.7
25-34	61	62.3
35-44	70	54.3
45-54	54	40.7
55-64	35	45.7
65-74	5	20.0
Industry Classification (NAICS)		
Agriculture, Forestry, Fishing, Hunting	12	16.7
Utilities	2	100.00
Construction	93	53.8
Manufacturing	8	75.0
Wholesale Trade	11	54.6
Retail Trade	12	58.3
Transportation and Warehousing	37	32.4
Information	2	100.0
Finance and Insurance	1	100.0
Real Estate/Rental/Leasing	1	100.0
Professional, Scientific and Technical Services	3	33.3
Administrative/Support/Waste Management/Remediation Service	25	56.0
Educational Services	2	100.0
Health Care and Social Assistance	2	100.0
Arts, Entertainment and Recreation	7	42.9
Accommodation and Food Services	6	66.7
Other Services	8	37.5
Public Administration	22	77.3
Not Coded	2	50.0
Occupational Classification (SOC)		
Management	18	22.2
Computer and Mathematical	1	100. 0
Architecture and Engineering	3	0.0
Arts, Design, Entertainment, Sports, Media	2	100.0
Healthcare Practitioners & Technical	2	100.0
Healthcare Support	1	100. 0
Protective Service	23	82.6
Food Preparation and Serving Related	4	50.0
Building & Grounds Cleaning & Maintenance	15	40.0
Personal Care & Service	6	16.7
Sales and Related	10	40.0
Office & Administrative Support	13	38.5
Construction & Extraction	70	52.6
Installation, Maintenance & Repair	29	69.0
Production	6	83.3
Transportation & Material Moving	50	50.0
Military Specific Occupations	1	0.0
Not Coded	2	100. 0

* 2 cases were not submitted to WC for claim status

Maryland Occupational Safety and Health (MOSH) Summary

MOSH is limited with respect to the number of nonfatal cases it can investigate each year. The agency currently investigates all fatalities and serious occupational injuries that come to its attention, either from the media, the medical examiner, or other sources. A list of injury dates for STC patients enrolled and interviewed was provided to MOSH. In order to maintain HIPAA compliance, information beyond date of injury could not be provided to the MOSH staff. This difficulty was not initially realized, as the grant was written before HIPAA was enacted. MOSH staff retrieved files for all cases matching the dates on the list provided. NSC staff members traveled to the MOSH office to review the hard-copy files. Cases which matched interviewed study subjects were then abstracted for employer name, industry, occupation and any citations or violations as a result of the MOSH investigation. After file abstraction, industry and occupation coding was completed by an NSC staff member as per chart review procedures and data were entered in an Access database.

Not surprisingly, MOSH only investigated 23 (8.9%) of the 258 subjects interviewed. Sixteen (69.6%) of the companies investigated were issued at least one serious violation, as declared in the MOSH summary. The sixteen companies cited received a total of 72 serious violations. Two companies received greater than 10 violations. Upon review of the violation cited, there was no violation the occurred at a much higher frequency; therefore, further investigation of violations may be warranted.

Clipping Service Summary

Capital Clipping Service, a Burrelle Affiliate, provided press clippings from daily and weekly newspapers, magazines, trade journals and Internet eClips covering the State of Maryland from February 13, 2003 through June 2007. Specific sources included the Baltimore Sun, Washington Post and Washington Times, Gazette newspapers, and other local media including television news. The clipping service scanned these sources for references about job-related deaths and injuries occurring within the State of Maryland using the following key words: Accidents in connection with: Automobile, Buildings, Construction, Heavy machinery, Motor vehicles, Tractor Trailers, Trucks, Employees, Job-related, Work-related, Workplace, and companies.

Clippings were received weekly. The clippings were grouped together by the incident and kept in binders. Each incident was given a reference number followed by an alphabetic suffix for each clipping received. The articles were entered into a database whereby STC admissions, deaths, MOSH investigations, and mechanism of injury and a brief description of incident were captured. In addition, a person -specific database was created for the 2003 and 2004 clippings involving STC admissions in order to be linked to the Maryland Trauma Registry Data. The clippings were linked to the STC interview data for 2004 through March 2007. In addition, articles that were not work-related, occurred outside of Maryland, or were outside the study window were received but not coded.

Altogether we received clippings for 537 different incidents. The results are described in Table 44. These data include 48 events with MOSH involvement and 87 occurrences with STC admissions. There were 257 episodes where at least one death occurred; however, the death may not have been a worker (i.e, tractor trailer hitting a passenger vehicle and three people in the passenger vehicle expired). Between 2003 and 2004 the clippings revealed 24 incidents whereby the clipping indicated that at least one person was admitted to the STC. These 24 incidents were linked with the Maryland Trauma Registry using date, name gender, age, county of injury and mechanism of injury. Fourteen of the twenty-four incidents (58%) were matched to trauma registry files. This rate may be low because the information provided in the clipping was not specific enough to make a clear determination of a match. Eighty work-related events mentioning an admission to the STC were documented by the clipping service for 2004 through March 2007, the time period the STC interviews were conducted. Seven people in 6 work-related occurrences were matched to STC interviews for a total of 7.5% match rate. There are several reasons the match rate may be low: 1) the injured party taken to the STC may not have been an injured worker and 2) those events described in the clipping may have resulted in a severely injured person who was unable to be

interviewed and 3) the person mentioned in the clipping may not have been recruited. One-quarter of the clippings, during the interview aspect of the study, involved at least one death. Many times it was the injured worker who died. There were only 80 clippings for the 1,492 people identified as being admitted to the STC for a work-related injury from January 2004 through March 2007. This suggests that the newspaper clipping is not very efficient at picking up WR cases admitted to Shock Trauma.

Table 44 Incident Specific Clipping Service Summary N=537

General Information	N
Admitted To STC	87
Mosh Investigation	48
Deaths Occurred	257
Injury Mechanisms	
Transportation	290
Gun Shot	47
Pedestrians Struck	40
Fall	32
Crush	31
Fire	30
Struck By Object	29
Other Transportation	27
Stabbed Or Cut	17
Electrocution	13
Explosion	8
Struck By Person	5
Involving An Animal	3
Drowning	3
Choking	2
Poisoning	1
Conveyor	1
Unknown	7

AIM 4: *To determine the strengths and weaknesses of available data sources for identifying work-related injuries for 2004, the only year which both passive and active surveillance data were available. We had originally planned to use 2003 but because of delays in grant funding this had to be delayed to 2004. We used the following methods:*

a. *Review of medical records for a sample of sentinel injuries in patients admitted to trauma centers statewide to identify work-related injures. (all cases indicated as WR and a 5% sample of non-WR cases)*

b. *Validation of statewide surveillance data against trauma registry data confirmed by the nurses participating in the study. In addition for STC only, validation of surveillance data with the interviews of trauma center patients.*

c. *Comparison of reporting in different databases for the cases we determined were work-related.*

d. *Determination of the magnitude of the underreporting of such injuries, especially motor-vehicle-related injuries.*

Validation using hospital records

The surveillance data for sentinel injuries was validated using 2004 trauma center data, the only year for which both passive (i.e., linked data) and active (STC interviews) surveillance data were available. The same methodology was used for this validation as is described in AIM 2.

Chart Abstraction – Trauma Centers

Trauma Centers:
Each of the nine trauma centers in Maryland was approached. IRB approval and chart reviews were completed at eight of the hospitals. We were not able to get IRB approval in time for data abstraction from one of the trauma centers despite repeated attempts to get this (See section on Institutional Review Boards for more details).

Chart Abstraction procedure
Chart review groupings were based on *sentinel injuries* and grouped as work-related and non-worked as indicated in the Trauma Registry. *The chart abstraction procedure was the same as described in Aim 2 except* Charts to be reviewed were generated from the linked data from each of the nine adult trauma centers in Maryland according to the following criteria: a) work-related (all) and non-work related (5% sample).

As described in Aim 2, chart abstraction was completed by NSC and DHMH staff for the years 2001, 2002 and 2004. A copy of the data collection tool is included in the Appendix J. Reviewers were trained to code work-status according to the following criteria:

1).work related
2) not work related
3) chart reviewed but could not determine work-relatedness (unclear)
4) chart found but no information available
5) chart not found

False-Negative Rate. Cases that 1) were identified as *not work related* in the 2004 linked database for the nine trauma centers and 2) involved any of the above-defined sentinel injuries served as the population for this component of the validation effort. Using medical record numbers, a 5% sample of charts were identified at each of the trauma centers for review. Charts were then reviewed in order to determine whether the injury was, in actuality, *work related* (yes/no/possible). As discussed earlier, there is considerable information in the chart on injury circumstances, including information to determine work relatedness. If there was an indication in the chart that the injury was work related, then the event was defined as a false negative. From the linked database, we were able to determine the total number of non-work-related injuries in each of the sampled hospitals. For each institution, the false-negative rate was calculated by dividing the number of *falsely negative non-work-related injuries in the sampled hospital(s)* (found by chart review) by *the total number of non-work-related injuries in the sampled hospital(s)* (indicated in the linked database).

False-Positive Rate. The procedure for estimating the false-positive rate of work-related injuries for the sentinel injuries was similar to that used to estimate the false-negative rate. Cases that 1) were identified as *work related* in the linked database and 2) resulted from any of the above-defined sentinel injuries served as the population for this component of the validation effort. All work-related inpatient cases were studied. Chart reviews were then conducted to determine whether the injury was actually *not work related* (yes/no/possible). If there was an indication in the chart that the injury was not work related, then the event was defined as a false positive. From the linked database, we were able to estimate the total number of work-related injuries for the sentinel injuries studied in each of the trauma centers. The false-positive rate was calculated by dividing *the number of falsely positive work-related injuries in the sampled hospital(s) (*found by chart review) by *the total number of work-related injuries in the trauma centers* (indicated in the linked database).

False-Negatives

Medical records were located for 129 (96.3%) of the 134 sampled trauma center patients who were indicated by the linked data in 2004 to have suffered *non-work-related* sentinel injuries. Record review of the 129 cases indicated that 14 (10.9%) of these individuals had actually sustained *work-related* injuries (Table 45). This proportion was very similar to the 10.8% false negative rate indicated in the community hospital chart review. There was considerable variation by hospital, as there were no false negatives in 2 hospitals, although none of the eight trauma centers from which records were sampled had a proportion higher than 28.6%. More detail on how we rated the charts obtained from each trauma center for work-relatedness is displayed in Table 46. In 6.2% of the cases it was not clear if the injury was work-related or not. Some of these could well be work-related if more information were available.

If we apply the 10.9% proportion of false negative cases calculated by chart review for sentinel injuries to the total number of sentinel cases indicated in the trauma registry to be *non-work-related* for 2004 (n=2,549), we would expect approximately 278 *more work-related cases* which were erroneously coded as non-work-related to have been provided trauma care in a 1-year period.

Table 45 Falsely Negative Non-Work Related Injury Rate in Trauma Centers
5% Sample Non-Work Related Sentinel Injuries in 2004

Hospital Number	Number of Non-work Related Chart Reviews	Number of Cases Indicated to be Work-related	False Negative Percent
A	24	2	8.3
B	38	4	10.5
E	14	4	28.6
F	13	0	0.0
G	4	1	25.0
H	15	2	13.3
I	10	0	0.0
J	11	1	9.1
Total	**129**	**14**	**10.9**

Table 46 Chart Review for Trauma Center Patients with Sentinel Injuries that were Not Work-related in the Linked Data, 5% sample 2004 Trauma Center Data (N=129)

	Chart Review Determination				
Hospital	Work-related	Not Work-related	Not Clear	No information in chart	Hospital Total
A	2 (8.3)	19 (79.2)	1 (4.2)	2 (8.3)	24 (100.0)
B	4 (10.5)	33 (86.8)	1 (2.7)	0 (0.0)	38 (100.0)
E	4 (28.6)	6 (42.9)	1 (7.1)	3 (21.4)	14 (100.0)
F	0 (0.0)	10 (76.9)	2 (15.4)	1 (7.7)	13 (100.0)
H	1 (25.0)	2 (50.0)	1 (25.0)	0 (0.0)	4 (100.0)
I	2 (13.3)	9 (60.0)	1 (6.7)	3 (20.0)	15 (100.0)
J	0 (0.0)	8 (80.0)	0 (0.0)	2 (20.0)	10 (100.0)
K	1 (9.1)	8 (72.7)	1 (9.1)	1 (9.1)	11 (100.0)
All Hospitals	14 (10.9)	95 (73.6)	8 (6.2)	12 (9.3)	129 (100.0)

False-Positives

The false positive rate was ascertained by examining *all* trauma center patients who were indicated by the linked data in 2004 to have suffered *work-related* sentinel injuries. Of the 730 cases that were sampled from the linked data, we found charts for 718 (98.4%). This analysis was not limited to just a sample of work-related sentinel injuries, as we took all sentinel cases because of the relatively small number of such injuries that were documented as having occurred on the job. Record review (Table 47) indicated that 171 (23.8%) of the 718 individuals did not have evidence in their chart to determine if the injury was work-related, a proportion that was much higher than the 14.7% false positive rate indicated in the community hospital chart review and more than twice the 10.9% false negative rate calculated for trauma center patients. The trauma center false positive rate varied somewhat among the eight trauma centers, ranging between 11.1% and 43.5%.

Table 47 Falsely Positive Work-related Injury Rate in Trauma Centers
All Work-related Sentinel Injuries in 2004

Hospital Number	Number of Work-related Chart Reviews	Number of Cases Indicated to be Non-work related	False Positive Percent
A	42	15	35.7
B	364	64	17.6
E	103	38	36.9
F	23	10	43.5
G	33	10	30.3
H	63	7	11.1
I	19	6	31.6
J	71	21	29.6
Total	**718**	**171**	**23.8**

In an effort to better explain factors responsible for the high false positive rate using linked data for trauma patients, we examined in more detail the results of our trauma center chart abstraction for those patients selected with work-related sentinel injuries. As listed in the column headings of Table 48, 100 of the 718 charts (13.9%) gave no evidence of the injury being work-related, a finding that was more than twice the proportion found in the hospital and ED chart review reported earlier. For another 28 cases (3.9%) there was insufficient information in the chart to be able to judge whether or not the injury could have been work-related. If we only consider false positive cases to be those instances where the chart had enough information to determine if the injury was not work-related (n = 100) then the false positive rate would be reduced to 100/718 or 13.9%, or to 100/647 (15.5%) if we disregard all charts with vague or insufficient information from the calculation.

The left column of Table 48 indicates the linked data source identifying cases as work-related. For instance, of the 459 cases where the trauma registry indicated that the injury was work-related, 420 (91.5%) were confirmed as work-related in the chart and another 14 (3.1%) were possibly work-related. There were also 14 records (3.1%) that clearly had information in the chart suggesting the case was not work-related. However, as shown in Table 48, the 420 cases represent 76.8% of all 547 cases confirmed by the medical chart to have occurred at work. In addition, 389 of the 547 confirmed work-related cases (71.1%) were identified by inpatient payor source. On the other hand, cases identified in the EMS report as involving a fall from at least 15 feet made up 64% of the 100 instances where the chart indicated the injury was not work-related and 32.1% of the 28 instances where insufficient information was available in the chart to give any indication of work-relatedness. This suggests that the EMS variable 'fall from height' may over-represent work-relatedness. In fact, of all of the 135 cases identified by EMS as falls from height, only 47 (38.4%) could be confirmed as definitely work-related. However, if we exclude the 64 cases identified by the EMS 'fall from height' variable from the false positives, then only 107 of the 718 trauma cases (14.9%) would be false positives (or 36/647 {5.6%} if we disregard all charts with vague or insufficient information).

Table 48 Comparison of Work-relatedness Determined by Chart Review With Cases Identified as Work-related by Each Data Source Among Patients with Sentinel Injuries that were Work-related in Linked Data 2004 Trauma Center Data (N = 718)

	Total	Chart Review Determination							
	Reviewed (N = 718)	Work-related (N = 547)		Not Work-related (N = 100)		Not Clear (N = 28)		No Information in Chart (N = 43)	
		n	%	n	%	n	%	n	%
Trauma Center Data									
Work-related	459	420	76.8*	14	14.0	14	50.0	11	25.6
Inpatient Data									
Workers' Compensation	420	389	71.1	8	8.0	12	42.9	11	25.6
Industrial	108	100	18.3	3	3.0	4	14.3	1	2.3
Farm	2	0	0.0	1	1.0	0	0.0	1	2.3
Mine	0	0	0.0	0	0.0	0	0.0	0	0.0
EMS Data									
Fall from 15 feet	135	47	8.6	64	64.0	9	32.1	15	34.9
Industrial	60	54	9.9	4	4.0	1	3.6	1	2.3
Farm	12	2	0.4	10	10.0	0	0.0	0	0.0
Police Reports									
Commercial Driver	154	117	21.4	13	13.0	6	21.4	18	41.9

* 76.8% = proportion of all work-related injuries confirmed by chart review that were identified by Trauma Registry as work-related

If we apply the 23.8% proportion of false positive cases calculated by chart review for sentinel injuries to the total number of sentinel cases indicated in the trauma registry to be *work-related* for 2004 (n=699), we would expect approximately 166 *fewer work-related cases* to have been provided trauma care over 1 year.

In summary, by extrapolating our findings to the 2004 linked data, the chart review exercise would potentially yield 278 more work-related sentinel injury cases by analysis of false negatives and 166 fewer work-related sentinel injury cases by analysis of false positives, yielding a total of 112 more work-related cases. However, the 2004 linked trauma registry data only indicated that 1,015 had occurred on the job. Thus, the addition of 112 work-related sentinel injury cases represents an 11% potential increase to the number of trauma center admitted individuals whose injury had occurred at work.

2004 Interviewed Subjects Validation of Work-Relatedness

For 2004, the only year for which we had interviews and linked data, we attempted to match the interviewed cases with the linked database of all injuries. Of the 91 subjects who were interviewed in 2004, 88 were matched to the linked data. There are various reasons the remaining 3 could not be linked. 1) The medical record number may have been updated from the time we recorded it until the data was submitted to HSCRC and the MTR. 2) The person may have been discharged crossing over either

calendar or fiscal years and therefore we did not have the records available for matching. 3) The interview data and tracking data does not contain date of birth so there may have been several admissions on a given day and it could not be said with certainty a valid match was found. Of the 88 that were matched, Table 49 contains a summary of the findings. All cases of commercial drivers in the police data were identified as WR. All cases interviewed were by definition work-related but 16 were not identified as being work-related in any the 6 sources. Overall 30 were found in 1 data source as being work-related, 36 were found in 2 data sources as being work-related, and 6 were found in 3 data sources as being work-related (Table 49b).

Table 49 Validation of Work-Relatedness for Interviewed Subjects

Data source	# linked	# work-related	% work-related
Police (MAARS)	6	6	100
ED (ACD)	9	6	66.7
Hospital (HDD)	81	59	72.8
Trauma Registry (MTR)	81	42	51.9
Death Certificate	0	0	0
Ambulance (MAIS)	7	7	100

A grand total of 72 of 88 or 81.8% were found to be work-related in at least one data source. The HDD had the highest percentage of agreement (72.8%). Only 52% of the work injury cases interviewed were indicated as work-related in the trauma registry.

Table 49b Summary of Data Source Agreement

	Source	Frequency	Percent
NWR	None	16	18.2
1 Data Source	MAARS	1	1.1
	HDD	21	23.9
	MTR	8	9.0
2 Data Sources	MAARS/HDD	2	2.3
	ACD/HDD	4	4.5
	MAARS/MTR	2	2.3
	HDD/MTR	24	27.3
	HDD/MAIS	2	2.3
	MTR/MAIS	2	2.3
3 Data Sources	MAARS/HD/MTR	1	1.1
	ACD/HDD/MTR	2	2.3
	HDD/MTR/MAIS	3	3.4
Total		88	100.0

Underreporting

The issue of under-reporting has been discussed in a number of sections of this report. One particular area we identified early in our proposal was the reporting of motor vehicle injuries. As expected, identification of work-related injuries due to motor vehicle crashes by the standard work-related variables was relatively low. Using police reported data on drivers of commercial vehicles as the "gold" standard. Table 19 showed that 52% and 65% of the ED and inpatient data, respectively, gave an indication that the injury was work-related. For the trauma registry, there was only a 49% agreement. For death certificates, however, 89% were identified as work-related. In the linkage with the patients interviewed in 2004, 6 cases linked with the police (MARS) records and these were commercial drivers.

AIM 5: *To use knowledge resulting from this surveillance to make recommendations for a long-term, sustainable surveillance system for occupational injuries*

We sought to develop a system that is cost-effective and makes the most efficient use of available data sources. Where necessary, recommendations have also been made to improve the value of existing data sources to capture occupational injuries.

The goal of this research was to develop a model for comprehensive statewide surveillance of severe occupational injuries (defined as deaths, hospitalizations, or emergency department visits) at the state level that involves linking different databases. To our knowledge, this is the first state to attempt such an endeavor. Our study demonstrates that it is possible to successfully link together a disparate group of databases, and create an incident specific database to conduct surveillance of serious occupational injuries. These data included emergency department and hospital discharge records, trauma registry records, ambulance run sheets, police crash reports, death certificates and medical examiners' autopsy reports. An indication of work-relatedness in any of these linked datasets was chosen to define an occupational injury case.

Among the 9,847 cases of work-related hospitalizations only 77.1% were identified by expected payor type as Workers' Compensation which is the variable primarily recommended for use in identifying occupational injuries. A further 6% were identified as having an "industrial" place of occurrence. Only 56 additional cases were identified with farm as the place of occurrence. Falls from 15 or more feet, identified from the EMS data, brought in an additional 5.1% of the cases. Finally, linkage with the trauma registry added an additional 6% of cases, representing the most severe of the injuries requiring hospitalization. Further examination of the falls reported by EMS seems to indicate that it may not be specific enough to indicate work-related injuries, especially in the extremes of age.

For the purposes of this study we included not only Workers' Compensation as expected payor source as part of our work-related definition but also the place codes of "industrial", "mine" and "farm". While this is only a place of injury in the E-code, we included them because it is likely that many of these are work-related. The addition of these 3 place of occurrence codes likely to indicate work-relatedness is likely to overestimate the work-relatedness of that subset of injuries as not all of those occurring in a likely workplace are necessarily work-related injuries. Place of occurrence was missing for 83% of ED records and 74% of hospital data. More analyses are planned of our case abstractions to determine how well using only place codes agrees with our chart review. However, the proportion of injuries occurring in industrial, mine and farm settings is likely to be small. A 2006 study in British Columbia also included these place codes as indicators of work-relatedness. (Alamgir et al 2006).

Of the non-work-related sentinel injury ED charts reviewed in community hospitals, 15.6% of cases had evidence in the chart that they were actually work-related (false negatives), as did 4.3% of inpatient charts. Applying the findings to the 312,541 non work-sentinel hospitalizations would increase the total work injury ED count by 48,752 (from 163,739 to 212,491 or 29.8% increase) and hospitalizations by 530 (from 9,847 to 10,377 or 5.4%). Unfortunately we do not have chart review data on all injuries but clearly even our method of data linkage undercounts work injuries considerably. It would require abstraction of a much larger sample of charts if we were to estimate underreporting for the non-sentinel injuries which have a much lower likelihood of being work-related. We did not have resources in this grant to do such a task.

We were surprised that we were not able to get 100% linkage of the work-related deaths we identified from the linked data with the files we were given from the Medical Examiner's office (OCME). It appears there is a problem with being able to select all work-related cases from their computer. We are working with the OCME to determine what the problem is. In theory, the OCME should have all cases noted as WR as the medical examiners are the ones who complete the death certificate for injury deaths, including checking the "injury at work" box. We plan to conduct further work to improve the identification of cases in the ME office. One potential issue could be with regard to the identification of cases not investigated by the Central OCME office in Baltimore but by the deputy ME's in each country.

A major weakness of most of the databases for occupational injury surveillance is the lack of data on industry and occupation. This prevented us from calculating rates at a global level by industry and occupation. The death certificate contains text data on industry and occupation but Maryland has never entered or coded it. Some states do and it would be an important addition to occupational injury and disease surveillance if it were to be included. The major barrier is cost.

The identification of work-related motor vehicle injuries is always difficult. Our study noted that commercial drivers identified by the police reports had relatively incomplete identification of work-relatedness in ED (51.9%) inpatient data (65.3%) and trauma registry data (48.5%) but much better on death certificates (88.9%). We plan to work further with groups in the state to see if we can identify better ways to identify work-related traffic crashes.

The strength of the trauma registry is that it is the only database on non-fatal injuries that specifically asks if the injury was work-related. However despite our efforts to work with the trauma nurse coordinators there still seems to have been underreporting of WR in the trauma registry. It turns out that cases are not entered into the trauma registry or WR determined by trauma nurse coordinators but by the trauma registrars. We are working on means to improve reporting by the trauma registry.

The identification of possible work-related cases to interview at the trauma center was difficult as there is only limited information available to the screener at the hospital to determine work-relatedness. It relied largely on the suspicion of the screener based on reviewing the admission log. Unfortunately, the level of detail on the injury circumstances in the log varies between cases. Since our study was completed, STC has hired research nurses that now provide around the clock coverage of all admissions and review all cases while they are being admitted. Their role is to screen all admissions for eligibility in the many different research studies being done at STC. For future studies, we would propose that these research nurses be used to screen all subjects at the time of admission for the work-relatedness of injuries in addition to their other evaluations. This would provide unique information not available elsewhere. They are in a better position to evaluate work-relatedness as they are part of the admission process where it will be easier to collect potential work-related information. They can also get consent and enroll patients for those cases where a telephone interview is necessary, as the subject may be discharged before the interview can be completed.

To summarize the recommendations made earlier in other parts of the report, here are some of the key points regarding improving surveillance for serious occupational injuries.

- Data linkage greatly improves the ability to identify injuries as potentially work-related.
- Using only the traditional Workers' Compensation as expected payor source only identifies about 77% of work-related injuries.
- The use of the EMS data element "falls over 15ft" may not be useful to identify work-related injuries as it appears it identifies too many false positives for work-relatedness.
- No one database or specific variable within a database identifies all work-related injuries.
- More work is needed to coordinate efforts to evaluate reporting of workplace fatalities including the ability to use the state data from the Census of Fatal Occupational Injuries (CFOI). Unfortunately, BLS confidentiality laws currently prohibit this.
- The addition of an "injury at work" variable on the hospital discharge file and emergency department visit database would be a good first step in improving reporting of work-related injuries.

In the course of this research, we have identified those datasets that provide the most accurate information, and can provide the basis for an ongoing surveillance system. We plan on submitting several abstracts on the study to the upcoming National Occupational Injury Research Symposium 2008 Pittsburgh, Pennsylvania October 21-23, 2008. Manuscripts based on these abstracts are in preparation. In future work we will also explore the possibility of using capture – recapture as a means of improving estimates of work-relatedness.

An important contribution of this grant was the stimulation of interest at the Maryland Department of Health and Mental Hygiene in occupational injuries. For example, they provided us with assistance in abstracting medical records from the hospitals across the state. This occurred even after it became apparent that they were unable to accept funding from us. Most of their previous work had been on community injuries with little or no emphasis on occupational injuries. During the early phases of our study we assisted the State Health Department to develop a grant on occupational health surveillance which was submitted to NIOSH in 2005. Unfortunately, it was not funded, primarily since the main person writing the grant at the State Health Department did not have much occupational health experience. Since then they have hired Dr. Clifford Mitchell who used to direct the occupational medicine residency at Johns Hopkins. We have begun discussions with him to develop a new collaborative proposal building on our joint expertise.

We are also exploring a potential collaboration with the Maryland Injured Workers' Insurance Fund (IWIF) regarding linkage with workers' compensation data. This would greatly expand the information available for prevention and planning. Plans are also underway to collaborate with the State Health Department (DHMH) and Medical Examiners Office (OCME) in an ongoing surveillance effort to improve occupational injury data in Maryland. Armed with the data obtained from our study, we will work with DHMH, MOSH, OCME, and IWIF to identify priority areas for injury prevention. These agencies have a strong commitment to continue working with us on this project and will ultimately develop intervention policies and educational strategies to mitigate injuries in high-risk occupations identified by this research.

AIM 6: *To identify priority areas for injury prevention within the state of Maryland based on groups of workers at high risk of injury*

This process was conducted in collaboration with state injury prevention and occupational health and safety professionals and should serve as a model for the development of such programs in other states.

An important issue for determining priorities for occupational injury interventions is the availability of information on the industry and occupation of the injured worker. This is essential for targeting many interventions. We had hoped to be able to develop injury rates by industry and occupation but this data was not available in any of the databases we used.

One important research question we sought to answer with this study was whether information on industry and occupation data was available in the medical records. In the absence of such information it would be difficult to get this data in the future. In our review of the medical records from the 4 community hospitals (Aim 2) and the trauma centers (Aim 3) we attempted to collect occupation and industry information. In general, employer name was available on most cases, primarily in the admission data, as these are often tied to health insurance. It is possible to use this to look up the specific industry in state employer databases and on the internet. Occupation data were more difficult to obtain and relied on the injury circumstances to determine the activity of the person (e.g. fell from ladder while painting).One difficulty, however, is that the job activities and employer described by the injured worker may not necessarily reflect that recorded officially in the Workers' Compensation files. For example, one case involved a worker driving cars off a ship at the docks in Baltimore. He describes working on the docks, presumably for the Port Authority. However, he was actually a temporary employee hired by a temporary employment agency. Thus his official industry was not shipping but a temporary employment agency.

Based on the information in the chart it was usually possible to code the broad industry category and often the broad occupational group. However it was much more difficult to code specific industries and occupations. An important finding from our interview study, however, was that good information was more likely to be collected if the industry and occupation were specifically requested. Ideally, this could be asked as part of the admission procedure for hospitalizations.

The major injury mechanisms identified among the total work-related population were: fall (20%), cut/pierce (20%), and struck by object (18%). Overexertion accounted for 14%, while 6% were associated with motor vehicle-related incidents and 3% with hot objects or fire. Workers injured in falls or motor vehicle crashes were significantly more likely to be hospitalized. Upper and lower extremity injuries accounted for more than half of all injuries. Findings from this research are being shared with the Maryland Department of Health and Mental Hygiene, Maryland Occupational Safety and Health, as well as the leaders of the state trauma care system and Office of the Chief Medical Examiner. By monitoring trends in occupational injury over time, it will be possible to identify priorities for targeted intervention efforts. We also hope that the knowledge we have gained in this process may be useful to other states who wish to embark on the same undertaking.

Presentations and Publications

Presentations

1. Dischinger P, Auman KM, Ho SM, Kufera JA, Braver ER, Smith GS. A Statewide Surveillance of Occupational Injury. XVIIth World Congress on Safety and Health at Work, Orlando, FL, September 18-22, 2005. (Poster)

2. Dischinger P, Auman KM, Ho SM, Kufera JA, Braver ER, Smith GS. Enhanced Surveillance to Detect Severe Nonfatal Occupational Injuries. NORA Symposium 2006, Washington, DC, April 2006. (Poster) See Appendix N for Abstract

3. Auman KM, Dischinger P, Ho SM, Kufera JA, Braver ER, Smith GS. A Comprehensive Surveillance of Occupational Injury in Maryland. Maryland Trauma Registry, Education and Prevention subcommittee of TraumaNet, Baltimore, MD, March, 2006.

4. Auman KM, Dischinger P, Ho SM, Kufera JA, Braver ER, Smith GS. Occupational Injuries in Maryland. American Trauma Society – Maryland Division Board Meeting. Bowie, MD, September, 2006.

5. Dischinger P, Smith GS, Ho SM, Auman KM, Kufera JA, Braver ER. Statewide Surveillance of Occupational Injury Hospitalizations in Maryland. Abstract accepted: 9th World Conference on Injury Prevention and Safety Promotion Mérida, Yucatán, México March 15-18, 2008.

Inclusion of gender and minority subjects

We attach in Appendix O a copy of the PHS – 2590.

Inclusion of Children as Subjects in Clinical Research

In accordance with the "Public Policy Requirements and Objectives – Requirements for Inclusiveness in Research Design – Inclusion of Children as Subjects in Clinical Research" children are defined as individuals under the age of 21 years. In the inpatient interview aspect of this study we included children who were working. The UMB, HRPO approved the protocol to include minors aged 13-17. We had an "Assent form for Adolescents age 13-17" and a parental consent form. We identified 15 and 73 potential subjects between 13-17 and 18-20 years of age respectively. We were unable to consent and interview the younger subjects for various reasons. We enrolled and conducted interviews for 8/73 of the older subjects.

No children under the age of 18 were interviewed for the study. In the available databases we did include children in our analyses but no contact was made with them. While work injuries are uncommon under age 16, they do occur and where relevant we have included information on them. Injuries to teens are gaining increasing recognition but it is even more difficult to accurately ascertain which ones are work-related.

APPENDICES

A. ED Data fields Maryland

B. Inpatient Data fields Maryland

C. Map of 9 designated adult trauma centers

D. Case Inclusion Criteria Maryland Trauma Registry

E. MD Automated Accidents Report System (MAARS)

F. Maryland Ambulance Information System (MAIS) run sheet

G. Death Certificate Sample Maryland

H. Data Elements OCME and Workers' Compensation databases

I. Figure 2 expanded showing effect of excluding EMS fall more than 15ft from criteria for work-relatedness.

J. Chart Review Abstraction Form. Used for community hospital and trauma center data abstraction

K. Enrollment Screening Tool

L. Subject Interview Form (Version 5, 2/3/05)

M. Telephone Interview Form (abbreviated interview)

N. NORA Abstract

0. Inclusion Enrollment Report (PHS 398/2590)

APPENDICES

Appendix A:

ED Data Fields – Maryland

(NEW FORMAT)

04/02/02
(AC-CONF-550.DOC)

CONFIDENTIAL AMBULATORY CARE FILE
(550 CHAR.) EACH RECORD CONTAINS THE FOLLOWING FIELDS:

TYPE 1 RECORDS

ITEM NO	NO.OF BYTES	RECORD POSITION	FIELD NAME	COMMENTS
1	6	0001 - 0006	PROVIDER NUMBER	
2	11	0007 - 0017	MEDICAL RECORD #	
3	20	0018 - 0037	PATIENT ACCT NUMBER	
4	8	0038 - 0045	FROM DATE OF SERVICE	(MMDDCCYY)
5	8	0046 - 0053	THRU DATE OF SERVICE	(MMDDCCYY)
6	1	0054 - 0054	RECORD TYPE	ALWAYS "1"
7	2	0055 - 0056	ENCOUNTER TYPE	01=CLINIC 02=EMERGENCY ROOM 03=LABOR/DELIVERY
8	2	0057 - 0058	FILLER	(NOT USED)
9	8	0059 - 0066	BIRTH DATE	(MMDDCCYY)
10	1	0067 - 0067	SEX	1=MALE 2=FEMALE 9=UNKNOWN
11	1	0068 - 0068	RACE	1=WHITE 2=AFRICAN AMERICAN 3=ASIAN OR PACIFIC ISLANDER 4=AMERICAN INDIAN OR ESKIMO 5=OTHER 9=UNKNOWN
12	1	0069 - 0069	FILLER	(NOT USED)
13	1	0070 - 0070	FILLER	(NOT USED)
14	2	0071 - 0072	COUNTY CODE	01=ALLEGANY 02=ANNE ARUNDEL 03=BALTIMORE 04=CALVERT 05=CAROLINE 06=CARROLL

Came with 2003 data

ITEM NO	NO.OF BYTES	RECORD POSITION	FIELD NAME	COMMENTS
			COUNTY CODE CONTINUED	07=CECIL 08=CHARLES 09=DORCHESTER 10=FREDERICK 11=GARRETT 12=HARFORD 13=HOWARD 14=KENT 15=MONTGOMERY 16=PRINCE GEORGE'S 17=QUEEN ANNE'S 18=ST. MARY'S 19=SOMERSET 20=TALBOT 21=WASHINGTON 22=WICOMICO 23=WORCESTER 29-UNIDENTIFIED MD 30=BALTIMORE CITY (INDEPENDENT CITY) 39=DELAWARE 49=PENNSYLVANIA 59=WEST VIRGINIA 69=VIRGINIA 79=DISTRICT OF COLUMBIA 89=FOREIGN 98=OTHER SATES 99=UNKNOWN
15	5	0073 - 0077	ZIP CODE	XXXXX 77777=NOT APPLICABLE 99999=UNKNOWN
16	2	0078 - 0079	PRINCIPAL HMO PAYER	01=AETNA HEALTH PLAN ATLANTIC 02=CAPITOLCARE 03=CFS HEALTH GROUP 04=CHESAPEAKE HEALTH 05=CIGNA HEALTHCARE MIDATLANTIC INC 06=COLUMBIA MED PLAN 07=DELMARVA HEALTH 08=HUMANA GROUP HEALTH PLAN 09=GWA HEALTH PLAN 10=HEALTHPLUS 11=KAISER PERMANENTE 12=MAMSI 13=TOTAL HEALTH CARE 14=U.S HEALTHCARE

ITEM NO	NO.OF BYTES	RECORD POSITION	FIELD NAME	COMMENTS
			PRINCIPAL HMO PAYER CONTINUED	15=PRUDENTIAL HEALTHCARE PLAN-MD ATLANTIC 16=PRINCIPAL HEALTH CARE INC 17=PREFERRED HEALTH NETWORK OF MD 18=PHYSICIANS HEALTH PLAN INC 19=PRINCIPAL HEALTH\ CARE OF DEL. INC 20=MD PHYSICIAN CARE 21=HELIX FAMILY CARE 22=JAI MEDICAL 23=PRIORITY PARTNERS 24=UNITED HEALTHCARE 25=NEW AMERICAN HEALTH 26=PRIME HEALTH 27=AMERICAID 29=OTHER HMO/MCO/PSO
17	2	0080 - 0081	SECONDARY HMO PAYER	01=AETNA HEALTH PLAN ATLANTIC 02=CAPITOLCARE 03=CFS HEALTH GROUP 04=CHESAPEAKE HEALTH 05=CIGNA HEALTHCARE MIDATLANTIC INC 06=COLUMBIA MED PLAN 07=DELMARVA HEALTH 08=HUMANA GROUP HEALTH PLAN 09=GWA HEALTH PLAN 10=HEALTHPLUS 11=KAISER PERMANENTE 12=MAMSI 13=TOTAL HEALTH CARE 14=U.S HEALTHCARE 15=PRUDENTIAL HEALTHCARE PLAN-MD ATLANTIC 16=PRINCIPAL HEALTH CARE INC 17=PREFERRED HEALTH NETWORK OF MD 18=PHYSICIANS HEALTH PLAN INC 19=PRINCIPAL HEALTH\ CARE OF DEL. INC

ITEM NO	NO.OF BYTES	RECORD POSITION	FIELD NAME	COMMENTS
			SECONDARY HMO PAYER CONTINUED	20=MD PHYSICIAN CARE 21=HELIX FAMILY CARE 22=JAI MEDICAL 23=PRIORITY PARTNERS 24=UNITED HEALTHCARE 25=NEW AMERICAN HEALTH 26=PRIME HEALTH 27=AMERICAID 29=OTHER HMO/MCO/PSO
18	2	0082 - 0083	FILLER	(NOT USED)
19	2	0084 - 0085	PRIMARY PAYER	01=MEDICARE 02=MEDICAID 03=TITLE V 04=BLUE CROSS MD 05=COMMERCIAL INS. 06=OTH.GOVT.PROGRAM 07=WORKER'S COMP. 08=SELF-PAY 09=CHARITY/NO CHARGE 10=OTHER 11=DONOR 12=COMMERCIAL HMO 13=DO NOT USE 14=MEDICAID HMO 15=MEDICARE HMO 16=BLUE CROSS NCA 17=BLUE CROSS OTHER 99=UNKNOWN
20	2	0086 - 0087	SECONDARY PAYOR	01=MEDICARE 02=MEDICAID 03=TITLE V 04=BLUE CROSS MD 05=COMMERCIAL INS. 06=OTH.GOVT.PROGRAM 07=WORKER'S COMP. 08=SELF-PAY 09=CHARITY/NO CHARGE 10=OTHER 11=DONOR 12=COMMERCIAL HMO 13=DO NOT USE 14=MEDICAID HMO 15=MEDICARE HMO 16=BLUE CROSS NCA 17=BLUE CROSS OTHER 77=NOT APPLICABLE 99=UNKNOWN

ITEM NO	NO.OF BYTES	RECORD POSITION	FIELD NAME	COMMENTS
21	6	0088 - 0093	FILLER	(NOT USED)
22	20	0094 - 0113	FILLER	(NOT USED)
23	7	0114 - 0120	PRIMARY DIAGNOSIS	
24	7	0121 - 0127	OTHER DIAGNOSIS 1	
25	7	0128 - 0134	OTHER DIAGNOSIS 2	
26	7	0135 - 0141	OTHER DIAGNOSIS 3	
27	7	0142 - 0148	OTHER DIAGNOSIS 4	
28	7	0149 - 0155	OTHER DIAGNOSIS 5	
29	7	0156 - 0162	OTHER DIAGNOSIS 6	
30	7	0163 - 0169	OTHER DIAGNOSIS 7	
31	7	0170 - 0176	OTHER DIAGNOSIS 8	
32	7	0177 - 0183	OTHER DIAGNOSIS 9	
33	7	0184 - 0190	OTHER DIAGNOSIS 10	
34	7	0191 - 0197	OTHER DIAGNOSIS 11	
35	7	0198 - 0204	OTHER DIAGNOSIS 12	
36	7	0205 - 0211	OTHER DIAGNOSIS 13	
37	7	0212 - 0218	OTHER DIAGNOSIS 14	
38	7	0219 - 0225	OTHER DIAGNOSIS 15	
39	7	0226 - 0232	E-CODE	
40	4	0233 - 0236	RECURRING NO.OF VISITS	
41	7	0237 - 0243	ADMITTING DIAGNOSIS	
42	2	0244 - 0245	CONDITION CODE 1	
43	2	0246 - 0247	CONDITION CODE 2	
44	2	0248 - 0249	CONDITION CODE 3	
45	2	0250 - 0251	CONDITION CODE 4	
46	2	0252 - 0253	CONDITION CODE 5	
47	2	0254 - 0255	OCCURRENCE SPAN CODE	
48	8	0256 - 0263	OCCURRENCE SPAN DATE	(MMDDCCYY)
49	2	0264 - 0265	VALUE CODE	
50	2	0266 - 0267	ACCIDENT HOUR CODE	
51	3	0268 - 0270	BILL TYPE	
52	280	0271 - 0550	FILLER	(NOT USED)

CONFIDENTIAL AMBULATORY CARE FILE
(550 CHAR.) EACH RECORD CONTAINS THE FOLLOWING FIELDS:

TYPE 2 RECORDS

ITEM NO	NO. OF BYTES	RECORD POSITION	FIELD NAME	COMMENTS
1	6	0001 - 0006	PROVIDER NUMBER	
2	11	0007 - 0017	MEDICAL RECORD #	
3	20	0018 - 0037	PATIENT ACCT NUMBER	
4	8	0038 - 0045	FROM DATE OF SERVICE	(MMDDCCYY)
5	8	0046 - 0053	THRU DATE OF SERVICE	(MMDDCCYY)
6	1	0054 - 0054	RECORD TYPE	ALWAYS "2"
7	430	0055 - 0484	PATIENT REVENUE DATA TABLE CONTAINING 10 OCCURENCES OF REVENUE DATA. EACH OCCURRENCE CONTAINS THE FOLLOWING DATA FIELDS. UB92 REVENUE CODE OF 0999 OR 0001 DESIGNATES TOTALS FOR PATIENT NOTE: EACH PATIENT MAY HAVE MULTIPLE TYPE 2 RECORDS PER DISCHARGE	
7.1a	4	0055 - 0058	UB92 REVENUE CODE	
7.1b	7	0059 - 0065	UNITS OF SERVICE	
7.1c	9	0066 - 0074	CHARGES	DOLLARS AND CENTS (NO DECIMAL POINTS)
7.1d	5	0075 - 0079	CPT4 OR HCPCS CODE	
7.1e	2	0080 - 0081	CPT4 MODIFIER #1	
7.1f	2	0082 - 0083	CPT4 MODIFIER #2	
7.1g	2	0084 - 0085	CPT4 MODIFIER #3	
7.1h	2	0086 - 0087	CPT4 MODIFIER #4	
7.1i	2	0088 - 0089	CPT4 MODIFIER #5	
7.1j	8	0090 - 0097	SERVICE DATE	(MMDDCCYY)
8	66	0485 - 0550	FILLER	(NOT USED)

CONFIDENTIAL AMBULATORY CARE FILE
(550 CHAR.) EACH RECORD CONTAINS THE FOLLOWING FIELDS:

TYPE 3 RECORDS

ITEM NO	NO.OF BYTES	RECORD POSITION	FIELD NAME	COMMENTS
1	6	0001 - 0006	PROVIDER NUMBER	
2	11	0007 - 0017	MEDICAL RECORD #	
3	20	0018 - 0037	PATIENT ACCT NUMBER	
4	8	0038 - 0045	FROM DATE OF SERVICE	(MMDDCCYY)
5	8	0046 - 0053	THRU DATE OF SERVICE	(MMDDCCYY)
6	1	0054 - 0054	RECORD TYPE	ALWAYS "3"
7	1	0055 - 0055	FILLER	(NOT USED)
8	6	0056 - 0061	FILLER	(NOT USED)
9	3	0062 - 0064	PATIENT AGE IN YEARS	
10	5	0065 - 0069	PATIENT AGE IN DAYS	
11	1	0070 - 0070	METRO CODE	0=NOT METRO 1=BALT. METRO 2=WASH, DC METRO
12	1	0071 - 0071	TEACHING CODE	0=NOT TEACHING 1=TEACHING
13	1	0072 - 0072	BED CAPACITY CODE	0=NOT OVER 400 BEDS 1=OVER 400 BEDS
14	1	0073 - 0073	PSRO AREA CODE	1=WESTERN MD 2=BALT.CITY 3=MONTGOMERY 4=PRINCE GEORGES 5=CENTRAL MD 6=SOUTHERN MD 7=DELMARVA
15	1	0074 - 0074	HSA AREA CODE	1=WESTERN MD 2=MONTGOMERY CO. 3=SOUTHERN MD 4=CENTRAL MD 5=EASTERN SHORE
16	1	0075 - 0075	ICG AREA CODE	

ITEM NO	NO.OF BYTES	RECORD POSITION	FIELD NAME	COMMENTS
17	1	0076 - 0076	FROM DAY OF WEEK	1=SUNDAY
18	1	0077 - 0077	THRU DAY OF WEEK	2=MONDAY 3=TUESDAY 4=WEDNESDAY 5=THURSDAY 6=FRIDAY 7=SATURDAY
19	1	0078 - 0078	CONF/NON-CONF FLAG	N=NONCONF DATA C=CONF.DATA

NOTE * ALL CHARGE FIELDS ARE IN DOLLARS AND CENTS
* NO DECIMAL POINTS

20	9	0079 - 0087	ROOM CHARGES
21	9	0088 - 0096	OPER.ROOM CHARGES
22	9	0097 - 0105	DRUG CHARGES
23	9	0106 - 0114	RADIOLOGY CHARGES
24	9	0115 - 0123	LABORATORY CHARGES
25	9	0124 - 0132	SUPPLIES CHARGES
26	9	0133 - 0141	THERAPY CHARGES
27	9	0142 - 0150	OTHER CHARGES
28	9	0151 - 0159	TOTAL CHARGES
29	9	0160 - 0168	MEDICAL/SURGICAL ACUTE CHARGES
30	9	0169 - 0177	CORONARY CARE CHARGES
31	9	0178 - 0186	MEDICAL/SURGICAL INTENS CHARGES
32	9	0187 - 0195	NURSERY CHARGES
33	9	0196 - 0204	ONCOLOGY CHARGES
34	9	0205 - 0213	SKILLED NURSING CARE CHARGES
35	9	0214 - 0222	PSYCHIATRIC ACUTE CHARGES
36	9	0223 - 0231	OPERATING ROOM CHARGES
37	9	0232 - 0240	COST OF DRUGS SOLD CHARGES
38	9	0241 - 0249	RADIOLOGY DIAGNOSTIC CHARGES
39	9	0250 - 0258	RADIOLOGY THERAPEUTIC CHARGES
40	9	0259 - 0267	NUCLEAR MEDICINE CHARGES
41	9	0268 - 0276	CAT SCAN CHARGES
42	9	0277 - 0285	MRI CHARGES
43	9	0286 - 0294	CARDIAC CATHETERIZATION CHARGES
44	9	0295 - 0303	LABORATORY CHARGES
45	9	0304 - 0312	MEDICAL SUPPLIES CHARGES
46	9	0313 - 0321	RESPIRATORY THERAPY CHARGES
47	9	0322 - 0330	PHYSICAL THERAPY CHARGES
48	9	0331 - 0339	OCCUPATIONAL THERAPY CHARGES
49	9	0340 - 0348	SPEECH & AUDIOLOGY CHARGES
50	9	0349 - 0357	PULMONARY FUNCTION CHARGES
51	9	0358 - 0366	ANESTHESIOLOGY CHARGES
52	9	0367 - 0375	BLOOD CHARGES
53	9	0376 - 0384	EMERGENCY ROOM CHARGES
54	9	0385 - 0393	OUTPATIENT CLINIC CHARGES
55	9	0394 - 0402	FREE STANDING CLINIC CHARGES

ITEM NO	NO. OF BYTES	RECORD POSITION	FIELD NAME	COMMENTS
56	9	0403 - 0411	LABOR & DELIVERY CHARGES	
57	9	0412 - 0420	EKG CHARGES	
58	9	0421 - 0429	EEG CHARGES	
59	9	0430 - 0438	OTHER CHARGES	
60	9	0439 - 0447	TOTAL CHARGES	
61	103	0448 - 0550	FILLER	(NOT USED)

Appendix B:

Inpatient Data Fields – Maryland

06/05/2003 VER 2.0 MARYLAND HSCRC INPATIENT CONFIDENTIAL FILE
CONFIDENTIAL FILE LAYOUT (970 CHARACTERS)

RECORD POSITION	NO. BYTES	FIELD NAME	COMMENTS
01-34	34	DISCHARGE KEY	
01-06	6	PROVIDER NUMBER	
07-17	11	MEDICAL RECORD NUMBER (STANDARDIZED)	
18-19	2	ADMIT MONTH (MM)	
20-21	2	ADMIT DATE (DD)	
22-25	4	ADMIT YEAR (CCYY)	
26-27	2	DISCHARGE MONTH (MM)	
28-29	2	DISCHARGE DATE (DD)	
30-33	4	DISCHARGE YEAR (CCYY)	
34-34	1	RECORD TYPE 1	
35-36	2	ADMIT HOUR	
37-37	1	NATURE OF ADMISSION	1=DELIVERY 2=NEWBORN 3=EMERGENCY 4=URGENT 5=SCHEDULED 6=OTHER 8=REHABILITATION 9=UNKNOWN
38-39	2	SOURCE OF ADMISSION	00=TRANSFERRED FROM ON-SITE ACUTE CARE UNIT TO REBAH UNIT 01=TRANSFERRED FOR ANOTHER HOSPITAL TO A SPECIALTY CENTER 02=TRANSFERRED FROM ANOTHER HOSPITAL FOR ANY OTHER REASON 03=TRANSFERRED FROM A NURSING HOME 04=TRANSFERRED FROM ANY OTHER INSTITUTION 05=ADMITTED FROM HOME 06=TRANSFERRED FROM LITHOTRIPSY FACILITY 07=TRANSFERRED FROM ON-SITE AMBULATORY OUTPATIENT SURGERY UNIT 08=TRANSFERRED FROM OFF-SITE AMBULATORY OUTPATIENT UNIT 09=UNKNOWN 10=NEWBORN

Came with 2003 data

B1

RECORD POSITION	NO. BYTES	FIELD NAME	COMMENTS
38-39	2	SOURCE OF ADMISSION (CONT)	12=ADMITTED FROM ON-SITE SUB-ACUTE FACILITY 13=ADMITTED FROM OTHER SUB-ACUTE FACILITY
40-40	1	ADMIT FROM EMERGENCY ROOM	1=ADMITTED FROM EMERGENCY ROOM 7=NOT APPLICABLE 9=UNKNOWN
41-42	2	BIRTHDATE MONTH (MM)	
43-44	2	BIRTHDATE DAY (DD)	
45-48	4	BIRTHDATE YEAR (CCYY)	
49-49	1	SEX	1=MALE 2=FEMALE 9=UNKNOWN
50-50	1	RACE	1=WHITE 2=AFRICAN AMERICAN 3=ASIAN OR PACIFIC ISLANDER 4=AMERICAN INDIAN/ ESKIMO/ALEUT 5=OTHER 9=UNKNOWN
51 51	1	ETHNICITY	1=SPANISH/HISPANIC ORIGIN 2=NOT SPANISH/HISPANIC ORIGIN 9=UNKNOWN
52-52	1	MARTIAL STATUS	1=SINGLE 2=MARRIED 3=SEPARATED 4=DIVORCED 5=WIDOW/WIDOWER 9=UNKNOWN

RECORD POSITION	NO. BYTES	FIELD NAME	COMMENTS
53-54	2	AREA OF RESIDENCE	COUNTY CODE 01=ALLEGANY 02=ANNE ARUNDEL 03=BALTIMORE COUNTY 04=CALVERT 05=CAROLINE 06=CARROLL 07=CECIL 08=CHARLES 09=DORCHESTER 10=FREDERICK 11=GARRETT 12=HARFORD 13=HOWARD 14=KENT 15=MONTGOMERY 16=PRINCE GEORGE'S 17=QUEEN ANNE'S 18=ST. MARY'S 19=SOMERSET 20=TALBOT 21=WASHINGTON 22=WICOMICO 23=WORCESTER 29=UNIDENTIFIED MARYLAND 30=BALTIMORE CITY (INDEPENDENT CITY) 39=DELAWARE 49=PENNSYLVANIA 59=WEST VIRGINIA 69=VIRGINIA 79=DISTRICT OF COLUMBIA 89=FOREIGN 98=OTHER STATES 99=UNIDENTIFIED
55-59	5	RESIDENCE ZIP CODE	XXXXX ZIP CODE 77777 FOREIGN 99999 UNKNOWN

RECORD POSITION	NO. BYTES	FIELD NAME	COMMENTS
60-61	2	PRINCIPAL HMO PAYOR	01=AETNA HEALTH PLANS 02=CAPITOLCARE (B/C-NCA) 03=CPS HEALTH GROUP 04=CHESAPEAKE HEALTH PLAN 05=CIGNA HEALTHCARE MID-ATL 06=COLUMBIA MEDICAL PLAN 07=DELMARVA HEALTH PLAN 08=HUMANA GROUP HEALTH PLAN 09=GWU HEALTH PLAN 10=HEALTHPLUS 11=KAISER PERMANENTE 12=MAMSI 13=TOTAL HEALTH CARE 14=U.S.HEALTHCARE 15=PRUDENTIAL HEALTH CARE 16=PRINCIPAL HEALTH CARE 17=PREFERRED HEALTH NETWORK 18=PHYSICIANS HEALTH PLAN 19=PRINCIPAL HEALTH DELAWARE 20=MARYLAND PHYSICIANS CARE 21=HELIX FAMILY HEALTH 22=JAI MEDICAL 23=PRIORITY PARTNERS 24=UNITED HEALTHCARE 25=NEW AMERICAN HEALTH 26=PRIME HEALTH 27=AMERICAID 29=OTHER HMO
62-63	2	SECONDARY HMO PAYOR	01=AETNA HEALTH PLANS 02=CAPITOLCARE (B/C-NCA) 03=CPS HEALTH GROUP 04=CHESAPEAKE HEALTH PLAN 05=CIGNA HEALTHCARE MID-ATL 06=COLUMBIA MEDICAL PLAN 07=DELMARVA HEALTH PLAN 08=HUMANA GROUP HEALTH PLAN 09=GWU HEALTH PLAN 10=HEALTHPLUS 11=KAISER PERMANENTE 12=MAMSI 13=TOTAL HEALTH CARE 14=U.S.HEALTHCARE 15=PRUDENTIAL HEALTH CARE 16=PRINCIPAL HEALTH CARE 17=PREFERRED HEALTH NETWORK 18=PHYSICIANS HEALTH PLAN 19=PRINCIPAL HEALTH DELAWARE 20=MARYLAND PHYSICIANS CARE

POSITION	RECORD BYTES	NO. FIELD NAME	COMMENTS
			21=HELIX FAMILY HEALTH 22=JAI MEDICAL 23=PRIORITY PARTNERS 24=UNITED HEALTHCARE 25=NEW AMERICAN HEALTH 26=PRIME HEALTH 27=AMERICAID 29=OTHER HMO
64-69	6	FILLER	
70-71	2	DISPOSITION OF PATIENT	01=HOME OR SELF CARE 02=DO NOT USE 03=HOME HEALTH CARE 04=DO NOT USE 05=ACUTE CARE GEN HOSP 06=OTHER HEALTH CARE FACILITY 07=DIED 08=LEFT AGAINST MEDICAL ADVICE 09=UNKNOWN 10=REHAB FACILITY 11=REHAB UNIT OF HOSP 12=ON-SITE DISTINCT REHAB UNIT 13=TRANS TO NURSING FAC 14=DISCHARGE TO ONSITE PSYCHE 15=DISCHARGE TO ONSITE SUB-ACUTE 16=DISCHARGE TO OTHER SUB-ACUTE FACILITY
72-74	3	ALTERNATIVE RATE METHOD	ARM CODE
75-76	2	SOURCE OF PAYMENT	EXPECTED PAYOR FOR MOST OF THIS BILL 01=MEDICARE 02=MEDICAID 03=TITLE V 04=BLUE CROSS OF MD 05=COMMERCIAL INSURANCE 06=OTHER GOVERNMENT PROGRAM 07=WORKMEN'S COMPENSATION 08=SELF PAY 09=CHARITY

RECORD POSITION	NO. BYTES	FIELD NAME	COMMENTS
			10=OTHER 11=DONOR 12=HMO 13=MEDICAID (STATE ONLY) 14=MEDICAID HMO 15=MEDICARE HMO 16=BLUE CROSS (NCA) 17=BLUE CROSS OTHER 99=UNKNOWN
77-78	2	SECONDARY SOURCE OF PAYMENT	SECONDARY PAYOR 01=MEDICARE 02=MEDICAID 03=TITLE V 04=BLUE CROSS OF MD 05=COMMERCIAL INSURANCE 06=OTHER GOVERNMENT PROGRAM 07=WORKMEN'S COMPENSATION 08=SELF PAY 09=CHARITY 10=OTHER 11=DONOR 12=HMO 13=MEDICAID (STATE ONLY) 14=MEDICAID HMO 15=MEDICARE HMO 16=BLUE CROSS (NCA) 17=BLUE CROSS OTHER 77=NOT APPLICABLE 99=UNKNOWN
79-84	6	ATTENDING PHYSICIAN	XXXXXX PHYSICIAN NUMBER 999999 UNKNOWN
85-90	6	OPERATING PHYSICIAN	XXXXXX PHYSICIAN NUMBER 777777 NOT APPLICABLE 999999 UNKNOWN
91-92	2	MAJOR SERVICE	01,B1=MEDICINE 02,B2=SURGERY 03,B3=OBSTETRICS 04,B4=NEWBORN 05,B5=PEDIATRIC 06,B6=PSYCHIATRIC 07,B7=OTHER 08,B8=REHABILITATION 09,B9,99=UNKNOWN B=SPACE

RECORD POSITION	NO. BYTES	FIELD NAME	COMMENTS
93-94	2	TYPE OF DAILY SERVICE	01=ALL OTHER 02=SHOCK TRAUMA 03=ONCOLOGY 04=SKILLED NURSING CARE 05=INTERMEDIATE (CHRONIC) CARE
93-94	2	TYPE OF DAILY SERVICE (CONT)	06=NEO-NATAL INTENSIVE CARE 07=BURN CARE 08=REHAB
95-97	3	NON-PSYCHIATRIC DAYS	001-776 NUMBER OF DAYS 777=NOT APPLICABLE 999=UNKNOWN
98-100	3	PSYCHIATRIC DAYS	001-776 NUMBER OF DAYS 777=NOT APPLICABLE 999=UNKNOWN
101-101	1	READMISSION	1=YES 2=NO
102-104	3	MEDICAL/SURGICAL ICU DAYS	XXX=NUMBER OF DAYS 777=NOT APPLICABLE 999=UNKNOWN
105-107	3	CORONARY CARE DAYS	XXX=NUMBER OF DAYS 777=NOT APPLICABLE 999=UNKNOWN
108-110	3	BURN CARE DAYS	XXX=NUMBER OF DAYS 777=NOT APPLICABLE 999=UNKNOWN
111-113	3	NEO-NATAL ICU DAYS	XXX=NUMBER OF DAYS 777=NOT APPLICABLE 999=UNKNOWN
114-116	3	PEDIATRIC ICU DAYS	XXX=NUMBER OF DAYS 777=NOT APPLICABLE 999=UNKNOWN
117-119	3	SHOCK TRAUMA DAYS	XXX=NUMBER OF DAYS 777=NOT APPLICABLE 999=UNKNOWN
120-122	3	OTHER CARE DAYS	XXX=NUMBER OF DAYS 777=NOT APPLICABLE 999=UNKNOWN

RECORD POSITION	NO. BYTES	FIELD NAME	COMMENTS
123-126	4	NEWBORN BIRTH WEIGHT	XXXX=ACTUAL WEIGHT AT BIRTH IN GRAMS 7777=PATIENT NOT A NEWBORN 9999=UNKNOWN
127-129	3	FILLER	
130-136	7	PRINCIPAL DIAGNOSIS	
137-143	7	OTHER DIAGNOSIS1	
144-150	7	OTHER DIAGNOSIS2	
151-157	7	OTHER DIAGNOSIS3	
158-164	7	OTHER DIAGNOSIS4	
165-171	7	OTHER DIAGNOSIS5	
172-178	7	OTHER DIAGNOSIS6	
179-185	7	OTHER DIAGNOSIS7	
186-192	7	OTHER DIAGNOSIS8	
193-199	7	OTHER DIAGNOSIS9	
200-206	7	OTHER DIAGNOSIS10	
207-213	7	OTHER DIAGNOSIS11	
214-220	7	OTHER DIAGNOSIS12	
221-227	7	OTHER DIAGNOSIS13	
228-234	7	OTHER DIAGNOSIS14	
235-241	7	E-CODE	XXXXXXX=ICD9-CM CODE BBBBBBB=NOT APPLICABLE bbbbbbb=SPACES
242-242	1	RESERVE FLAG	
243-250	8	AMBULANCE RUN NUMBER	
251-257	7	PRINCIPAL PROCEDURE	XXXXXXX=ICD9-CM CODE BBBBBBB=NOT APPLICABLE bbbbbbb=SPACES
258-265	8	PRINCIPAL PROCEDURE DATE	01-12=MONTH 77=NOT APPLICABLE 99=UNKNOWN 01-31=DAY 77=NOT APPLICABLE 99=UNKNOWN XXXX=YEAR 7777=NOT APPLICABLE 9999=UNKNOWN

RECORD POSITION	NO. BYTES	FIELD NAME	COMMENTS
266-272	7	OTHER PROCEDURE 2	XXXXXXX=ICD9-CM CODE BBBBBBB=NOT APPLICABLE bbbbbbb=SPACES
273-280	8	OTHER PROCEDURE DATE 2	01-12=MONTH 77=NOT APPLICABLE 99=UNKNOWN 01-31=DAY 77=NOT APPLICABLE 99=UNKNOWN XXXX=YEAR 7777=NOT APPLICABLE 9999=UNKNOWN
281-287	7	OTHER PROCEDURE 3	SAME AS OTHER PROCEDURE 1
288-295	8	OTHER PROCEDURE DATE 3	SAME AS OTHER PROCEDURE DATE 1
296-302	7	OTHER PROCEDURE 4	SAME AS OTHER PROCEDURE 1
303-310	8	OTHER PROCEDURE DATE 4	SAME AS OTHER PROCEDURE DATE 1
311-317	7	OTHER PROCEDURE 5	SAME AS OTHER PROCEDURE 1
318-325	8	OTHER PROCEDURE DATE 5	SAME AS OTHER PROCEDURE DATE 1
326-332	7	OTHER PROCEDURE 6	SAME AS OTHER PROCEDURE 1
333-340	8	OTHER PROCEDURE DATE 6	SAME AS OTHER PROCEDURE DATE 1
341-347	7	OTHER PROCEDURE 7	SAME AS OTHER PROCEDURE 1
348-355	8	OTHER PROCEDURE DATE 7	SAME AS OTHER PROCEDURE DATE 1

RECORD POSITION	NO. BYTES	FIELD NAME	COMMENTS
356-362	7	OTHER PROCEDURE 8	SAME AS OTHER PROCEDURE 1
363-370	8	OTHER PROCEDURE DATE 8	SAME AS OTHER PROCEDURE DATE 1
371-377	7	OTHER PROCEDURE 9	SAME AS OTHER PROCEDURE 1
378-385	8	OTHER PROCEDURE DATE 9	SAME AS OTHER PROCEDURE DATE 1
386-392	7	OTHER PROCEDURE 10	SAME AS OTHER PROCEDURE 1
393-400	8	OTHER PROCEDURE DATE 10	SAME AS OTHER PROCEDURE DATE 1
401-407	7	OTHER PROCEDURE 11	SAME AS OTHER PROCEDURE 1
408-415	8	OTHER PROCEDURE DATE 11	SAME AS OTHER PROCEDURE DATE 1
416-422	7	OTHER PROCEDURE 12	SAME AS OTHER PROCEDURE 1
423-429	7	OTHER PROCEDURE 13	SAME AS OTHER PROCEDURE 1
430-436	7	OTHER PROCEDURE 14	SAME AS OTHER PROCEDURE 1
437-443	7	OTHER PROCEDURE 15	SAME AS OTHER
444-444	1	REHABILITATION ADMISSION CLASS	1=INITIAL REHABILITATION 2=EVALUATION 3=READMISSION 4=UNPLANNED DISCHARGE 5=CONTINUING REHABILITATION
445-451	7	REHABILITATION IMPAIRMENT GROUP CODE	
452-461	10	FILLER	
462-464	3	FILLER	
465-466	2	FILLER	

RECORD POSITION	NO. BYTES	FIELD NAME	COMMENTS
467-468	2	CURRENT MDC	
469-471	3	CURRENT DRG	
472-472	1	RTC	
473-476	4	RETURNED FROM GROUPER MPR	
477-481	5	RETURNED FROM GROUPER ADX	
482-486	5	RETURNED FROM GROUPER SDX	
487-490	4	RETURNED FROM GROUPER PR2	
491-494	4	RETURNED FROM GROUPER NOR	
495-498	4	RETURNED FROM GROUPER NO2	
499-503	5	RETURNED FROM GROUPER COM	
504-507	4	RETURNED FROM GROUPER PR3	
508-515	8	RETURNED FROM GROUPER VCC	
516-516	1	RETURNED FROM GROUPER CC	
517-517	1	ATTENDING PHYSICIAN FLAG	0=VALID PHYSICIAN NUMBER 1=INVALID PHYSICIAN NUMBER
518-523	6	ATTENDING PHYSICIAN GHOST NUMBER	
524-524	1	OPERATING PHYSICIAN FLAG	0=VALID PHYSICIAN NUMBER 1=INVALID PHYSICIAN NUMBER
525-530	6	OPERATING PHYSICIAN GHOST NUMBER	
531-533	3	AGE IN YEARS	
534-538	5	AGE IN DAYS (IF AGE IN YEARS = 000)	
539-541	3	LENGTH OF STAY	
542-542	1	MAJOR SERVICE MAPPED FROM DRG	1=OBSTETRICS 2=PSYCHIATRY 3=GYNECOLOGY 4=MEDICINE 5=SURGERY 6=NEWBORN 7=PEDIATRIC MEDICINE (AGE < 18) 8=PEDIATRIC SURGERY (AGE < 18)
543-543	1	METROPOLITAN CODE	0=NOT METROPOLITAN 1=BALTIMORE METROPOLITAN 2=WASHINGTON METROPOLITAN
544-544	1	TEACHING HOSPITAL CODE	0=NOT TEACHING 1=TEACHING

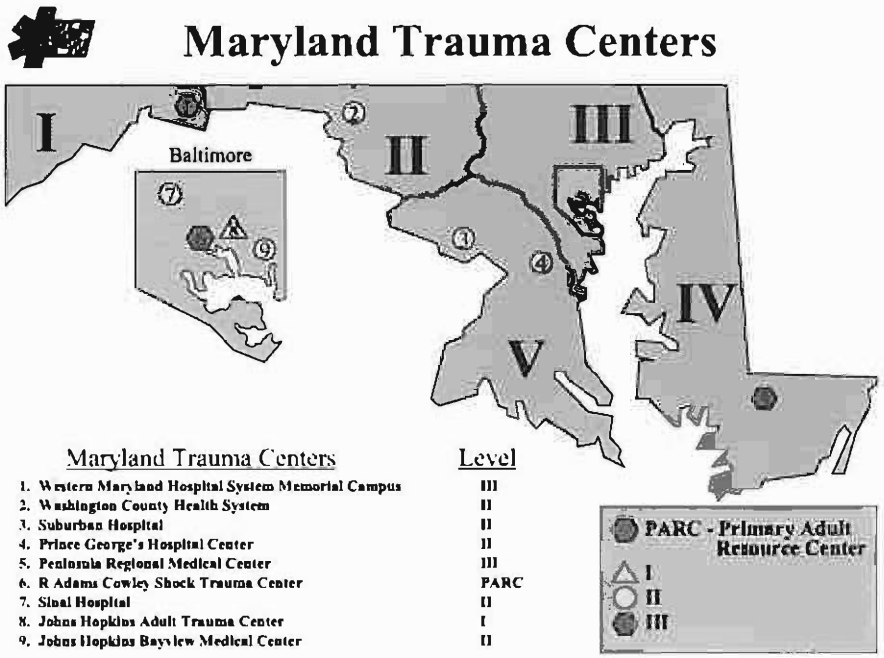
RECORD POSITION	NO. BYTES	FIELD NAME	COMMENTS
545-545	1	BED CAPACITY (HOSPITAL BED SIZE)	0=NOT OVER 400 BEDS 1=OVER 400 BEDS
546-546	1	PSRO AREA	1=WESTERN MARYLAND 2=BALTIMORE CITY 3=MONTGOMERY 4=PRINCE GEORGES 5=CENTRAL MARYLAND 6=SOUTHERN MARYLAND 7=DELMARVA
547-547	1	HSA (HEALTH STATIC AREA GROUPED BY COUNTY)	1=CENTRAL MARYLAND 2=EASTERN SHORE 3=SOUTHERN MARYLAND 4=WESTERN MARYLAND 5=MONTGOMERY COUNTY
548-548	1	ICG CODE	
549-549	1	ADMIT DAY OF WEEK	
550-550	1	DISCHARGE DAY OF WEEK	
551-553	3	PREOP TIME FOR PRIMARY PROCEDURE	
554-556	3	OTHER PREOP TIME 1	
557-559	3	OTHER PREOP TIME 2	
560-562	3	OTHER PREOP TIME 3	
563-565	3	OTHER PREOP TIME 4	
566-568	3	OTHER PREOP TIME 5	
569-571	3	OTHER PREOP TIME 6	
572-574	3	OTHER PREOP TIME 7	
575-577	3	OTHER PREOP TIME 8	
578-580	3	OTHER PREOP TIME 9	
581-583	3	OTHER PREOP TIME 10	
584-584	1	CLASS FOR PRIMARY PROCEDURE	
585-585	1	CLASS FOR 1ST SECONDARY PROCEDURE	
586-586	1	CLASS FOR 2ND SECONDARY PROCEDURE	
587-587	1	CLASS FOR 3RD SECONDARY PROCEDURE	
588-588	1	CLASS FOR 4TH SECONDARY PROCEDURE	
589-589	1	CLASS FOR 5TH SECONDARY PROCEDURE	
590-590	1	CLASS FOR 6TH SECONDARY PROCEDURE	
591-591	1	CLASS FOR 7TH SECONDARY PROCEDURE	
592-592	1	CLASS FOR 8TH SECONDARY PROCEDURE	
593-593	1	CLASS FOR 9TH SECONDARY PROCEDURE	
594-594	1	CLASS FOR 10TH SECONDARY PROCEDURE	
595-595	1	CLASS FOR 11TH SECONDARY PROCEDURE	
596-596	1	CLASS FOR 12TH SECONDARY PROCEDURE	
597-597	1	CLASS FOR 13TH SECONDARY PROCEDURE	
598-598	1	CLASS FOR 14TH SECONDARY PROCEDURE	

RECORD POSITION	NO. BYTES	FIELD NAME	COMMENTS
599-607	9	DAILY ROOM & BED CHARGES	IMPLIED DECIMAL POINT ON
608-616	9	OPERATING ROOM CHARGES	ALL CHARGES 9999999V99
617-625	9	DRUGS CHARGES	
626-634	9	RADIOLOGY CHARGES	
635-643	9	LABORATORY CHARGES	
644-652	9	SUPPLIES CHARGES	
653-661	9	THERAPY CHARGES	
662-670	9	OTHER CHARGES	
671-679	9	TOTAL CHARGES	
680-682	3	FILLER	
683-691	9	MEDICAL/SURGICAL ACUTE CHARGES	
692-700	9	CORONARY CARE CHARGES	
701-709	9	MEDICAL/SURGICAL INTENS CHARGES	
710-718	9	NURSERY CHARGES	
719-727	9	ONCOLOGY CHARGES	
728-736	9	SKILLED NURSING CARE CHARGES	
737-745	9	PSYCHIATRIC ACUTE CHARGES	
746-754	9	OPERATING ROOM CHARGES	
755-763	9	COST OF DRUGS SOLD CHARGES	
764-772	9	RADIOLOGY DIAGNOSTIC CHARGES	
773-781	9	RADIOLOGY THERAPEUTIC CHARGES	
782-790	9	NUCLEAR MEDICINE CHARGES	
791-799	9	CAT SCAN CHARGES	
800-808	9	MRI CHARGES	
809-817	9	CARDIAC CATHETERIZATION CHARGES	
818-826	9	LABORATORY CHARGES	
827-835	9	MEDICAL SUPPLIES CHARGES	
836-844	9	RESPIRATORY THERAPY CHARGES	
845-853	9	PHYSICAL THERAPY CHARGES	
854-862	9	OCCUPATIONAL THERAPY CHARGES	
863-871	9	SPEECH & AUDIOLOGY CHARGES	
872-880	9	PULMONARY FUNCTION CHARGES	
881-889	9	ANESTHESIOLOGY CHARGES	
890-898	9	BLOOD CHARGES	
899-907	9	EMERGENCY ROOM CHARGES	
908-916	9	OUTPATIENT CLINIC CHARGES	
917-925	9	FREE STANDING CLINIC CHARGES	
926-934	9	LABOR & DELIVERY CHARGES	
935-943	9	EKG CHARGES	
944-952	9	EEG CHARGES	
953-961	9	OTHER	
962-970	9	TOTAL	

Appendix C:

Map of Maryland Designated Adult Trauma Centers

APPENDIX C:
MAP OF DESIGNATED
MARYLAND ADULT TRAUMA CENTERS



Note: The Roman numerals I-V on the map refer to the Maryland EMS System Regions.

Appendix D:

Case Inclusion Criteria
Maryland Trauma Registry

In order to allow each trauma center to include cases in the Maryland Trauma Registry which may or may not be included by other centers, and still to be able to compare "apples with apples," it is important to identify the main reason a case is being included in the registry. This cannot always be done simply by examining the data. Therefore, when you decide to include a case, you MUST identify a reason for doing so. Prior to January 1, 2004, the decision to enter the patient into the registry was based solely upon either his/her mechanism of injury and/or his/her anatomical injuries. While that is still true, as of January 1, 2004 and forward, one must also include how the patient was triaged and came to arrive at the trauma center. This process can be indicated by the data element, TRAUMA PATIENT DEFINITION (field #4). One should note that based on the new patient definition, if data definitions 1 through 4 are chosen, the record will be transferred to the state trauma registry. After one chooses data definitions 1 through 4, one must also select additional options to give more detail. If data definition 8 is chosen, the record will not be transferred to the state trauma registry. Both the old and the new definitions are shown here in Part A; Part B defines the codes to be entered into the inclusion criteria field, INCLUDE (field #7); Part C lists the data elements required for the various inclusion classes.

A. Definitions.

As of January 1, 2004 and forward, an injured patient should be included in the registry if the patient:

1. Is triaged by EMS from a scene to a trauma center consistent with the Trauma Triage Decision Tree in the Maryland Medical Protocols for EMS Providers.
2. Is transferred to a trauma center from another facility consistent with the Adult or Pediatric trauma referral guidelines in the Maryland EMS Interhospital Transfer Guidelines.
3. Arrives at a trauma center by any means but meets the criteria in the Trauma Triage Decision Tree in the Maryland Medical Protocols for EMS Providers, or the criteria in the Maryland EMS Interhospital Transfer for Adult or Pediatric trauma.
4. Is transferred to the trauma service from another service at a trauma center, and meets the criteria in 1 or 2 or 3.
8. Other hospital defined.

If definitions 3 or 4 were chosen, then select either of the following:

1. Trauma Decision Tree.
2. Maryland EMS Interhospital Transfer for Adult or Pediatric Patients.

Additionally, if definitions 1 through 4 were chosen, also select one of the following:

1. Severe multiple injuries (2 or more systems) or severe single system injury.
2. Cardiac or major vessel injuries.
3. Severe head injury.
4. Injuries with complications (e.g., shock, sepsis, respiratory failure, cardiac failure).
5. Severe facial injuries.
6. Severe orthopaedic injuries.
7. Comorbid factors (e.g., age < 5 or > 55 years, cardiac or respiratory disease, insulin-dependent diabetes, morbid obesity, pregnancy, immunosuppressed patients, patient with bleeding disorder or patient on anticoagulants).
8. Penetrating injuries to extremities with vascular compromise.
9. Mechanism of injury (Category C in Trauma Decision Tree).

Prior to January 1, 2004, the patients were included in registry as follows:

1. *Injury cases* were defined as those with an ICD-9-CM diagnosis between 800.00 and

959.9.

2. *Additional cases* were defined as those resulting from hanging, near drowning, inhalation or ingestion, or poisoning events.

3. *Trauma cases* were a subset of both *injury cases* and *additional cases*. This subset is based on those cases which meet at least one of the following conditions:

1. High energy dissipation, rapid deceleration
2. Deformity of a contact point
3. Prolonged extrication time
4. Ejection from vehicle
5. Pedestrian struck
6. Falls three times the victim's height
7. Multisystem injuries (2 or more systems)
8. Fracture of 2 or more long bones
9. Amputation
10. Major crush injury
11. Traumatic ventilatory compromise
12. Hypovolemic shock
13. Neurotrauma
    * GCS of 13 or less
    * Spinal column injury with motor and/or sensory deficit
14. Penetrating injury to:
    * Head
    * Neck
    * Thorax
    * Abdomen
    * Groin
15. Burns
    * Split and full thickness burns
    * Greater than 10% in patients under 10 and over 50 years of age
    * Greater than 20% in all other ages
    * Burns of the face, hands, feet, or perineum
    * Respiratory system burns
    * Electrical burns
    * Chemical burns
16. Death of another occupant
17. Other conditions at the discretion of the individual trauma center

B. Inclusion Codes.

1. Trauma Cases Managed Entirely in the Emergency Department (REQUIRED)
   - 1.1 Dead On Arrival
   - 1.2 Emergency Department Death
   - 1.3 Emergency Department Discharge Against Medical Advice
   - 1.4 Emergency Department Transfer to Another Hospital for Specialty Care
   - 1.5 Emergency Department Transfer to Another Hospital
   - 1.6 Emergency Department Transfer to Short Stay Unit

2. Trauma Cases Admitted as Hospital Inpatients (REQUIRED)
   - 2.1 Admitted Through the Emergency Department
   - 2.2 Admitted Directly to Inpatient Service

3. Injury Cases Admitted as Hospital Inpatients, but NOT Identified as Trauma (REQUIRED)
   - 3.1 Hospital Death with Trauma Surgeon Consultation
   - 3.2 Hospital Death with No Trauma Surgeon Consultation
   - 3.3 Admitted to the ICU with Trauma Surgeon Consultation
   - 3.4 Admitted to the ICU with No Trauma Surgeon Consultation
   - 3.5 Hospital Length of Stay of 3 Days or More with Trauma Surgeon Consultation
   - 3.6 Hospital Length of Stay of 3 Days or More with No Trauma Surgeon Consultation

Note: If two or more conditions apply, e.g. a patient stays 12 days in the ICU and then dies, choose the first condition, starting from 3.1, which applies.

4. Additional Trauma Service Utilization Cases (OPTIONAL)
   - 4.1 Field-defined Priority One or Two Injury Cases Not Meeting Either Conditions under Inclusion Definitions 1, 2 or 3
   - 4.2 Trauma Service Consultation Only in the Emergency Department
   - 4.3 Trauma Service Consultation Only in the Hospital
   - 4.4 Other self-defined criteria
   - 4.5 Other self-defined criteria

8. No injury etiology
   - 8.1 Trauma Team Response without an Injury Etiology

C. Data Requirement Definitions.

Cases registered under inclusion definitions 1 and 2 require all applicable data dictionary elements.
Cases registered under inclusion definition 3 require a minimal data set consisting of the following:

* Hospital History Number
* Admission Date
* Discharge Date
* Date of Birth
* Gender

Cases registered under inclusion definition 4 have no data requirements. Data inclusion is left to the discretion of the individual trauma center.

Appendix E:

MD Automated Accident Report System (MAARS)

State of Maryland Motor Vehicle Accident Report

REPORT NO. 1	PAGE OF 2	ACCIDENT DATE 3	ACCIDENT TIME 4	REPORT TYPE 5 ☐ FATAL ☐ INJURY ☐ PDO ☐ HIT & RUN ☐ NON-TRAFFIC	RESEARCH 6	LOCAL CASE NUMBER 7	LOCAL CODES 8	PHOTOS ? 9 ☐ NO ☐ YES
08886765								

INVESTIGATING OFFICER ID 10	AGENCY AND AREA 11	SUPERVISING OFFICER ID 12	REVIEWER ID # 13	CODE – AND – NAME OF MUNICIPALITY 14	COUNTY 15

RD CHAR 16	RTE NUM Accident Occurred On 17	ROAD NAME 18	IN LANE 19	TRAF SIG 20 ☐ NO ☐ YES	ON RAMP 21 ☐ NO ☐ YES	Ramp Number (Direction) 1 N–W 2 W–N 3 E–N 4 N–E 5 S–E 6 E–S 7 W–S 8 S–W 9 Other 22	0–Not Ramp	IN INTERSECTION 23 ☐ NO ☐ YES
	Ø							

RD COND 24	INT-RTE 25	INTERSECTING ROAD NAME or Log Mile Reference Manual description. 26	MILEPT 27	DIR 28	Dist. of Acc fr INT-RTE/Ref. & Dir. 29 ☐ FT ☐ MI
	Ø		.		.

RD DIV 30

SRF COND 34

CM ZONE 35 ☐ NO ☐ YES

JUNCT'N 36

EVENT-1 37

EVENT-2 38

FD OBJ 39

COLL TY 40

LIGHT 41

WEATHER 42

ACCIDENT DIAGRAM

Show & Label: Roads, Traffic Units, the Travel Direction consistant with the Log Mile Reference Manual, and Movement of Traffic Units. 31

NORTH: 32

N

DESCRIBE ACCIDENT briefly- identify units by numbers. Also identify the following
a) the OBJECT DAMAGED & NATURE OF DAMAGE (Property other than vehicles) and
b) the NAME & ADDRESS OF OWNER when applicable. 33

UNIT # 43: 01

NAME (First, Middle, Last) 44 | SEX 45

ADDRESS (No., Street, City, State, Zip) TEL ☐ Work ☐ Res 47 | INJ 48 | EMS 49

TYPE OF UNIT 46 ☐ DRIVER ☐ "PED"

MOVEMENT 50	CONDITN 51	SUBST 52	TEST 53	RESULT 54	FOR PEDS ONLY	AGE 55	TYPE 56	LOCAT'N 57	OBEY 58	VISIBL 59
				.		Ø				

SPEED LIMIT 60	SAF. EQU 61	EQ PROB 62	EJECT 63	CITATION NUMBER (S) 64	FAULT 65 ☐ NO ☐ YES

GOING 66 | DRIVER'S LICENSE NUMBER 67 | STATE 68 | CLASS 69

CONTINU 70 | DR DATE OF BIRTH 71 | IRREGULAR CONDITION 72 ☐ PARKED ☐ CAUGHT FIRE ☐ HIT & RUN ☐ DRIVERLESS | HM SPILL 73 ☐ N ☐ Y | HAZ MAT NUMBER 74

BODY TY 75 | COMMER. VEHICLE ONLY | U. S. DOT NUMBER 76 | ICC NUMBER 77 | BODY TY 78 | COLL 79 ☐ NO ☐ YES

MOST HE 80 | OWNER OR CARRIER NAME (Write "SAME" if Driver) TEL ☐ Work ☐ Res 81

CONTRIB CIRCUM-STANCES 82-1 | OWNER / CARRIER ADDRESS 83 | TOWED VEH (S) 84

82-2 | YEAR & MAKE OF VEHICLE 85 | MODEL 86 | 1st IMPACT PT. 87 | MAIN IMPACT 88

82-3 | EXP YR & REGISTR # STATE 89 | AREAS DAMAGED 90 | INSURER 91

82-4 | VEHICLE ID NUMBER 92 | POLICY NUMBER 93

DAM EXT 94 | VEHICLE REMOVED BY 95 | VEHICLE REMOVED TO 96

UNIT # 43: 02

NAME (First, Middle, Last) 44 | SEX 45

ADDRESS (No., Street, City, State, Zip) TEL ☐ Work ☐ Res 47 | INJ 48 | EMS 49

TYPE OF UNIT 46 ☐ DRIVER ☐ "PED"

MOVEMENT 50	CONDITN 51	SUBST 52	TEST 53	RESULT 54	FOR PEDS ONLY	AGE 55	TYPE 56	LOCAT'N 57	OBEY 58	VISIBL 59
				.		Ø				

SPEED LIMIT 60	SAF. EQU 61	EQ PROB 62	EJECT 63	CITATION NUMBER (S) 64	FAULT 65 ☐ NO ☐ YES

GOING 66 | DRIVER'S LICENSE NUMBER 67 | STATE 68 | CLASS 69

CONTINU 70 | DR DATE OF BIRTH 71 | IRREGULAR CONDITION 72 ☐ PARKED ☐ CAUGHT FIRE ☐ HIT & RUN ☐ DRIVERLESS | HM SPILL 73 ☐ N ☐ Y | HAZ MAT NUMBER 74

BODY TY 75 | COMMER. VEHICLE ONLY | U. S. DOT NUMBER 76 | ICC NUMBER 77 | BODY TY 78 | COLL 79 ☐ NO ☐ YES

MOST HE 80 | OWNER OR CARRIER NAME (Write "SAME" if Driver) TEL ☐ Work ☐ Res 81

CONTRIB CIRCUM-STANCES 82-1 | OWNER / CARRIER ADDRESS 83 | TOWED VEH (S) 84

82-2 | YEAR & MAKE OF VEHICLE 85 | MODEL 86 | 1st IMPACT PT. 87 | MAIN IMPACT 88

82-3 | EXP YR & REGISTR # STATE 89 | AREAS DAMAGED 90 | INSURER 91

82-4 | VEHICLE ID NUMBER 92 | POLICY NUMBER 93

DAM EXT 94 | VEHICLE REMOVED BY 95 | VEHICLE REMOVED TO 96

TRAFFIC UNIT # 97	SEATING POSITION 98	CODE all injured & uninjured PASSENGERS below. Use "W" for witness in TRAF UNIT and SEAT columns. WRITE NAME & ADDRESS of injured Passengers and Witnesses. Witness Telephone # 99	SEX 100	AGE 101	SAFETY EQUIP 102	EQUIP PROB. 103	INJUR SEVER 104	EJEC-TION 105	EMS UNIT 106
				Ø					
				Ø					
				Ø					
				Ø					
				Ø					
				Ø					
				Ø					

E UNIT M S A 107	INJURED TAKEN BY 108	INJURED TAKEN TO. 109	EMS RUN REPORT # 110	E UNIT M S B 107	INJURED TAKEN BY 108	INJURED TAKEN TO. 109	EMS RUN REPORT # 110

Appendix F:

MD Ambulance Information System (MAIS) Run Sheet

MARYLAND AMBULANCE INFORMATION SYSTEM (Rev. 7/96)

60566201

STATION RUN NUMBER | JURISD INCIDENT NUMBER | SUPL | BOX NUMBER | DISTRICT | RECEIVING FACILITY: | OTHER UNITS ON SCENE:

DATE: MONTH | DAY | YR

5814806

RESPONSE LOCATION: | ZIP CODE | INC TYPE | OCCUP | ACTION | DISP

PATIENT NAME: | PARENT/ GUARDIAN: | PATIENT ADDRESS: | HOME PHONE:

PROVIDER 1 ID# | PROVIDER 1 NAME

PROVIDER 2 ID# | PROVIDER 2 NAME

PROVIDER 3 ID# | PROVIDER 3 NAME

DOCUMENTATION OF TIMES

911 CALL | AMB CALL | DPT STA | ARV LOC | DPT LOC | ARV HOS | RTN SER | CTY | UNIT

RESPONSE IDENTIFICATION

HIGHEST STAFFED: EMT-A, IVT, EMT-B, CRT, EMT-P, Other

NO CARE REQUIRED: PDOA, Cancel, False, No Pt, Refuse, Unit 2

DISPATCH: ALS, BLS

PRIORITY: One, Two, Three, Four, N/A

1st DUE: Yes, No

PATIENT

AGE | RACE: Black, White, Other

GENDER: Male, Female

CHIEF COMPLAINT:

HISTORY:

ROUTINE MEDICATIONS:

ALLERGIES:

ASSESSMENT/CARE:

FIRST VITALS

SYS | DIA | PULSE | RES

LOC PRIOR TO ARRIVAL? Yes / No

GCS: E | M | V

LUNGS: Normal, Wheeze, Rales, Decrease (R)

SIGNS/SYMP

Agitated, Airway Obs, Cyanotic, Dehydrated, Diaphoretic, Hemorrhage, Hypothermic, Laceration, Nausea, Pain (Head, Chest, Neck, Abdom, Back, Extrm), Paralysis, Pupils (A), Resp Distrs, Syncope, Vomiting, Weakness, OTHER

ASSESSMENT

INJURY TYPE: ATV Crash, Beating, Bike, Burn, Drowning, Fall, Farm, GSW, Industrial, Lawn Mwr, Motorcycle, MV Crash, Pedestrian, Sport/Rec, Stabbing, Tox Inhal, Venom Bite, OTHER

TRAUMA ID: Shock, Multi Sys, Sev S Sys, Pen Wnd, CNS Inj, Mechanism, Other Fatal, Age

MECHANISMS: Deformity, Ejection, Entrapment, Fall ≥ 15', Speed

SAFETY EQUIP: Not Used, Belt/Harn, Safety Seat, Air Bag, Helmet

CONDITIONS

Allergic Rxn, Asthma, Behavior, Cardiac Arst, CHF, COPD, CVA, Diabetes, DNR (A), Exposure, GI Disorder, Med. Illness, MI/Cardiac, OB/GYN, Overdose, Poison, Resp Arst, Seizure, OTHER

E.C.G.

Nor Sinus, Sinus Tach, A-Fib, SVT, Sinus Brad, Block (1 2 3), Asystole, PEA, PVC's, Vent Fib, Vent Tach, OTHER

C/A WITNESSED? Yes / No

CPR START: Citizen, 1st Resp, EMS BLS, EMS ALS

TIME

AIRWAY/VENTILATION

Suction, Oropher, Nasopher, NC, Face Mask, NR Mask, BVM, PPD, Mech Ventilator, Hyperventilate, O² at, Other

LPM

CIRCULATION

IV1 | IV2 | EJ | IO

PROV #

Total cc's:

Dx/ Site

ET Size:

Spinal Immob, Cntrl Bld, Tract/Splint, PASG, CPR, CPR Mech, OB Delivery, Restraints, Other

MEDS

MEDS	PR1	PR2	PR3	MEDS	PR1	PR2	PR3
Adenosine				Glucagon			
Albuterol				Glucose Paste			
Atropine				Ipecac			
Calcium				Lidocaine			
Charcoal				Morphine			
Dextrose				Naloxone			
Diazepam				Nitroglycerin			
Dopamine				Nitroprusside			
Epi 1:10K				Na Bicarb			
Epi 1:1K				Tetracaine			
Epi Pen				Xylocaine Meds			
Furosemide				Benadryl			

HOSPITALS

Consulting | Transferring | Receiving

ABG's @ ER (if available)

pH | pO2 | pCO2 | BE (+ / −)

On-Line Physician:

MEDIC:

PROVIDER SIGNATURE

X

HOSPITAL SIGNATURE

EMS REVIEWER

EXPOSURE (B) (A) (C)

TRANSPORT BY

No Transport, This Unit, Other Ambu, Other Air

TRANS REASON

Classed I, Spec Rel, Pri-Alert 3, Pri-Consult, Transfer, Routine, Patient

SPECIAL PURPOSE

Mul Pat Seen, Mul Pat Trans, Haz Mat, Add Nar, Fire Rehab, Excep Call

RADIO: No Attempt, Poor, Good, Failed

VAR

PROV #	TIME	B.P.	PULSE	RESP.	RHYTHM	PULSE OX (%)	CARE PROVIDED	AMOUNT
	:	/						
	:	/						
	:	/						
	:	/						

MIEMSS RECORD

F1

Appendix G:

Death Certificate Sample
Maryland

PLEASE TYPEWRITE OR PRINT WITH BALL POINT PEN SO ALL COPIES WILL BE LEGIBLE

SPEEDISET® MOORE BUSINESS FORMS, INC

STATE OF MARYLAND
DEPARTMENT OF HEALTH AND MENTAL HYGIENE
MEDICAL EXAMINER'S CERTIFICATE OF DEATH

1 - FOR STATE REGISTRAR — REG NO.

1 DECEASED NAME (TYPE OR PRINT) FIRST: John MIDDLE: LAST: Doe					7a DATE KNOWN OF DEATH / ESTIMATED ☐: MONTH 1 DAY 1 YEAR 19 99	7b HOUR M
3 SEX	4 RACE	5 DATE OF BIRTH MONTH DAY YEAR	6 AGE (IN YEARS LAST BIRTHDAY) YRS	IF UNDER 1 YR: MONTHS DAYS	IF UNDER 24 HRS: HOURS MIN	7c DATE PRONOUNCED DEAD: MONTH 1 DAY 1 YEAR 19 99	7d HOUR 9:99A M
7a BIRTHPLACE (STATE OR FOREIGN COUNTRY)	7b CITIZEN OF WHAT COUNTRY?	8 MARRIED ☐ NEVER MARRIED ☐ WIDOWED ☐ DIVORCED ☐				9 BALTIMORE CITY OR COUNTY OF DEATH: Baltimore City	MD
10 CITY OR TOWN OF DEATH: Baltimore	11 NAME OF HOSPITAL, NURSING HOME, OR OTHER INSTITUTION (IF NOT IN SUCH FACILITY, GIVE STREET ADDRESS): University Hospital				12a USUAL OCCUPATION (TYPE OF WORK FOR MOST OF WORKING LIFE)	12b KIND OF BUSINESS OR INDUSTRY	
USUAL RESIDENCE (IF INSTITUTION, GIVE RESIDENCE BEFORE ADMISSION) 13a STATE	13b COUNTY	13c CITY OR TOWN	13d INSIDE CITY LIMITS? YES ☐ NO ☐	13e STREET ADDRESS			
14 FATHER'S NAME FIRST MIDDLE LAST			15 MOTHER'S MAIDEN NAME FIRST MIDDLE LAST				
16a. WAS DECEASED EVER IN U.S. ARMED FORCES? (YES, NO, OR UNKNOWN)	IF YES GIVE WAR OR DATES	16b SOCIAL SECURITY NO.	17 INFORMANT	ADDRESS			

MEDICAL CERTIFICATION

18 CAUSE OF DEATH (Enter only one cause per line for (a), (b), and (c).) — APPROXIMATE INTERVAL BETWEEN ONSET AND DEATH

PART I DEATH WAS CAUSED BY:
IMMEDIATE CAUSE (a): Multiple injuries
DUE TO, OR AS A CONSEQUENCE OF:
Conditions, if any, which gave rise to immediate cause (a) stating the underlying cause last.
(b):
DUE TO, OR AS A CONSEQUENCE OF:
(c):

PART 2 OTHER SIGNIFICANT CONDITIONS CONTRIBUTING TO DEATH BUT NOT RELATED TO THE TERMINAL DISEASE OR CONDITION GIVEN IN PART 1 (a):

19a DATE OF OPERATION	19b CONDITION FOR WHICH OPERATION WAS PERFORMED?	20 AUTOPSY?
		YES ☒ NO ☐

21a EXTERNAL CAUSE WAS UNDERLYING ☒ OR CONTRIBUTING ☐ CAUSE OF DEATH	21b TIME OF INJURY HOUR A.M. MONTH DAY YEAR: 2:22xx 1 1 19 99	21c. HOW INJURY OCCURRED (ENTER NATURE OF INJURY IN ITEM 18 PART I OR PART 2): Pedestrian struck by auto
21d INJURY OCCURRED WHILE AT WORK ☐ NOT WHILE AT WORK ☒	21e PLACE OF INJURY (AT HOME, STREET, FACTORY, FARM, ETC.): road	21f LOCATION STREET: Penn St. CITY OR TOWN: Baltimore COUNTY: STATE: MD.

22a. I certify that I took charge of the remains described above, held an Autopsy ☒ Inspection ☐, Inquiry ☐ and in my opinion death resulted from: Natural causes ☐, Accident ☒, Suicide ☐, Homicide ☐, Undetermined manner ☐.

ACTUAL SIGNATURE _____ M.D. TITLE (SPECIFY): Assistant MEDICAL EXAMINER DATE SIGNED 1/2/99

EXAMINER'S NAME (TYPE OR PRINT): Humpty Dumpty, M.D. ADDRESS: 111 Penn St. Balto.MD.

23a. BURIAL, CREMATION, REMOVAL (SPECIFY)	23b DATE	23c NAME OF CEMETERY OR CREMATORY	23d LOCATION CITY OR TOWN / COUNTY / STATE
24 FUNERAL DIRECTOR NAME / ADDRESS		25a. DATE REC'D BY REGISTRAR	25b REGISTRAR'S SIGNATURE

TO MEDICAL EXAMINER: THIS CERTIFICATE SHOULD BE EXECUTED WITHIN 24 HOURS AFTER DEATH. IF ANY DELAY IS NECESSARY, PLEASE EXECUTE THE CERTIFICATE, WRITING THE WORD "PENDING" IN PENCIL IN ITEM 18. GIVE PAGES 1, 2, AND 3 TO THE FUNERAL DIRECTOR. PAGE 4 SHOULD BE FORWARDED TO THE CHIEF MEDICAL EXAMINER ALONG WITH FORM PM 3. RETAIN PAGE 5 FOR YOUR FILES. **TO FUNERAL DIRECTOR:** PAGE 3 SHOULD BE USED AS A BURIAL-TRANSIT PERMIT. PAGES 1 AND 2 SHOULD BE FILED, WITHIN 72 HOURS AFTER DEATH, WITH THE STATE DEPARTMENT OF HEALTH AND MENTAL HYGIENE, DIVISION OF VITAL RECORDS, 201 W. PRESTON STREET, BALTIMORE, MARYLAND, 21201 PRIOR TO BURIAL, CREMATION, OR REMOVAL.

DIVISION OF VITAL RECORDS, 201 W. PRESTON ST., BALTIMORE, MD. 21201

17 84 SM BP_____

DHMH - 17 (VR A15 ME (5))

G1

Appendix H:

Data Elements OCME and Workers Compensation Databases

Data Elements Workers Compensation & OCME databases

Workers Compensation
First Report of Injury

Employee Name
Date of Birth Social Security Number
Sex
Address
Date of Hire
Occupation/Job Title
Days worked/week
Industry Code
Date/time of injury
Type of injury
Location of injury
Specific activity employee engaged in
Describe sequence of events
Were safeguard/safety equipment provided Y/N
Were they used Y/N

OCME
Investigation Report – fields requested

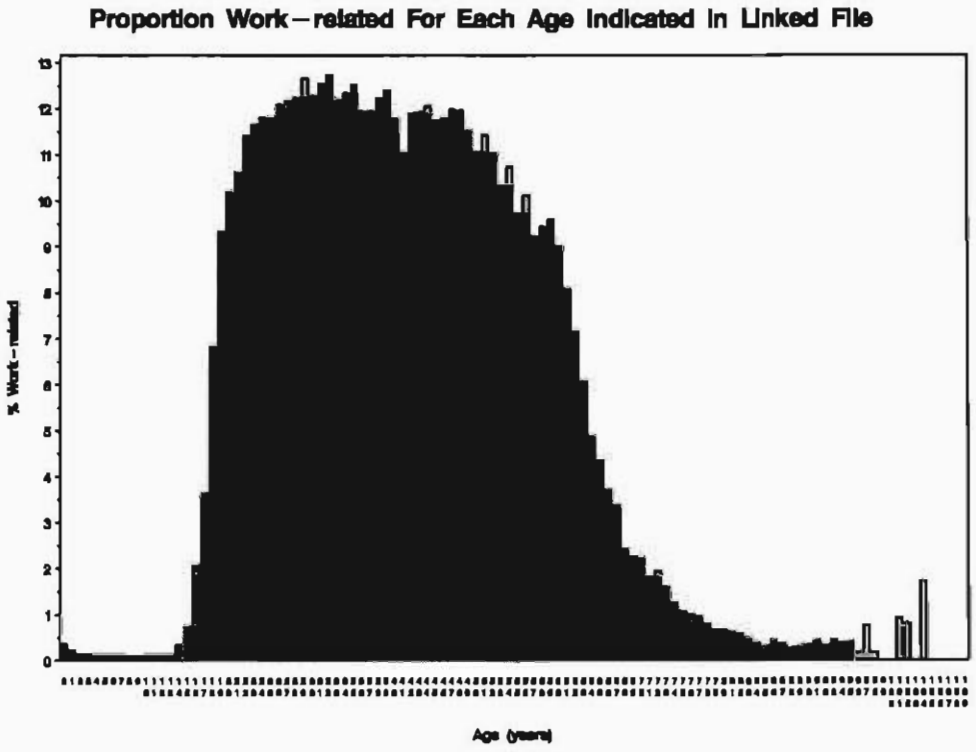
Case Number
Name
Age Date of Birth
Sex Race
Address
Jurisdiction
Associated cases and case numbers
Date time of incident and death
Cause of death Manner of death
Location of original incident
Activity of decedent
Agent causing death
Work-relatedness:
Did incident/injury leading to death occur while:
at work
at usual workplace
driving related to work duties
commuting to or from work
Occupation
Is this different from normal occupation
Business/industry

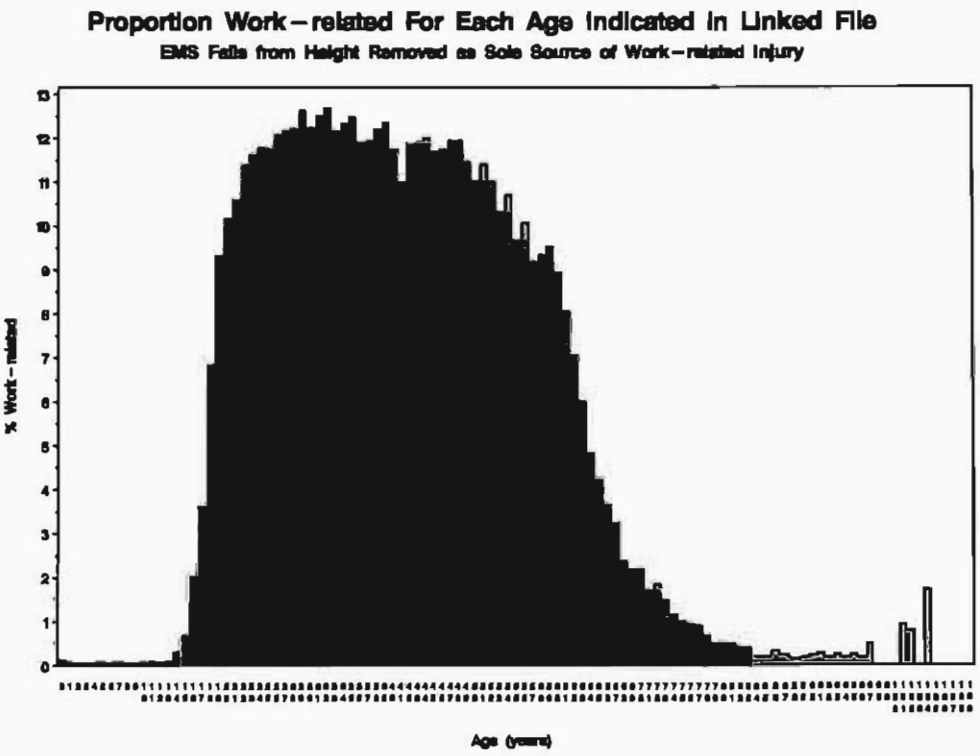
Appendix I:

Figure 2 Expanded

(showing effect of excluding
EMS falls more than 15ft from criteria
for work-relatedness)

Figure 2: Proportion Work-related For Each Age Indicated in Linked File





Appendix J:

Chart Review Abstraction Form.

(Used for community hospital and trauma center data abstraction)

Data Abstraction Form

Hospital Number: _____
Medical Record Number: _____ (ID number on the printed list)
Admission Date and Time: _____

If bolded items are yes, which source was it verified through? (Check all that apply)

☐ Nursing Notes ☐ Doctor Notes
☐ Financial Records ☐ Other: _____

CRITERIA	Work-related YES	NO
On Employer Premises		
• **Engaged in work activity, apprentice, vocational training (work-related)**		
• **On break, in hallways, rest room, cafeteria, storage area (work-related)**		
• **In employer parking lots while working, arriving, or leaving (work-related)**		
• Engaged in recreational activities on employer controlled facilities (games, etc.) for personal enjoyment **(not considered work-related)**		
• As a visitor for non-work purposes, not on official business **(not considered work-related)**		
Off Employer Premises		
• **Working for pay or compensation, including at home (work-related)**		
• **Working as a volunteer EMS, firefighter, or law enforcement officer (work-related)**		
• **Working in a family business, including family farm. Activity should be clearly related to a profit-oriented business.** (work-related)		
• **Traveling on business, including to and from customer/business contacts (work-related)**		
• **Engaged in work activity where vehicle is considered the work environment (e.g., taxi driver, truck driver, etc.) (work-related)**		
• Homemaker working at homemaking activities **(not considered work-related)**		
• Working for self – non profit, i.e., mowing lawn, repairing own roof hobby, or recreation activities **(not considered work-related)**		
• Student engaged in school activities (not **considered work-related)**		
• Operating vehicle (personal or commercial) for non-work purposes **(not considered work-related)**		
• Commuting to or from work site **(not considered work-related)**		

Employment Information
Company: _____
Occupation / Job Title: _____
Description *(Include details to aid in the coding of industry and occupation)*:
_____
_____
_____
_____

After Abstraction coding: Work-related Status

1 Work-related
2 Not work-related
3 Possibly work-related
4 Unknown
• Chart not located

Appendix K:

Enrollment Screening Tool

NIOSH – Recruitment Screening Tool (041905)

STC #_____

MR# _____

Screening Date: ___/__ ___/__ ___

Yes	No	Inclusion Criteria
		Occupational Injury (One of the following must be yes)
		On Employer Premises, 1) engaged in work activity, apprentice, vocational training
		2) On break, in hallways, rest room, cafeteria, storage area
		3) In employer parking lots while working, arriving or leaving
		Off Employer Premises, 1) Working for pay or compensation, including at home
		2) Working as a volunteer EMS, firefighter, or law enforcement officer
		3) Working in a family business, including family farm. Activity should be clearly related to a profit oriented business.
		4) Traveling on business, including to and from customer/business contacts
		5) Engaged in work activity where vehicle is considered the work environment (e.g., taxi driver, truck driver, etc.)
		Cognitively Intact (Score 8 or higher on Mini-Mental Exam Below)
		English/Spanish Speaking

Yes	No	Exclusion Criteria
		Non-Occupational Injury (If subject describes any of the following, the injury is non-work related)
		On Employer Premises, 1) Engaged in recreational activities on employer controlled facilities (games, etc.) for personal enjoyment
		2) As a visitor for non-work purposes, not on official business
		Off Employer Premises, 1) Homemaker working at homemaking activities
		2) Working for self – non profit, i.e., mowing lawn, repairing own roof, hobby or recreation activity
		3) Student engaged in school activities
		4) Operating vehicle (personal or commercial) for non-work purposes
		5) Commuting to or from work site.
		Not - Cognitively Intact (Score 7 or less on Mini-Mental Exam Below)
		Non-English/Spanish Speaking What Language? _____

NIOSH – Recruitment Screening Tool (041905)

STC #_____

MR# _____

Screening Date: ___/__ ___/___ ___

Evaluation to Sign Informed Consent: (Each correct response is scored as 1 point). The subject must score 8/10 correctly to proceed with the consent process.

What is the…	Points
1. Year: ___ ___ ___ ___	1
2. Season: _____	1
3. Date: ___ ___/___ ___/___ ___	1
4. Day: _____	1
5. Month: _____	1
Where are we …	
6. State _____	1
7. County _____	1
8. Town or City _____	1
9. Hospital _____	1
10. Floor _____	1
	Total Score: ___

For use during screening of subjects:

Reviewed and subject acceptable for study: ___ **NO**
___**YES Recruited** **Study #** ____
___**Yes but not recruited** **(reason)** _____

_____ _____
Signature of Person conducting screen Date

_____ _____
Signature of Principal Investigator Date

UMB IRB Protocol #: H21442

Comments:

K2

Appendix L:

Subject Interview Form

(Version 5, 2/3/05)

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200_
Interviewer: KA// _ _

A. DEMOGRAPHICS

A.1 Age: ___ ___ in years

A.2 Sex:
☐ 1. Male
☐ 2. Female

A.3 Do consider yourself to be Hispanic? *(Includes: Puerto Rican, Cuban/Cuban American, Dominican (Republic), Mexican, Mexican American, Central or South American, Other Latin American, Other Hispanic/Latino)*
☐ 1. Yes
☐ 2. No

A.4 What race do you consider yourself to be? (check all that apply)
☐ 1. White
☐ 2. Black/African American
☐ 3. Am. Indian/ Alaska Native
☐ 4. Asian
☐ 5. Native Hawaiian/Pacific Islander
☐ 88. Other, Specify _____
☐ 97. Don't Know
☐ 99. Refused

A.5 What is your home zip code?: ___ ___ ___ ___ ___ - ___ ___ ___ ___ (zip +4)

A.6 Are you now married, widowed, divorced, separated, never married, or living with a partner?

☐ 1. Married
☐ 2. Widowed
☐ 3. Divorced
☐ 4. Separated
☐ 5. Never Married
☐ 6. Living with a partner
☐ 97. Don't Know
☐ 99. Refused

A.7 What is the HIGHEST level of school you have completed or the highest degree you have received?

☐ 1. Eighth grade or less
☐ 2. Some high school (9^{th}, 10^{th}, 11^{th}, 12^{th} grade, no diploma)
☐ 3. High school graduate
☐ 4. GED or equivalent
☐ 5. Some technical school
☐ 6. Technical school graduate
☐ 7. Some college
☐ 8. College graduate
☐ 9. Postgraduate or professional degree
☐ 97. Don't Know
☐ 99. Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

A.8 Where were you born?

☐ 1.USA **GO TO SECTION B**

☐ 2.Other, specify: _____ (see country code for data entry)

☐ 97. Don't know **GO TO SECTION B**

☐ 99. Refused **GO TO SECTION B**

A.9 About how long have you been in the United States?

___ ___ years
00 less than 1 year
01 – 94 years
95 +
97 Don't know
99 Refused

a. If less than 1 year, how many months ___ ___ months

Industry and Occupation Coding

NAICS02 ___ ___ ___ ___ ___ ___

NAICS87 ___ ___ ___ ___ ___ ___

SIC ___ ___ ___ ___

SOC00 ___ ___ - ___ ___ ___ ___. ___ ___

Notes:

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

B. INJURY CIRCUMSTANCES

The next questions are about your injury and how you got hurt

B.1 Can you describe in your own words what happened? (e.g. How did you get hurt?)? Include what you were doing and any equipment or other factors that contributed to the injury.
Record all volunteered information.

Questions that may be asked to obtain additional information. PROBES	
➢ **How** did injury occur? (e.g. fall, mvc, shooting, stabbing, hitting, kicking, beating, etc.) ➢ What **specific task** were you performing at the time of injury (e.g. lifting, driving, climbing, operating machinery, etc…) ➢ Were you using or working any type of **equipment/tools** when you were injured or were you a driver or passenger in a motor vehicle ➢ What do you see as the **main causes** of your injury? ➢ **Where** were you when the injury occurred? (e.g. inside, building, parking lot/garage, street, public transportation, etc.) Need to be very specific. ➢ Were you **alone** when the incident occurred? ➢ Did **jewelry or clothing** contribute to the injury? If so how and what. ➢ "Did a **medical condition** contribute to you being injured?" i.e., seizure, blackout, dizziness, falling asleep, effects of a medication(s), diabetes (low sugar/insulin reaction). ➢ Do you work at **another job** besides this one? ➢ **Residential** or **commercial** location?	
Summary Review: *Review the main points of the summary with the subject. Ask if you missed any important details. Ask respondent to expand on parts that are unclear. Use another piece of paper if needed. Using the information provided, verify the answers to the following items.*	

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

THIS SPACE IS FOR DRAWING PICTURES RELATED TO INJURY CIRCUMSTANCES

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

B.2 When did you *start work* (include all your jobs)?

Date: ___ ___/___ ___/___ ___
mm dd yy

Time: ___ ___ : ___ ___ (00:00 thru 23:59)

B.3 At what *time of day* were you *injured*? ___:___ 00:00 thru 23:59

B.4 Date of Injury: ___ ___/___ ___/___ ___
mm dd yy

B.5 Computer calculation: Interval between starting work and injury

In the next set of questions, I will ask you more details about what happened both at the time of injury.

B.6 Were you performing your *normal work duties* or filling in for someone who was absent from work?
☐ 1. Performing normal work duties
☐ 2. Filling in for someone
☐ 88. Other, specify: _____
☐ 97. Don't know
☐ 99. Refused

B.7 Not counting this injury, how many times this week did you do the same task you were doing when you got hurt?
___ ___ times 97 = Don't know 99 Refused

B.8 Not counting this injury, how many times in the last month did you do the same task you were doing when you got hurt?
___ ___ times 97 = Don't know 99 Refused

B.9 Was your work task *unusual or uncommon* in anyway at the time of injury? For example, were you repairing a machine or using an unusual tool? *(Note: Unusual or common = less than once per month)*
☐ 1. Yes *Go to 9.a*
☐ 2. No
☐ 97. Don't know
☐ 99. Refused

a. Describe what was unusual about the task?_____

_____

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

B.10 Was your ***work method*** or work practice ***different from usual*** at the time of injury? For example, did your work require you to switch the way you regularly do your job or change hands?

☐ 1. Yes *Go to 10.a*
☐ 2. No
☐ 97. Don't know
☐ 99. Refused

*a. Describe how it was unusual.*_____

A few questions about how you were feeling when you were injured...

B.11 Were you rushed for any reason at the time of the injury?
☐ 1. Yes *Go to 11.a*
☐ 2. No *Go to 12*
☐ 97. Don't know *Go to 12*
☐ 99. Refused *Go to 12*

a. What caused you to rush?

_____

B.12 How many times per week or month on average are you rushed at work?

___ ___ times ☐ Week ☐ Month 97. Don't Know
99. Refused

B.13 How long are you usually rushed at work?

___ ___ ___ minutes ___ ___ ___ hours 997. Don't Know
999. Refused

B.14 Were you tired at the time of the injury?
☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

B.15 Were you hungry?
☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

B.16 Just before your injury, were you feeling stressed?

☐ 1. Yes *Go to 16.a*
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

a. What was stressful at that time? _____

B.17 On the day that you were injured, was there anything going on in your life that was different from usual, either good or bad? This could be at your workplace, in your personal life or about your family.

☐ 1. Yes *Go to 17.a*
☐ 2. No
☐ 97. Don't know
☐ 99. Refused

a. What was unusual about that day?

_____

B.18 I'm now going to read you a series of statements about your job and I want you to tell me if you strongly agree, somewhat agree, somewhat disagree, or strongly disagree with each statement.

	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree
	1	2	3	4
a. I have the freedom to decide what I do on my job.	☐	☐	☐	☐
b. My job requires that I work very fast.	☐	☐	☐	☐
c. It is basically my own responsibility to decide how my job gets done.	☐	☐	☐	☐
d. My job requires that I work very hard.	☐	☐	☐	☐
e. I have a lot of say about what happens on my job.	☐	☐	☐	☐
f. I never seem to have enough time to get everything done on my job.	☐	☐	☐	☐

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

Note: Use the information in the narrative to answer B19-B27. If the information was not provided in the narrative, please ask the questions.

B.19 Where were you when the injury happened? Please be very specific :

☐ 1. **House** *(Apartment; Boarding house; Farm house; Home premises; House (residential); Noninstitutional place of residence; Private: Driveway, garage, garden, home walk, swimming pool in private house or garden)*
Check if....
☐ Inside
☐ Outside

☐ 2. **Farm** *(Farm: buildings, land under cultivation)*

☐ 3. **Mine / quarry** *(Gravel pit; Sand pit; Tunnel under construction)*

☐ 4. **Industrial place / premises** includes construction *(Building under construction; dockyard; drydock; Factory: building, premises; Garage(place of work); Industrial yard; Loading platform (factory/store); Plant, industrial; Railway yard; Shop (place of work); Warehouse; Workhouse)*
Check if....
☐ Construction Area

☐ 5. **Place for recreation and sport** *(Amusement park; Baseball field; Basketball court; Beach resort; Cricket ground; Fives court; Football field; Golf course; Gynasium; Hockey field; Holiday camp; Ice palace; Lake resort; Mountain resort; Playground, including school playground; public park, Racecourse, Resort NOS, Riding School; Rifle range; Seashore resort; Skating rink; Sports ground; Sports palace; Swimming pool, public; Tennis court, Vacation resort*
Check if....
☐ Sport facility, athletic field or playground, park/recreation area (fields bike or jog path)

☐ 6. **Street / highway**

☐ 7. **Public building** *(Includes adjacent grounds) – airport; bank; café; casino; church; cinema; clubhouse; courthouse; courthouse; dance hall; garage building (for car storage); hotel; market (grocery or other commodity); movie house; music hall; nightclub; office; office building; opera house; post office; public hall; radio broadcasting station; restaurant; school (state, public, private); shop, commercial; station (bus, railway); store; theater*
Check if....
☐ School (non-residential)
☐ Child care center or Preschool
☐ Trade and service areas (shopping center, restaurant, store, bank, gas station)

☐ 8. **Residential Institution** *(Children's home; Dormitory; Hospital; Jail; Old people's home; Orphanage; Prison; Reform school*
Check if....
☐ Health care facility (Hospital)

☐ 9. **Other specified place** *(Beach NOS; Canal; Caravan site NOS; Derelict House; Desert; Dock; Forest; Harbor; Hill; Lake NOS; Mountain; Parking lot; Parking place; Pond or pool (natural); Prairie; Public place NOS; Railway line; Reservoir; River; Sea; Seashore NOS; Stream; Swamp; Trailer court; Woods*

Specify: _____
Check if....
☐ Parking lot
☐ Outside
☐ River, Lake, Stream, Ocean

☐ 10. **Unspecified place**

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

B.20 Were other people injured in this incident?

☐ 1. Yes *Go to 20.a*
☐ 2. No
☐ 97. Don't know
☐ 99. Refused

a. If yes, how many? ___ ___ ___ (001-995) 997 Don't know 999 Refused

B.21 For construction/remodeling workers: Were you working in/on …

☐ 0. Not construction/remodeling worker
☐ 1. Single-family home
☐ 2. High-rise apartments
☐ 3. High-rise office or commercial building
☐ 4. Low-rise housing with many families such as townhouses
☐ 5. Low-rise commercial building
☐ 97. Don't Know
☐ 99. Refused

B.22 Did a medical condition contribute to you being injured, i.e. seizure, blackout, dizziness, falling asleep, effects of medication(s), diabetes(low sugar/insulin reaction).

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

B.23 Were you alone when the incident occurred?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

B.24 Did the direct actions of a co-worker, customer or someone else contribute to, or cause your injury?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

B.25 Please describe your body movement or position just before you were injured.
Were you **Read the following list** : *Check all that apply)*

☐ 1. Walking
☐ 2. Crawling
☐ 3. Running
☐ 4. Standing
☐ 5. Kneeling
☐ 6. Bending or twisting
☐ 7. Climbing up to
☐ 8. Climbing down from
☐ 9. Jumping up to
☐ 10. Jumping down from
☐ 11. Squatting
☐ 12. Sitting
☐ 13. Reaching/Stretching
☐ 14. Lifting
☐ 15. Pushing/Pulling
☐ 16. Reclining
☐ 17. Driving *(Note: Sitting is assumed so there is no need to check both)*
☐ 88. Other, specify:_____
☐ 97. Don't Know
☐ 99. Refused

B.26 Intent: (*The role of human intent in the occurrence of the injury incident)*

☐ 1. Unintentional (accidental)
☐ 2. Intentional self-harm (suicide, attempted suicide)
☐ 3. Assault (interpersonal violence) *Go to 26.d*
☐ 4. Undetermined (awaiting results of investigation)
☐ 88. Other

☐ a. Legal interventions
☐ b. Operations of war and civil insurrection
☐ c. Specify: _____

☐ 97. Don't Know

If assault .....

d. What was the intent/relationship to perpetrator ?

☐ 1. Criminal Intent (Type I)
☐ 2. Customer/Client (Type II)
☐ 3. Worker on Worker (Type III)
☐ 4. Personal Relationship (Type IV)
☐ 97. Don't Know
☐ 99. Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

B.27 Mechanism of Injury: (Check the first appropriate box which describes the cause of the person's injury/poisoning) If more than one mechanism, record the one that precipitated the injury.

Number	MECHANISM	GO TO SECTION	Page
☐1	Animal or Insect	D	15
☐2	Choking or hanging / suffocation	K	28
☐3	Crushed	C	12
☐4	Near-drowning	K	28
☐5	Fall	E	16
☐6	Fire, flames or heat (Fire/burn/scald related)	F	20
☐7	Gun shot (Firearm), **Intentional**	I	26
☐8	Gun shot (Firearm), **Unintentional**	I	26
☐9	Overexertion/strenuous movements	K	28
☐10	Poisoning (Carbon Monoxide, Smoke Inhalation, Chemical, Drug)	G	21
☐11	Sexual Assault	J	27
☐12	Stab or cut (Cut/ Pierce), **Intentional**	C	12
☐13	Stab or cut (Cut/ Pierce), **Unintentional**	C	12
☐14	Struck/hit by object , **Intentional**	C	12
☐15	Struck/hit by object , **Unintentional**	C	12
☐16	Struck/hit by person, **Intentional**	I	26
☐17	Struck/hit by person, **Unintentional**	I	26
☐18	Transportation (motor vehicle/bicycle/motorcycle/pedestrian/train/boat/tractor/airplane, etc.)	H	22
88	Other, specify: _____	K	28
97	Don't Know	K	28
99	Refused	K	28

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

C. MACHINERY (For: *Crushed, Stab or Cut Unintentionally, Struck or Hit by Object)*

C.1 Was your injury *(struck/hit by object; crush, stab or cut)* caused by *[machinery/tool/equipment/part]*?

☐ 1. Yes *Go to 2*
☐ 2. No *Go to Section I page 26*

C.2 What type of [*machine/tool/equipment/part*]? _____

C.3 If applicable, object causing injury:

☐ 0. N/A
☐ 1. Nail
☐ 2. Wire
☐ 3. Hand tool, specify _____
☐ 4. Large machine, specify _____
☐ 5. Vehicle (forklift, tractor, car, etc.)
☐ 88. Other, specify: _____
☐ 97. Don't Know
☐ 99. Refused

C.4 Did the [*machine/tool/equipment/part*] that you were using at the time of injury perform any differently from usual – malfunction, jam or get stuck at the time of the injury ?

☐ 1. Yes *Go to 4.a*
☐ 2. No *Go to 5*
☐ 97. Don't know *Go to 5*
☐ 99. Refused *Go to 5*

a. [*If not already captured*] Describe how the [*machine/tool/equipment/part*] performed differently.

_____

_____

C.5 How many times per week or month on average does [*machine/tool/equipment/part*] perform differently from usual, e.g. malfunction or jam? *To clarify: the object they were working with when hurt.*

___ ___ times ☐ Week ☐ Month 96. Not Applicable
97. Don't Know
99. Refused

C.6 How long does your [*machine/tool/equipment/part*] perform differently from normal – malfunction, jam or get stuck?

___ ___ ___ minutes ___ ___ ___ hours 996. Not Applicable
997. Don't Know
999. Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

C.7 Were your work materials or products different from usual at the time of the injury? For example were your work materials/products different in quality or shape or rougher than usual?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

C.8 How many times per week or month on average are your work materials different from usual, e.g. in quality or shape?

___ ___ times ☐ Week ☐ Month 97. Don't Know
99. Refused

C.9 How long on average does your work material differ in quality?

___ ___ ___ minutes ___ ___ ___ hours 997. Don't Know
999. Refused

C.10 Did this equipment have some type of safety device to help prevent the type of injury you received? For example, a safety shield or automatic shut-off device?

☐ 1. Yes *Go to 10.a*
☐ 2. No *Go to 11*
☐ 97. Don't Know *Go to 11*
☐ 99. Refused *Go to 11*

a. If yes, what?
☐ 1. Automatic shut-off
☐ 2. Passive shield/guard
☐ 88. Other, specify _____
☐ 97. Don't Know
☐ 99. Refused

C.11 Were you maintaining or repairing machinery at the time of injury?

☐ 1. Yes *check if ... maintaining* ☐ *repairing* ☐
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___ / ___ ___ /200__
Interviewer: KA// ___

Note: Use the information in the narrative to answer the following question. If the information was not provided in the narrative, please ask the questions.

C.12 Did any of the following contribute to your injury?

	(1) Yes	(2) No	(97) Don't Know	(99) Refused/ Missing
Clothing	☐	☐	☐	☐
Jewelry	☐	☐	☐	☐
Hair	☐	☐	☐	☐

If Intentional Injury Go to Section J -- Page 27

If Unintentional Injury Go to Section K -- Page 28

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Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

D. ANIMAL or INSECT INJURIES

D.1 What animal injured you?

- ☐ 1. Cat
- ☐ 2. Dog
- ☐ 3. Horse
- ☐ 4. Insect
- ☐ 5. Rodent
- ☐ 6. Snake/Reptile
- ☐ 88. Other, specify: _____
- ☐ 97. Don't know
- ☐ 99. Refused

Go to Section K – Page 28

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Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

E. FALLS

E.1 What caused you to fall? Was it due to:

- ☐ 1. Slipping, tripping or stumbling
- ☐ 2. Jumping or diving
- ☐ 3. Collision with/pushing, shoving by another person
- ☐ 4. Loss of balance/dizziness/becoming faint/ seizure
- ☐ 88. Other, specify: _____
- ☐ 97. Don't know
- ☐ 99. Refused

E.2 Did you fall to the same level, fall to a lower level or did you fall on stairs or steps?

- ☐ 1. Same Level *Go to 4*
- ☐ 2. Lower Level *Go to 3*
- ☐ 3. Stairs/ Steps *Go to 3*
- ☐ 97. Don't Know
- ☐ 99. Refused

E.3 How far did you fall, that is from the working surface to surface you landed on?

__ __ feet __ __ inches OR ___ ___ ___ STORIES

If the answer is in STORIES, how many feet would you estimate were in each story? ___ ___*feet*

If stairs or steps go to 5

E.4 What surface did you fall from or through?

- ☐ 1. Scaffold
- ☐ 2. Ladder *Go to 4.a*
- ☐ 3. Roof
- ☐ 4. Floor
- ☐ 5. Vehicle, Machinery, or Equipment (Include truck, mounted aerial platforms and buckets)
- ☐ 6. Loading Dock, Deck or Porch
- ☐ 7. Walkway or Catwalk
- ☐ 8. Piled or Stacked Material
- ☐ 9. Ground level to lower level
- ☐ 10. Tree
- ☐ 88. Other, specify: _____
- ☐ 97. Don't Know
- ☐ 99. Refused

a. What kind of ladder was it?

☐ 1. Stepladder
☐ 2. Straight or straight extension ladder (can be moved from place to place)
☐ 3. Straight ladder (permanently attached)
☐ 4. Movable wooden ladder built by workers on-site to allow them to go from one level to another
☐ 5. Other (SPECIFY:_____)
☐ 97. Don't Know
☐ 99. Refused

E.5 Were you going down the stairs, up the stairs or were you working from the stairs when you fell?
☐ 0. Not Working on stairs
☐ 1. Going down the stairs
☐ 2. Going up the stairs
☐ 3. Working from the stairs
☐ 88. Other, specify: _____
☐ 97. Don't Know
☐ 99. Refused

E.6 Did any of the following conditions on the working surface contribute to your fall?

	(1)YES	(2)NO	(97)DK	(99)REFUSED
Water	☐	☐	☐	☐
Frost, snow or ice	☐	☐	☐	☐
Mud	☐	☐	☐	☐
Grease or oil	☐	☐	☐	☐
Tools or debris	☐	☐	☐	☐
Bolts or nails protruding through the surface	☐	☐	☐	☐
Other, specify	☐	☐	☐	☐

E.7 Did any of the following environmental conditions contribute to your fall?

	(1)YES	(2)NO	(97)DK	(99)REFUSED
Raining or snowing	☐	☐	☐	☐
Windy	☐	☐	☐	☐
Foggy	☐	☐	☐	☐
Glaring sunlight	☐	☐	☐	☐
Tools or debris	☐	☐	☐	☐
Dim light or darkness	☐	☐	☐	☐
Wind	☐	☐	☐	☐
Other, specify	☐	☐	☐	☐

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

E.8 What surface did you land on?

☐ 1. Scaffold
☐ 2. Ladder
☐ 3. Roof
☐ 4. Floor
☐ 5. Stairs or Steps
☐ 6. Vehicle, Machinery or Equipment
☐ 7. Loading Dock, Deck, or Porch
☐ 8. Walkway or Catwalk
☐ 9. Piled or Stacked Material
☐ 10. Ground Level
☐ 11. Rebar
☐ 88. Other, specify:_____
☐ 97. Don't Know
☐ 99. Refused

E.9 What was the surface that you landed on made of?

☐ 1. Dirt ☐ Check if Dirt was frozen
☐ 2. Grass ☐ Check if Grass was frozen
☐ 3. Gravel
☐ 4. Concrete
☐ 5. Asphalt
☐ 6. Wood
☐ 7. Metal
☐ 8. Rock
☐ 88. Other, specify:_____
☐ 97. Don't Know
☐ 99. Refused

E.10 Did you strike or fall against any objects during your fall?

☐ 1. Yes *Go to 10.a*
☐ 2. No *Go to 11*
☐ 97. Don't Know *Go to 11*
☐ 99. Refused *Go to 11*

a. What did you strike or fall against? _____

E.11 On the day of your fall, were guard rails, barricades, warning lines or safety monitors provided to prevent your fall?

☐ 1. Yes *Go to 11.a*
☐ 2. No *Go to 12*
☐ 97. Don't Know *Go to 12*
☐ 99. Refused *Go to 12*

a. At the time of your fall, was any part of this equipment temporarily removed or this procedure temporarily not being used?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

E.12 At the time of your fall, were catch platforms or safety nets set up to limit the distance a person could fall?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

E.13 At the time of the fall, were you tied off with a safety rope or some other type of fall protection equipment?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

Go to Section K – Page 28

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Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

F. FIRE/FLAMES/HEAT INJURIES

F.1 What was it that burned/scalded you? _____

If response is fire or smoke ask:

a. What caused the fire/smoke:
- ☐ 1. Cigarette, cigar, pipe
- ☐ 2. Cooking unit
- ☐ 3. Heater
- ☐ 4. Wiring
- ☐ 5. Motor vehicle battery caps, radiator caps
- ☐ 6. Fireworks
- ☐ 7. Other explosive specify: _____
- ☐ 8. Water or steam
- ☐ 9. Food
- ☐ 10. Chemicals
- ☐ 88. Other specify: _____
- ☐ 97. Don't know
- ☐ 99. Refused

Go to Section K -- Page 28

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Study # ___ ___ ___ ___
Interview Date: ___ ___ ___ ___/200__
Interviewer: KA// ___

G. POISONING

G.1 Did your poisoning result from:

- ☐ 1. A drug or medicinal substance used mistakenly or in overdose *Go to 1.a*
- ☐ 2. A harmful or toxic solid or liquid substance
- ☐ 3. Inhaling gases or vapors *Go to 1.b*
- ☐ 4. Eating a poisonous plant or other substance mistaken for food
- ☐ 5. A venomous animal or plant
- ☐ 6. A food poisoning
- ☐ 7. Allergic reaction
- ☐ 88. Other, specify : _____
- ☐ 97. Don't know
- ☐ 99. Refused

a. What was the agent / poison? _____

b. What was the source of the gases or vapors? _____

Go to Section K Page 28

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Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

H. TRANSPORTATION INJURIES

H.1 Were you injured as the driver of a vehicle, a passenger in a vehicle, a bicycle rider or a pedestrian?

- ☐ 1. driver of a vehicle — *Go to 2*
- ☐ 2. passenger in/on a vehicle — *Go to 1.a*
- ☐ 3. bicycle rider — *Go to 6*
- ☐ 4. pedestrian — *Go to 7*
- ☐ 97. Don't Know
- ☐ 99. Refused

a. Where were you riding?

- ☐ 1. Front seat
- ☐ 2. Back seat
- ☐ 3. Outside of cab
- ☐ 97. Don't know
- ☐ 99. Refused

H.2 What type of vehicle were you in?

- ☐ 1. Airplane — *Go to K – Page 28*
- ☐ 2. All terrain vehicle or ski/snow mobile — *Go to 5*
- ☐ 3. Boat — *Go to K – Page 28*
- ☐ 4. Bus — *Go to 3*
- ☐ 5. Farm Equipment (tractor) — *Go to 8*
- ☐ 6. Forklift — *Go to K – Page 28*
- ☐ 7. Large truck (Semitrailer truck, Delivery truck, Dump truck) — *Go to 2.b*
- ☐ 8. Light truck (including pickups, large cargo vans) — *Go to 2.a*
- ☐ 9. Motorcycle — *Go to 2.a*
- ☐ 10. Passenger car or minivan — *Go to 2.a*
- ☐ 11. Sport utility vehicle or utility vehicle — *Go to 2.a*
- ☐ 12. Train — *Go to K – Page 28*
- ☐ 88. Other, specify: _____ — *Go to K – Page 28*
- ☐ 97. Don't Know — *Go to K – Page 28*
- ☐ 99. Refused — *Go to K – Page 28*

a. Make, Model, Year of vehicle

1. Make: _____
2. Model: _____
3. Year: _____

If motorcycle go to 3

b. Were you wearing a seatbelt at the time of the injury?

- ☐ 1. Yes
- ☐ 2. No
- ☐ 97. Don't Know
- ☐ 99. Refused

c. Was the vehicle equipped with an airbag?

☐ 1. Yes	*Go to 2.c.i*
☐ 2. No	*Go to 3*
☐ 97. Don't Know	*Go to 3*
☐ 99. Refused	*Go to 3*

i. If yes, did the airbag deploy?
☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

H.3 Was this vehicle owned by the company you were working for at the time of your injury?
☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

H.4 Do you routinely drive as part of your job?

☐ 1. Yes	*Go to 6*
☐ 2. No	*Go to 6*
☐ 97. Don't Know	*Go to 6*
☐ 99. Refused	*Go to 6*

If injured on Motorcycle or Bicycle ask:

H.5 Were you wearing a helmet at the time of the injury?
☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

*If **driver** of motorcycle GO to 6, ELSE Go to Section K - Page 28*

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

H.6 I'd like to read a few things that some people have done while driving. For each one, please tell me if that is something your were doing just prior to your injury

	(1) Yes	(2) No	(97) Don't Know	(99) Refused
Tending to children – because they're unruly, need attention, etc.	☐	☐	☐	☐
Eating a meal or snack	☐	☐	☐	☐
Adjusting your vehicle's stereo or the climate control on the dashboard	☐	☐	☐	☐
Reading a road map, a newspaper, or some other publication	☐	☐	☐	☐
Dialing a cell phone or having a cell phone conversation while holding the phone	☐	☐	☐	☐
Talking with a passenger	☐	☐	☐	☐
Applying make-up, shaving or combing your hair	☐	☐	☐	☐
Preparing for work by reviewing notes, making lists, using a computer, etc.	☐	☐	☐	☐

Go to K – Page 28

H.7 What type of vehicle struck you? *(Pedestrians Only)*

☐ 1. Airplane
☐ 2. All terrain vehicle or ski/snow mobile
☐ 3. Boat (includes all on water vehicles)
☐ 4. Bus
☐ 5. Farm Equipment (tractor)
☐ 6. Forklift
☐ 7. Large truck (tractor trailer/semi)
☐ 8. Light truck (including pickups, vans and utility vehicles)
☐ 9. Motorcycle
☐ 10. Passenger car
☐ 11. Train
☐ 88. Other, specify: _____
☐ 97. Don't Know
☐ 99. Refused

Go to Section K – Page 28

H.8 Did the tractor overturn? *(Farm Equipment)*

☐ 1. Yes *Go to 8.a*
☐ 2. No *Go to K – Page 28*
☐ 97. Don't Know *Go to K – Page 28*
☐ 99. Refused *Go to K – Page 28*

a. If yes, was the tractor equipped with rollover protective equipment (rollbar, cage, etc.)

☐ 1. Yes	*Go to 8.a.i*
☐ 2. No	*Go to K – Page 28*
☐ 97. Don't Know	*Go to K – Page 28*
☐ 99. Refused	*Go to K – Page 28*

i. If yes, was it used?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

Go to Section K – Page 28

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Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

I. GUN SHOT (FIREARM) / STAB OR CUT / STRUCK HIT BY PERSON / STRUCK HIT BY OBJECT

I.1 What caused the injury? (ie, instrument, weapon, etc…)

☐ 1. Hands / fist
☐ 2. Feet / legs
☐ 3. Hand gun (pistol, revolver, etc)
☐ 4. Other gun (rifle, shotgun, etc.)
☐ 5. Knife
☐ 6. Baseball bat
☐ 7. Club / pipe
☐ 8. Other sharp object (scissors, ice pick, axe, etc.) specify: _____
☐ 9. Blunt object (rock, blackjack, etc) specify: _____
☐ 97. Don't Know
☐ 99. Refused

If Intentional Injury Go to Section J -- Page 27

If Unintentional Injury Go to Section K -- Page 28

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

J. INTENTIONAL INJURIES

J.1 Was the offender male or female?

- ☐ 1. Male
- ☐ 2. Female
- ☐ 97. Don't Know
- ☐ 99. Refused

J.2 Was the offender someone you knew or a stranger you had never seen before?

- ☐ 1. Known or seen before — *Go to 2.a*
- ☐ 2. Stranger — *Go to K – Page 28*
- ☐ 97. Don't know — *Go to K – Page 28*
- ☐ 99. Refused — *Go to K – Page 28*

a. If known or seen before, was this the only time this offender committed a crime against you or your household or made threats against you or your household?

- ☐ 1. Yes
- ☐ 2. No (there were other times)

Go to Section K Page 28

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Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

K. SAFETY/TRAINING

K.1 Before you were injured, did you know that you could be injured doing what you were doing?
☐ 1. Yes
☐ 2. No
☐ 3. Didn't think about it
☐ 99. Refused

K.2 Prior to your injury, had you received any instruction on how to avoid injury while doing this type of work?
☐ 1. Yes *Go to 2.a*
☐ 2. No *Go to 3*
☐ 97. Don't know *Go to 3*
☐ 99. Refused *Go to 3*

a. What did the training consist of?
☐ 1. General Safety
☐ 2. Specific to machine/equipment/task
☐ 3. Told to use caution
☐ 4. Not enough information
☐ 97. Don't know
☐ 99. Refused

b. Who provided the training? _____
☐ 1. Employer, not further specified
☐ 2. Manager/supervisor
☐ 3. Specific Office (Volunteer, Safety)
☐ 4. Co-workers
☐ 88. Other, specify _____
☐ 97. Don't Know
☐ 99. Refused

K.3 Do you use protective clothing/equipment/gear on your job? (safety glasses, helmet, safety belts, seatbelts, etc.)?

☐ 1. Yes *Go to 3.a*
☐ 2. No *Go to 5*
☐ 97. Don't Know *Go to 5*
☐ 99. Refused *Go to 5*

Study # __ __ __ __
Interview Date: __ __/__ __/200__
Interviewer: KA// __

a. What were you using?
b. Was it required for the job you were doing at the time of your injury?
c. What was its condition?

Equipment:	3a. Check if using protective clothing/ equipment/ gear at the time of injury	3b. Check if required of job at the time of your injury	3c. Condition of Equipment (3)Excellent	(2)Good	(1)Fair	(0)Poor
Apron	☐	☐	☐	☐	☐	☐
Face mask (respirator)	☐	☐	☐	☐	☐	☐
Fluorescent vest	☐	☐	☐	☐	☐	☐
Gloves	☐	☐	☐	☐	☐	☐
Hat	☐	☐	☐	☐	☐	☐
Helmet/Hardhat *Go to 4*	☐	☐	☐	☐	☐	☐
Jeans	☐	☐	☐	☐	☐	☐
Pot holder, mitts	☐	☐	☐	☐	☐	☐
Rubber soled shoes	☐	☐	☐	☐	☐	☐
Safety belts/harness	☐	☐	☐	☐	☐	☐
Safety Eyewear (glasses goggles)	☐	☐	☐	☐	☐	☐
Safety shoes / boots (steel-toed)	☐	☐	☐	☐	☐	☐
Seatbelt	☐	☐	☐	☐	☐	☐
Turnout Gear	☐	☐	☐	☐	☐	☐
Other, specify						
1.	☐	☐	☐	☐	☐	☐
2.	☐	☐	☐	☐	☐	☐
3.	☐	☐	☐	☐	☐	☐
4.	☐	☐	☐	☐	☐	☐

Go to 5 unless otherwise indicated.

K.4 Did the helmet or hardhat stay on when you were injured?

☐ 1. Yes *Go to 4.a*
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

a. Did the helmet or hardhat have a chinstrap?

☐ 1. Yes *Go to 4.b*
☐ 2. No *Go to 5*
☐ 97. Don't Know *Go to 5*
☐ 99. Refused *Go to 5*

b. Was the chinstrap fastened?

☐ 1. Yes *Go to 5*
☐ 2. No *Go to 5*
☐ 97. Don't Know *Go to 5*
☐ 99. Refused *Go to 5*

K.5 Was there adequate lighting for the task involved? *(If injured outdoors at night or while indoors)*

☐ 0 Not Applicable
☐ 1. Yes
☐ 2. No
☐ 97. Don't know
☐ 99. Refused

K.6 If outside, what were the weather conditions? (Check all that apply)

☐ 0. Not applicable, working indoors
☐ 1. Clear or sunny
☐ 2. Cloudy
☐ 3. Foggy
☐ 4. Raining
☐ 5. Sleeting
☐ 6. Snowing
☐ 7. Windy/Breezy
☐ 8. Moderate/Severe Winds
☐ 9. Cold
☐ 10. Warm/Hot
☐ 97. Don't Know
☐ 99. Refused

K.7 In your opinion, did the weather conditions contribute to your being injured?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

K.8 In your opinion, at the time of injury, did your employer provide all the necessary safety measures and/or equipment? (e.g. safety glasses, retaining walls, etc.)

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

K.9 Do you think that *this injury* could have been prevented in some way?

☐ 1. Yes	*Go to 9.a*
☐ 2. No	*Go to 10*
☐ 97. Don't Know	*Go to 10*
☐ 99. Refused	*Go to 10*

a. If yes, how could this injury have been prevented?

_____

K.10 Can you think of anything else to make this job safer *overall*?

_____

_____

K.11 Do you think you will be able to return to your same job?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

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Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

L. EMPLOYMENT

*The following questions refer to the job you were **working at the time of your injury.***

L.1 Which of the following best describes your job?
☐ 1. An employee of a PRIVATE company, business or individual for wages or commission?
☐ 2. A FEDERAL Government employee
☐ 3. A STATE government employee
☐ 4. A LOCAL government employee
☐ 5. Self-employed in OWN business, professional practice or farm
☐ 6. Working WITHOUT PAY in family business or farm
☐ 97. Don't Know
☐ 99. Refused

L.2 At the time of your injury, were you a member of a trade or labor union?
☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

L.3 At the time of your injury, for whom did you work? (Name of company, business, organization or employer)

Job or Business: _____

L.4 What kind of business or industry is this? (For example: TV and radio mgmt., retail shoe store, State Department of Labor)

Kind of Business: _____

L.5 What kind of work were you doing? (For example: farming, mail clerk, computer specialist)

Kind of Work: _____

L.6 What were your most important activities on this job or business? (For example: sells cars, keeps account books, operates printing press.) *(Tell me the 3 most important things you do)*

Task 1: _____

Task 2: _____

Task 3 _____

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

L.7 About how long have you worked at this job or business? *To Clarify: How much experience do you have with this type of work?*

Number: ___ ___ ___ (001 – 365) 997 Don't Know 999Refused

Time period:
☐ 1. Days
☐ 2. Weeks
☐ 3. Months
☐ 4. Years
☐ 97. Don't know
☐ 99. Refused

L.8 Are you paid by the hour on this job or business?
☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

L.9 Do you have paid sick leave on this job or business?
☐ 1. Yes
☐ 2. No
☐ 97. Don't know
☐ 99. Refused

L.10 Do you start work at about the same time every day?

☐ 1. Yes *Go to 10a*
☐ 2. No *Go to 11*
☐ 97. Don't know *Go to 11*
☐ 99. Refused *Go to 11*

a. What is the normal start time and finish time?
Start ___ ___ : ___ ___ (00:00 – 23:59)

Stop ___ ___ : ___ ___ (00:00 – 23:59)

Go to 12

L.11 Do you work rotating shifts or varying hours?

☐ 1. Yes *Go to 11.a*
☐ 2. No *Go to 12*
☐ 97. Don't know *Go to 12*
☐ 99. Refused *Go to 12*

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200___
Interviewer: KA// ___

a. Which shift were you working at the time of injury?

	(Using Military Time – 00:00 – 23:59) Start	Stop
☐ 1. Day shift	___ ___: ___ ___	___ ___: ___ ___
☐ 2. Afternoon shift	___ ___: ___ ___	___ ___: ___ ___
☐ 3. Evening shift	___ ___: ___ ___	___ ___: ___ ___
☐ 4. Night shift	___ ___: ___ ___	___ ___: ___ ___
☐ 5. 12 Hour Days		
☐ 6. 12 Hour Nights		
☐ 7. 24 Hour shift		
☐ 88. Other, specify: _____		
☐ 97. Don't know		
☐ 99. Refused		

b. How long had you been working on this particular shift?

Number: ___ ___ ___ (001 – 365) 997 Don't Know 999 Refused

Time period:
☐ 1. Days
☐ 2. Weeks
☐ 3. Months
☐ 4. Years
☐ 97. Don't know
☐ 99. Refused

c. How often do you change from one shift to another?

☐ 1. Days: ___
☐ 2. Weeks: ___
☐ 3. Months: ___
☐ 97. Don't know
☐ 99. Refused

d. I'm now going to ask you about the particular shifts through which you rotate. How many times per week or month do you work…

SHIFT	Number of Times	Week / Month	Start (00:00 – 23:59)	Stop (00:00 – 23:59)
… Day shift?	___	☐ Wk ☐ Mo	___ ___: ___ ___	___ ___: ___ ___
… Afternoon shift?	___	☐ Wk ☐ Mo	___ ___: ___ ___	___ ___: ___ ___
… Evening shift?	___	☐ Wk ☐ Mo	___ ___: ___ ___	___ ___: ___ ___
… Night shift?	___	☐ Wk ☐ Mo	___ ___: ___ ___	___ ___: ___ ___
… Other shift ? SPECIFY:	___	☐ Wk ☐ Mo	___ ___: ___ ___	___ ___: ___ ___

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

L.12 Were you working overtime or working an extra shift at the time of the injury? *To Clarify: For salaried people, more than usual number of hours.*

☐ 1. Yes *Go to 12a*
☐ 2. No *Go to 13*
☐ 97. Don't know *Go to 13*
☐ 99. Refused *Go to 13*

a. How many additional minutes or hours had you been working?

___ ___ ___ minutes ___ ___ ___ hours 997. Don't Know
999. Refused

L.13 How many times per week or month on average do you work overtime or an extra shift?

___ ___ times ☐ Week ☐ Month 97. Don't Know
99. Refused

L.14 On days that you work overtime or an extra shift, about how many minutes or hours of extra work do you do?

___ ___ ___ minutes ___ ___ ___ hours 997. Don't Know
999. Refused

L.15 About what time did you have your last work break before your injury?

Time ___ ___ : ___ ___ (00:00 – 23:59) ☐ Check if s. had not had break ☐ Check if no work breaks
Go to 16 if no work breaks

a. Computer calculation: Interval between last work break and injury.

b. Was this break at the usual time, earlier than usual or later than usual?
☐ 1. Usual Time
☐ 2. Earlier
☐ 3. Later
☐ 97. Don't know
☐ 99. Refused

L.16 Do your work breaks occur at fixed times or can you choose when to take them?
☐ 1. Fixed times
☐ 2. Can choose when to take them
☐ 3. Does not get a break
☐ 97. Don't know
☐ 99. Refused

L.17 How many days had you been working in a row (all jobs) before your last period of time off [*Include the day of the injury]* ?

___ ___ days 97 Don't know
99 Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

L.18 About how many hours had you worked at all jobs since your last period of time off *[Include the day of the injury]*?

Hours: ___ 97 Don't Know
99 Refused

L.19 How long were you off?

___ ___ ___. ___ ☐ Days ☐ Weeks 997 Don't Know
999 Refused

L.20 How many days in a row do you normally work before having a day or several days off from all jobs?

___ ___ ___ Days 997 Don't Know
999 Refused

L.21 How many days off do you normally have before going back to work at all jobs?

___ ___ ___ Days 997 Don't Know
999 Refused

L.22 Thinking about the particular location or facility where you work, how many people are employed there full and/or part time?

☐ 1. 1-9 employees
☐ 2. 10-24 employees
☐ 3. 25-49 employees
☐ 4. 50-99 employees
☐ 5. 100-249 employees
☐ 6. 250-499 employees
☐ 7. 500-999 employees
☐ 8. 1000 employees or more
☐ 97. Don't Know
☐ 99. Refused

L.23 Do you consider this to be your MAIN job?

☐ 1. Yes *Go to 24*
☐ 2. No *Go to 23.a*
☐ 97. Don't Know *Go to 24*
☐ 99. Refused *Go to 24*

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

a. Which of the following best describes your MAIN job?

☐ 1. An employee of a PRIVATE company, business or individual for wages or commission?
☐ 2. A FEDERAL Government employee
☐ 3. A STATE government employee
☐ 4. A LOCAL government employee
☐ 5. Self-employed in OWN business, professional practice or farm
☐ 6. Working WITHOUT PAY in family business or farm
☐ 97. Don't Know
☐ 99. Refused

b. For whom do you work at your MAIN job or business (Name of company, business, organization or employer)

Job or Business: _____

c. What kind of business or industry is this? (For example: TV and radio mgmt., retail shoe store, State Department of Labor)

Kind of Business: _____

d. What kind of work do you do? (For example: farming, mail clerk, computer specialist)

Kind of Work: _____

L.24 How many hours did you work LAST WEEK at ALL jobs or businesses?

___ ___ hours 00 Did not work
01-94
95 (for ≥ 95 hours)
97 Don't Know
99 Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

L.25 How many hours per week do you USUALLY work at ALL jobs or businesses?

___ ___ hours 01-94

95 (for ≥ 95 hours)

97 Don't Know
99 Refused

L.26 What is your best estimate of your earnings (include hourly wages, salaries, tips and commissions) before taxes and deductions from ALL jobs and businesses in the last year?

1☐ < $1,000	10☐$9K - $9,999	19☐$18K - $18,999	28☐$27K - $27,999	37☐$40K - $44,999
2☐$1K - $1,999	11☐$10K - $10,999	20☐$19K - $19,999	29☐$28K - $28,999	38☐$45K - $49,999
3☐$2K - $2,999	12☐$11K - $11,999	21☐$20K - $20,999	30☐$29K - $29,999	39☐$50K - $54,999
4☐$3K - $3,999	13☐$12K - $12,999	22☐$21K - $21,999	31☐$30K - $30,999	40☐$55K - $59,999
5☐$4K - $4,999	14☐$13K - $13,999	23☐$22K - $22,999	32☐$31K - $31,999	41☐$60K - $64,999
6☐$5K - $5,999	15☐$14K - $14,999	24☐$23K - $23,999	33☐$32K - $32,999	42☐$65K - $69,999
7☐$6K - $6,999	16☐$15K - $15,999	25☐$24K - $24,999	34☐$33K - $33,999	43☐$70K - $74,999
8☐$7K - $7,999	17☐$16K - $16,999	26☐$25K - $25,999	35☐$34K - $34,999	44☐>= $ 75,000
9☐$8K - $8,999	18☐$17K - $17,999	27☐$26K - $26,999	36☐$35K - $39,999	97☐Don't Know
				99☐Refused

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Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

M. INSURANCE

The next questions are about health insurance.

M.1 Are you covered by any kind of health insurance or some other kind of health care plan?

☐ 1.Yes	*Go to 1.a*
☐ 2.No	*Go to 2*
☐ 97. Don't know	*Go to 2*
☐ 99. Refused	*Go to 2*

a. What kind of health insurance or health care coverage do your have? (INCLUDE those that pay for only one type of service(nursing home care, accidents, or dental care, exclude private plans that only provide extra cash while hospitalized)).

☐ 1.Private health insurance plan from employer or workplace (can include spouses insurance)
☐ 2.Private health insurance plan purchased directly
☐ 3.Private health insurance plan through a state or local government or community program
☐ 4. Medicare
☐ 5. Medi-Gap
☐ 6. Medicaid
☐ 7. CHIP (Children's Health Insurance Program)
☐ 8. Military health care / VA
☐ 9. TRICARE/CHAMPUS/CHAMP-VA
☐ 10. Indian Health Service
☐ 11. State-sponsored health plan
☐ 12. Other government program
☐ 13. Single Service Plan (e.g., dental, vision, prescriptions)
☐ 88. Other, specify _____
☐ 97. Don't Know
☐ 99. Refused

M.2 Regarding your job or work last week, was health insurance offered to you through your workplace?

☐ 1. Yes
☐ 2. No
☐ 97. Don't know
☐ 99. Refused

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Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

N. HEALTH HISTORY

The next set of questions is about past injuries you may have had.

N.1 Please tell me, in the past 5 years, have you been admitted to a hospital for any injury?

☐ 1. Yes	*Go to 1.a*
☐ 2. No	*Go to 2*
☐ 97. Don't Know	*Go to 2*
☐ 99. Refused	*Go to 2*

a. If yes, how many times? ___ ___ ___ (enter 999 unknown)

N.2 In the past 3 months, have you had an injury for which you sought medical attention (including telephone advice)?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

N.3 How many times have you been injured on the job in the past 3 months?

___ ___ ___ times (000 –099) 997 Don't Know 999 Refused

The next set of questions focus on general information about you.

N.4 Are you left handed, right handed or able to use both hands equally well?

☐ 1. Left
☐ 2. Right
☐ 3. Both
☐ 97. Don't Know
☐ 99. Refused

N.5 How tall are you without shoes?

___ ___ ft (02 – 07) 97 Don't Know / 99 Refused
___ ___ inches (00-11)

data entry value inches: ___ ___

N.6 How much do you weigh without shoes?

___ ___ ___ lbs (050 – 500) 997 Don't Know / 999 Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

I'm now going to ask about your sleep before you went to work on the day of your injury.

N.7 What time did you go to sleep?

Date: ___ ___/___ ___/___ ___
mm dd yy

Time: ___ ___: ___ ___ (00:00 – 23:59)

N.8 What time did you wake up?

Date: ___ ___/___ ___/___ ___
mm dd yy

Time: ___ ___: ___ ___ (00:00 – 23:59)

Next our questions about how well you sleep. On a scale of 1 to 9, with 9 being the highest, please tell me.

	Extremely badly 1		Very badly 2		Fairly Badly 3		In Between 4 5 6		Fairly well 7	Very well 8	Extremely well 9
N.9 On a scale of 1 to 9, with 9 being the highest, how well did you sleep before you went to work on the day of your injury?	☐		☐		☐	☐	☐	☐	☐	☐	☐
N.10 How well do you usually sleep before you go to work?	☐		☐		☐	☐	☐	☐	☐	☐	☐

N.11 How much sleep do you usually *get* before going to work? ___ ___ . ___ hours

N.12 How much sleep do *you feel you normally need*? ___ ___ . ___ hours

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Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

N.13 Have you EVER been told by a doctor or other health professional that you had… ? If yes, do you take medications or use a medical device for these conditions? Take notes on what subject says.

	Condition			Medication/ Medical Device			Medication/ Medical Device Name	Notes
CHRONIC CONDITIONS	(1) Yes	(2) No	(99) Refused	(1) Yes	(2) No	(99) Refused		
Neurologic Disorders (Multiple Sclerosis, Parkinson's Disease, Peripheral Neuropathy, Narcolepsy, Cerebral Palsy, Muscular Dystrophy, Seizures/Epilepsy Laps of consciousness {black out, dizzy spells,}, Stroke, TBI, Hemiplegia, Paraplegia)	☐	☐	☐	☐	☐	☐		
Mental Health Disorders (Schizophrenia, Severe Anxiety Disorder, Depression, Manic Depression(Bi-Polar))	☐	☐	☐	☐	☐	☐		
Attention Deficit Disorder	☐	☐	☐	☐	☐	☐		
Eye Disorders (Visual disease not correctable with glasses/contacts, Visual Field Defect, Blindness, Cataracts, Glaucoma, Macular Degeneration, Night Blindness, Retinils Pigmentosa)	☐	☐	☐	☐	☐	☐		
Diabetes (Type I, Type II, Hypoglycemia)	☐	☐	☐	☐	☐	☐		
Cardiac Problems (Coronary Artery Disease, Myocardial Infarction{heart attack}, Cardiac Bypass {CABG, stent}, Arrhythmia{abnormal heart beats}	☐	☐	☐	☐	☐	☐		
Loss of Limb	☐	☐	☐	☐	☐	☐		
Other, specify	☐	☐	☐	☐	☐	☐		

These next questions are about your hearing.

N.14 Have you ever worn a hearing aid?

☐ 1. Yes
☐ 2. No
☐ 97. Don't know
☐ 99. Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

N.15 Which statement best describes your hearing without a hearing aid: good, a little trouble, a lot of trouble, deaf?

☐ 1. Good
☐ 2. A Little Trouble
☐ 3. A Lot of Trouble
☐ 4. Deaf
☐ 97. Don't know
☐ 99. Refused

The next set of questions are related to smoking.

N.16 Do you NOW smoke cigarettes every day, some days, or not at all

☐ 1. Every day *Go to 17*
☐ 2. Some days *Go to 18*
☐ 3. Not at all *Go to 19*
☐ 99. Refused *Go to 19*

N.17 On the average, how many cigarettes do you now smoke a day?

___ ___ cigarettes 01 – 94
95 (95 +)
97 Don't Know
99 Refused

N.18 Were you smoking at the time of your injury?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

These next questions are about drinking alcoholic beverages. Included are liquor such as whiskey or gin, beer, wine, wine coolers, and any other type of alcoholic beverage.

N.19 In any one year, have you had at least 12 drinks of any type of alcoholic beverage?

☐ 1. Yes *Go to 21*
☐ 2. No *Go to 20*
☐ 97. Don't Know *Go to 20*
☐ 99. Refused *Go to 20*

N.20 In your entire life, have you had at least 12 drinks of any type of alcoholic beverage?

☐ 1. Yes *Go to 21*
☐ 2. No *Go to 29*
☐ 97. Don't Know *Go to 29*
☐ 99. Refused *Go to 29*

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

N.21 In the PAST YEAR, how often did you drink any type of alcoholic beverage?

___ ___ ___ Number of Days per

000 Never	*Go to 29*
001- 365 days	*Go to 22*
997 Don't Know	*Go to 22*
999 Refused	*Go to 22*

Time Period
☐ 0. Never/None
☐ 1. Week
☐ 2. Month
☐ 3. Year
☐ 97. Don't Know
☐ 99. Refused

N.22 In the PAST YEAR, on those days that you drank alcoholic beverages, on the average, how many drinks did you have?

___ ___ drinks
01 – 94 drinks
95 95 and more
97 Don't Know
99 Refused

N.23 In the PAST YEAR, on how many DAYS did you have 5 or more drinks of any alcoholic beverage?

___ ___ ___ Number of Days per
000 Never
001- 365 days
997 Don't Know
999 Refused

Time Period
☐ 0. Never/None
☐ 1. Week
☐ 2. Month
☐ 3. Year
☐ 97. Don't Know
☐ 99. Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

Note: If answer yes to ever, ask within past 12 months.

		EVER				Within the past 12 months			
		Yes 1	No 2	Don't Know 97	Refused 99	Yes 1	No 2	Don't Know 97	Refused 99
N.24	Have you ever felt you should cut down on your drinking?	☐	☐	☐	☐	☐	☐	☐	☐
N.25	Have people annoyed you by criticizing your drinking?	☐	☐	☐	☐	☐	☐	☐	☐
N.26	Have you ever felt bad or guilty about your drinking?	☐	☐	☐	☐	☐	☐	☐	☐
N.27	Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover?	☐	☐	☐	☐	☐	☐	☐	☐

N.28 In the 24 hours (day or night) before you had your injury, did you drink any alcoholic beverage?

☐ 1. Yes *Go to 28.a*
☐ 2. No *Go to 29*
☐ 97. Don't Know *Go to 29*
☐ 99. Refused *Go to 29*

a. How many drinks did you have? ___ ___

b. When did you have your last drink?

Date: ___ ___/___ ___/___ ___
mm dd yy

Time: ___ ___: ___ ___ (00:00 – 23:59)

N.29 Have you ever used mood-altering substances? Including: Cocaine/crack, Marijuana/pot, Stimulants/uppers, LSD/mescaline, Tranquillizers not prescribed for you, Pain Killers not prescribed for you, Heroin/opiates, PCP, Sniff gases or fumes, Ecstasy, etc)

☐ 1. Yes *Go to 29.a*
☐ 2. No *Go to 34*
☐ 97. Don't Know *Go to 34*
☐ 99. Refused *Go to 34*

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200___
Interviewer: KA// ___

a. How often do you use these substances? illicit (ie. street) drugs? (Including: Cocaine/crack, Marijuana/pot, Stimulants/uppers, LSD/mescaline, Tranquilizers not prescribed for you, Pain Killers not prescribed for you, Heroin/opiates, PCP, Sniff gases or fumes, Ecstasy, etc)

- ☐ 0. Not currently using *Go to 34*
- ☐ 1. Less than monthly
- ☐ 2. Monthly
- ☐ 3. Weekly
- ☐ 4. Daily or almost daily
- ☐ 97. Don't know
- ☐ 99. Refused

Note: If answer yes to ever, ask within past 12 months.

		EVER				Within the past 12 months			
		Yes 1	No 2	Don't Know 97	Refused 99	Yes 1	No 2	Don't Know 97	Refused 99
N.30	Have you ever felt you should cut down on your drug use?	☐	☐	☐	☐	☐	☐	☐	☐
N.31	Have people annoyed you by criticizing your drug use?	☐	☐	☐	☐	☐	☐	☐	☐
N.32	Have you ever felt bad or guilty about your drug use?	☐	☐	☐	☐	☐	☐	☐	☐
N.33	Have you ever taken drugs first thing in the morning to get going or treat withdrawal symptoms?	☐	☐	☐	☐	☐	☐	☐	☐

Now I am going to ask you some questions about feelings you may have experienced the 30 days before you were injured.

N.34 During the 30 days before your injury, how often did you feel…

	(4) All of the time	(3) Most of the time	(2) Some of the time	(1) A little of the time	(0) None of the time	(97)Don't know	(99)Refused
a. … So sad that nothing could cheer you up?	☐	☐	☐	☐	☐	☐	☐
b. … Nervous?	☐	☐	☐	☐	☐	☐	☐
c. … Restless or fidgety	☐	☐	☐	☐	☐	☐	☐
d. … Hopeless	☐	☐	☐	☐	☐	☐	☐
e. … That everything was an effort?	☐	☐	☐	☐	☐	☐	☐
f. … Worthless?	☐	☐	☐	☐	☐	☐	☐

If the answers to a-f are none of the time. Skip to 36.

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200_
Interviewer: KA// ___

N.35 We just talked about a number of feelings you had during the Past 30 DAYS. Altogether, how MUCH did these feelings interfere with your life or activities: a lot, some, a little, or not at all?

☐ 1. A lot
☐ 2. Some
☐ 3. A little
☐ 4. Not at all
☐ 97. Don't Know
☐ 99. Refused

N.36 During the past month, have you often been bothered by feeling down, depressed or hopeless?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

N.37 During the past month, have you often been bothered by little interest or pleasure in doing things?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

N.38 During the 12 months before your injury, ABOUT how many days did you miss work at a job or business because of illness or injury (do not include maternity leave)?

___ ___ ___ days

000 None
001-365 days
997 Don't Know
999 Refused

N.39 During the 12 months before your injury, ABOUT how many days did illness or injury keep you in bed more than half of the day? (Include days while an overnight patient in a hospital)?

___ ___ ___ days

000 None
001-366 366 days
997 Don't Know
999 Refused

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Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

O. WORKERS COMPENSATION

This is the last section.

O.1 Do you plan/expect to have a Workers' Compensation claim submitted for your injury? (Note: Subject or employer could be filing claim)

☐ 1. Yes *Go to 2*
☐ 2. No *Go to 1.a*
☐ 97. Don't Know *Go to 3*
☐ 99. Refused *Go to 3*

a. If no, why won't a claim be submitted?

_____

O.2 Do you think you will need a lawyer to file your claim?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

O.3 Will you be able to receive any disability payments (income) through your employer?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

O.4 Were you injured at your main or only job or were you hurt at another job?

☐ 1. Main/only job
☐ 2. Other job
☐ 97. Don't know
☐ 99. Refused

This concludes our interview. Is there anything else about your injury that you would like us to know? Again thank you for your time and cooperation. The information you have provided is very valuable to us.

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Appendix M:

Telephone Interview Form
(abbreviated interview)

Occupational Injury Telephone Interview – Version 5 02/07/05

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

A. DEMOGRAPHICS

A.1 Age: ___ ___ in years

A.2 Sex:
☐ 1. Male
☐ 2. Female

A.3 Do consider yourself to be Hispanic? *(Includes: Puerto Rican, Cuban/Cuban American, Dominican (Republic), Mexican, Mexican American, Central or South American, Other Latin American, Other Hispanic/Latino)*
☐ 1. Yes
☐ 2. No

A.4 What race do you consider yourself to be? (check all that apply)
☐ 1. White
☐ 2. Black/African American
☐ 3. Am. Indian/ Alaska Native
☐ 4. Asian
☐ 5. Native Hawaiian/Pacific Islander
☐ 88. Other, Specify _____
☐ 97. Don't Know
☐ 99. Refused

A.5 What is your home zip code?: ___ ___ ___ ___ ___ - ___ ___ ___ ___ (zip +4)

A.6 Are you now married, widowed, divorced, separated, never married, or living with a partner?

☐ 1. Married
☐ 2. Widowed
☐ 3. Divorced
☐ 4. Separated
☐ 5. Never Married
☐ 6. Living with a partner
☐ 97. Don't Know
☐ 99. Refused

A.7 What is the HIGHEST level of school you have completed or the highest degree you have received?

☐ 1. Eighth grade or less
☐ 2. Some high school (9^{th}, 10^{th}, 11^{th}, 12^{th} grade, no diploma)
☐ 3. High school graduate
☐ 4. GED or equivalent
☐ 5. Some technical school
☐ 6. Technical school graduate
☐ 7. Some college
☐ 8. College graduate
☐ 9. Postgraduate or professional degree
☐ 97. Don't Know
☐ 99. Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

A.8 Where were you born?

☐ 1.USA **GO TO SECTION B**

☐ 2.Other, specify: _____ (see country code for data entry)

☐ 97. Don't know **GO TO SECTION B**

☐ 99. Refused **GO TO SECTION B**

A.9 About how long have you been in the United States?

___ ___ years

00 less than 1 year
01 – 94 years
95 +
97 Don't know
99 Refused

a. If less than 1 year, how many months ___ ___ months

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

A.10 About how long have you been in the United States?

___ ___ years
00 less than 1 year
01 – 94 years
95 +
97 Don't know
99 Refused

a. If less than 1 year, how many months ___ ___ months

THIS SPACE LEFT BLANK INTENTIONALLY

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

B. INJURY CIRCUMSTANCES

The next questions are about your injury and how you got hurt

B.1 Can you describe in your own words what happened? (e.g. How did you get hurt?)? Include what you were doing and any equipment or other factors that contributed to the injury.
Record all volunteered information.

Questions that may be asked to obtain additional information. PROBES	
➢ **How** did injury occur? (e.g. fall, mvc, shooting, stabbing, hitting, kicking, beating, etc.) ➢ What **specific task** were you performing at the time of injury (e.g. lifting, driving, climbing, operating machinery, etc…) ➢ Were you using or working any type of **equipment/tools** when you were injured or were you a driver or passenger in a motor vehicle ➢ What do you see as the **main causes** of your injury? ➢ **Where** were you when the injury occurred? (e.g. inside, building, parking lot/garage, street, public transportation, etc.) Need to be very specific. ➢ Were you **alone** when the incident occurred? ➢ Did **jewelry or clothing** contribute to the injury? If so how and what. ➢ "Did a **medical condition** contribute to you being injured?" i.e., seizure, blackout, dizziness, falling asleep, effects of a medication(s), diabetes (low sugar/insulin reaction). ➢ Do you work at **another job** besides this one? ➢ **Residential** or **commercial** location?	
***Summary Review**: Review the main points of the summary with the subject. Ask if you missed any important details. Ask respondent to expand on parts that are unclear. Use another piece of paper if needed. Using the information provided, verify the answers to the following items.*	

B.2

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

B.3 When did you *start work* (include all your jobs)?

Date: ___ ___/ ___ ___/___ ___
mm dd yy

Time: ___ ___ : ___ ___ (00:00 thru 23:59)

B.4 At what *time of day* were you *injured*? ___:___ 00:00 thru 23:59

B.5 Date of Injury: ___ ___/___ ___/___ ___
mm dd yy

B.6 Computer calculation: Interval between starting work and injury

B.7 Was your work task *unusual or uncommon* in anyway at the time of injury? For example, were you repairing a machine or using an unusual tool? *(Note: Unusual or common = less than once per month)*

☐ 1. Yes *Go to 2.a*
☐ 2. No
☐ 97. Don't know
☐ 99. Refused

a. Describe what was unusual about the task?_____

_____

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

Note: Use the information in the narrative to answer B3-B10. If the information was not provided in the narrative, please ask the questions.

B.8 Where were you when the injury happened? Please be very specific :

☐ 1. **House** *(Apartment; Boarding house; Farm house; Home premises; House (residential); Noninstitutional place of residence; Private: Driveway, garage, garden, home walk, swimming pool in private house or garden)*
Check if....
☐ Inside
☐ Outside

☐ 2. **Farm** *(Farm: buildings, land under cultivation)*

☐ 3. **Mine / quarry** *(Gravel pit; Sand pit; Tunnel under construction)*

☐ 4. **Industrial place / premises** includes construction *(Building under construction; dockyard; drydock; Factory: building, premises; Garage(place of work); Industrial yard; Loading platform (factory/store); Plant, industrial; Railway yard; Shop (place of work); Warehouse; Workhouse)*
Check if....
☐ Construction Area

☐ 5. **Place for recreation and sport** *(Amusement park; Baseball field; Basketball court; Beach resort; Cricket ground; Fives court; Football field; Golf course; Gynasium; Hockey field; Holiday camp; Ice palace; Lake resort; Mountain resort; Playground, including school playground; public park, Racecourse, Resort NOS, Riding School; Rifle range; Seashore resort; Skating rink; Sports ground; Sports palace; Swimming pool, public; Tennis court, Vacation resort*
Check if....
☐ Sport facility, athletic field or playground, park/recreation area (fields bike or jog path)

☐ 6. **Street / highway**

☐ 7. **Public building** *(Includes adjacent grounds) – airport; bank; café; casino; church; cinema; clubhouse; courthouse; courthouse; dance hall; garage building (for car storage); hotel; market (grocery or other commodity); movie house; music hall; nightclub; office; office building; opera house; post office; public hall; radio broadcasting station; restaurant; school (state, public, private); shop, commercial: station (bus, railway); store; theater*
Check if....
☐ School (non-residential)
☐ Child care center or Preschool
☐ Trade and service areas (shopping center, restaurant, store, bank, gas station)

☐ 8. **Residential Institution** *(Children's home; Dormitory; Hospital; Jail; Old people's home; Orphanage; Prison; Reform school*
Check if....
☐ Health care facility (Hospital)

☐ 9. **Other specified place** *(Beach NOS: Canal; Caravan site NOS; Derelict House; Desert; Dock; Forest; Harbor; Hill; Lake NOS; Mountain; Parking lot; Parking place; Pond or pool (natural); Prairie; Public place NOS; Railway line; Reservoir; River; Sea; Seashore NOS; Stream; Swamp; Trailer court; Woods*

Specify: _____
Check if....
☐ Parking lot
☐ Outside
☐ River, Lake, Stream, Ocean

☐ 10. **Unspecified place**

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

B.9 Were other people injured in this incident?

☐ 1. Yes *Go to 4.a*
☐ 2. No
☐ 97. Don't know
☐ 99. Refused

a. If yes, how many? __ ___ ___ (001-995) 997 Don't know 999 Refused

B.10 For construction/remodeling workers: Were you working in/on …

☐ 0. Not construction/remodeling worker
☐ 1. Single-family home
☐ 2. High-rise apartments
☐ 3. High-rise office or commercial building
☐ 4. Low-rise housing with many families such as townhouses
☐ 5. Low-rise commercial building
☐ 97. Don't Know
☐ 99. Refused

B.11 Did a medical condition contribute to you being injured, i.e. seizure, blackout, dizziness, falling asleep, effects of medication(s), diabetes(low sugar/insulin reaction).

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

B.12 Were you alone when the incident occurred?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

B.13 Did the direct actions of a co-worker, customer or someone else contribute to, or cause your injury?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

B.14 Please describe your body movement or position just before you were injured.
Were you **Read the following list** : *Check all that apply)*

☐ 1. Walking
☐ 2. Crawling
☐ 3. Running
☐ 4. Standing
☐ 5. Kneeling
☐ 6. Bending or twisting
☐ 7. Climbing up to
☐ 8. Climbing down from
☐ 9. Jumping up to
☐ 10. Jumping down from
☐ 11. Squatting
☐ 12. Sitting
☐ 13. Reaching/Stretching
☐ 14. Lifting
☐ 15. Pushing/Pulling
☐ 16. Reclining
☐ 17. Driving *(Note: Sitting is assumed so there is no need to check both)*
☐ 88. Other, specify:_____
☐ 97. Don't Know
☐ 99. Refused

B.15 Intent: (*The role of human intent in the occurrence of the injury incident)*

☐ 1. Unintentional (accidental)
☐ 2. Intentional self-harm (suicide, attempted suicide)
☐ 3. Assault (interpersonal violence) *Go to 10.d*
☐ 4. Undetermined (awaiting results of investigation)
☐ 88. Other

☐ a. Legal interventions
☐ b. Operations of war and civil insurrection
☐ c. Specify: _____

☐ 97. Don't Know

If assault .....

d. What was the intent/relationship to perpetrator ?

☐ 1. Criminal Intent (Type I)
☐ 2. Customer/Client (Type II)
☐ 3. Worker on Worker (Type III)
☐ 4. Personal Relationship (Type IV)
☐ 97. Don't Know
☐ 99. Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

B.16 Mechanism of Injury: (Check the first appropriate box which describes the cause of the person's injury/poisoning) If more than one mechanism, record the one that precipitated the injury.

Number	MECHANISM
☐1	Animal or Insect
☐2	Choking or hanging / suffocation
☐3	Crushed
☐4	Drowning (near drowning)
☐5	Fall
☐6	Fire, flames or heat (Fire/burn/scald related)
☐7	Gun shot (Firearm), **Intentional**
☐8	Gun shot (Firearm), **Unintentional**
☐9	Overexertion/strenuous movements
☐10	Poisoning (Carbon Monoxide, Smoke Inhalation, Chemical, Drug)
☐11	Sexual Assault
☐12	Stab or cut (Cut/ Pierce), **Intentional**
☐13	Stab or cut (Cut/ Pierce), **Unintentional**
☐14	Struck/hit by object , **Intentional**
☐15	Struck/hit by object , **Unintentional**
☐16	Struck/hit by person, **Intentional**
☐17	Struck/hit by person, **Unintentional**
☐18	Transportation (motor vehicle/bicycle/motorcycle/pedestrian/train/boat/tractor/airplane, etc.)
88	Other, specify: _____
97	Don't Know
99	Refused

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

C. EMPLOYMENT

*The following questions refer to the job you were **working at the time of your injury.***

C.1 Which of the following best describes your job?
☐ 1. An employee of a PRIVATE company, business or individual for wages or commission?
☐ 2. A FEDERAL Government employee
☐ 3. A STATE government employee
☐ 4. A LOCAL government employee
☐ 5. Self-employed in OWN business, professional practice or farm
☐ 6. Working WITHOUT PAY in family business or farm
☐ 97. Don't Know
☐ 99. Refused

C.2 At the time of your injury, were you a member of a trade or labor union?
☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

C.3 At the time of your injury, for whom did you work? (Name of company, business, organization or employer)

Job or Business: _____

C.4 What kind of business or industry is this? (For example: TV and radio mgmt., retail shoe store, State Department of Labor)

Kind of Business: _____

C.5 What kind of work were you doing? (For example: farming, mail clerk, computer specialist)

Kind of Work: _____

C.6 What were your most important activities on this job or business? (For example: sells cars, keeps account books, operates printing press.) *(Tell me the 3 most important things you do)*

Task 1: _____

Task 2: _____

Task 3 _____

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

C.7 About how long have you worked at this job or business? *To Clarify: How much experience do you have with this type of work?*

Number: ___ ___ ___ (001 – 365) 997 Don't Know 999Refused

Time period:
☐ 1. Days
☐ 2. Weeks
☐ 3. Months
☐ 4. Years
☐ 97. Don't know
☐ 99. Refused

C.8 Are you paid by the hour on this job or business?
☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

C.9 Do you have paid sick leave on this job or business?
☐ 1. Yes
☐ 2. No
☐ 97. Don't know
☐ 99. Refused

C.10 Do you start work at about the same time every day?

☐ 1. Yes	*Go to 9a*
☐ 2. No	*Go to 10*
☐ 97. Don't know	*Go to 10*
☐ 99. Refused	*Go to 10*

a. What is the normal start time and finish time?
Start ___ ___ : ___ ___ (00:00 – 23:59)

Stop ___ ___ : ___ ___ (00:00 – 23:59)

Go to 10

Study # ___ ___ ___ ___
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

C.11 Do you work rotating shifts or varying hours?

☐ 1. Yes	*Go to 10.a*
☐ 2. No	*Go to 11*
☐ 97. Don't know	*Go to 11*
☐ 99. Refused	*Go to 11*

a. Which shift were you working at the time of injury?

	(Using Military Time – 00:00 – 23:59) Start	Stop
☐ 1. Day shift	__:__ __	__:__ __
☐ 2. Afternoon shift	__:__ __	__:__ __
☐ 3. Evening shift	__:__ __	__:__ __
☐ 4. Night shift	__:__ __	__:__ __

☐ 5. 12 Hour Days
☐ 6. 12 Hour Nights
☐ 7. 24 Hour shift
☐ 88. Other, specify: _____
☐ 97. Don't know
☐ 99. Refused

b. How long had you been working on this particular shift?

Number: ___ ___ ___ (001 – 365) 997 Don't Know 999 Refused

Time period:
☐ 1. Days
☐ 2. Weeks
☐ 3. Months
☐ 4. Years
☐ 97. Don't know
☐ 99. Refused

c. How often do you change from one shift to another?

☐ 1. Days: ___
☐ 2. Weeks: ___
☐ 3. Months: ___
☐ 97. Don't know
☐ 99. Refused

d. I'm now going to ask you about the particular shifts through which you rotate. How many times per week or month do you work…

SHIFT	Number of Times	Week / Month	Start (00:00 – 23:59)	Stop (00:00 – 23:59)
… Day shift?	___	☐ Wk ☐ Mo	___ ___: ___ ___	___ ___: ___ ___
… Afternoon shift?	___	☐ Wk ☐ Mo	___ ___: ___ ___	___ ___: ___ ___
… Evening shift?	___	☐ Wk ☐ Mo	___ ___: ___ ___	___ ___: ___ ___
… Night shift?	___	☐ Wk ☐ Mo	___ ___: ___ ___	___ ___: ___ ___
… Other shift ? SPECIFY:	___	☐ Wk ☐ Mo	___ ___: ___ ___	___ ___: ___ ___

C.12 Thinking about the particular location or facility where you work, how many people are employed there full and/or part time?

☐ 1. 1-9 employees
☐ 2. 10-24 employees
☐ 3. 25-49 employees
☐ 4. 50-99 employees
☐ 5. 100-249 employees
☐ 6. 250-499 employees
☐ 7. 500-999 employees
☐ 8. 1000 employees or more
☐ 97. Don't Know
☐ 99. Refused

C.13 Do you consider this to be your MAIN job?
☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

Study # ___ ___ ___ __
Interview Date: ___ ___/___ ___/200__
Interviewer: KA// ___

D. WORKERS COMPENSATION

This is the last section.

D.1 Do you plan/expect to have a Workers' Compensation claim submitted for your injury? (Note: Subject or employer could be filing claim)

☐ 1. Yes *Go to 2*
☐ 2. No *Go to 1.a*
☐ 97. Don't Know *Go to 3*
☐ 99. Refused *Go to 3*

a. If no, why won't a claim be submitted?

_____

D.2 Do you think you will need a lawyer to file your claim?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

D.3 Will you be able to receive any disability payments (income) through your employer?

☐ 1. Yes
☐ 2. No
☐ 97. Don't Know
☐ 99. Refused

D.4 Were you injured at your main or only job or were you hurt at another job?

☐ 1. Main/only job
☐ 2. Other job
☐ 97. Don't know
☐ 99. Refused

This concludes our interview. Is there anything else about your injury that you would like us to know? Again thank you for your time and cooperation. The information you have provided is very valuable to us.

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Appendix N:

NORA Abstract

Abstract - NORA

Importance: Although there have been many studies of fatal occupational injuries, relatively few surveillance efforts have included the most severe nonfatal occupational injuries, including hospitalizations.

Purpose: This project seeks to develop and evaluate a model surveillance system to identify the entire spectrum of injury severity occurring in occupational settings and describe the specific types of injury and their circumstances. The first step was the creation of a comprehensive database to examine the incidence of occupational injury statewide.

Methods: Work-related injuries were detected in a variety of ways: mechanism of injury (for example, falls from heights ≥15 feet), location (farm, mine, quarry), emergency/hospital treatment in which the payor was Workers' Compensation, and sources that explicitly identified occupational etiology such as death certificates and the state trauma registry. Commercial motor vehicle crashes also were identified. Using probabilistic linkage techniques, databases were joined and a final incident-specific database was created for 2001-2002.

Findings: Table 1 describes the data sources used by number injured and the percent that were work-related (WR).

Table 1: Data Sources for Linkage	Total Injured	% WR
Emergency Department	1,065,979	7.8
In-Hospital Discharges	88,610	5.4
State Trauma Registry	34,779	7.8
Death Certificates	7,131	2.3
Police Crash Reports	78,239	2.9
Ambulance Transports	208,675	2.9
Total Linked Records	1,165,731	7.6

Overall, 88,300 injured workers were identified in 2001-2002. Over 60% were younger than 40. Teenagers comprised 6% and 20-29 year-olds comprised 26%. About 70% were male. Falls were more common among those ≥ age 50.

About 5% percent of all injury hospitalizations were for occupational injury, resulting in 4,766 admissions. A total of 2,673 workers were treated in trauma centers, suggesting a large number of high-energy events. Among these two groups, falls and motor vehicle crashes were the predominant mechanisms of injury.

Table 2 displays the percentage of all injured workers and hospitalized workers by specific body regions. Among all injured workers, upper extremity, lower extremity and back were the top three injured regions. Hospitalized workers had a different pattern, with a higher proportion of head, lower extremity and upper extremity injuries. For upper extremity injuries, ED visits primarily involved finger lacerations whereas those who were hospitalized commonly had forearm fractures. For lower extremity injuries, ankle fractures were the most common injury among hospitalized workers, but ankle and foot sprains were the most frequent ED-treated injury.

Table 2: Percentage of Injured Workers by Body Region								
	Head	Face	Neck	Thorax	Abdomen	Back	Upper Extrem	Lower Extrem
All	4	11	<1	3	1	14	46	26
In-Hospital	24	19	<1	13	9	17	38	43

How Findings Advance Research: This study is one of the most comprehensive efforts to conduct a statewide surveillance of occupational injury using multiple data sources. Data on the entire spectrum of injury severity previously were sparse, particularly for moderate to severe WR injuries.

Implications for Improving Workplace Safety: Many of the more severe injuries incur high medical costs and long-term disability. Greater priority should be placed on preventing such injuries.

N1

Appendix O:

Inclusion Enrollment Report
(PHS 398/2590)

Principal Investigator/Program Director (Last, First, Middle):

Inclusion Enrollment Report

This report format should NOT be used for data collection from study participants.

Study Title: A Comprehensive Surveillance of Occupational Injury in Maryland

Total Enrollment: 274 **Protocol Number:**

Grant Number:

PART A. TOTAL ENROLLMENT REPORT: Number of Subjects Enrolled to Date (Cumulative) by Ethnicity and Race

Ethnic Category	Sex/Gender			
	Females	Males	Unknown or Not Reported	Total
Hispanic or Latino	2	19	0	21 **
Not Hispanic or Latino	26	210	0	236
Unknown (individuals not reporting ethnicity)	0	1	16	17
Ethnic Category: Total of All Subjects*	28	230	16	274 *
Racial Categories				
American Indian/Alaska Native	1	3	0	4
Asian	0	6	0	6
Native Hawaiian or Other Pacific Islander	0	0	0	0
Black or African American	7	37	0	44
White	19	170	0	189
More Than One Race	1	4	0	5
Unknown or Not Reported	0	10	16	26
Racial Categories: Total of All Subjects*	28	230	16	274 *

PART B. HISPANIC ENROLLMENT REPORT: Number of Hispanics or Latinos Enrolled to Date (Cumulative)

Racial Categories	Females	Males	Unknown or Not Reported	Total
American Indian or Alaska Native	0	0	0	0
Asian	0	0	0	0
Native Hawaiian or Other Pacific Islander	0	0	0	0
Black or African American	1	0	0	1
White	1	11	0	12
More Than One Race	0	1	0	1
Unknown or Not Reported	0	7	0	7
Racial Categories: Total of Hispanics or Latinos**	2	19	0	21 **

* These totals must agree.
** These totals must agree.