National Trauma Data Bank

NTDB Research Data Set v. 7.2

User Manual

Mar 2009

NTDB
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www.ntdb.org

ACKNOWLEDGEMENT

The American College of Surgeons Committee on Trauma thanks the Health Resources and Services Administration (HRSA), the National Highway Traffic Safety Administration (NHTSA), the Centers for Disease Control and Prevention (CDC), and the Agency for Healthcare Research and Quality (AHRQ) for their support of the NTDB.

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The American College of Surgeons established the National Trauma Data Bank (NTDB) as a public service to be a repository of trauma related data voluntarily reported by participating trauma centers. *Please note that the NTDB is not a population-based dataset.*

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Table of Contents

Appendices

HISTORY OF NTDB

Injury remains a public health problem of vast proportions, although much has been done to reduce its incidence and mitigate its effects. A recent report from the Institute of Medicine (IOM) has stressed the need for accountability in all phases of emergency care systems, and called for measurements of quality that "evaluate the performance of individual providers within the system, as well as that of the system as a whole."[1]

As part of their pioneering work in the development of trauma centers during the 1970's, Boyd and colleagues developed a hospital trauma registry for research and monitoring.[2] As trauma centers and personal computers became more widespread, the use of registries grew to include entire trauma systems,[3] and standards were developed at a national level.[4] Starting in 1982, the American College of Surgeons Committee on Trauma (ACSCOT) coordinated the Major Trauma Outcome Study (MTOS), which until recently served as a standard reference database of seriously injured patients in the United States, and was the basis for many of the analytic methods that have become familiar to trauma surgeons.[5]

At the conclusion of MTOS in 1989, the ACSCOT renewed its commitment to trauma research and quality improvement by developing trauma registry software, with the intention that multiple users of this product could combine their results to produce a national database. After several years of slow progress, a recommendation was made to separate the development of a national database from the development of registry software.[6] This recommendation was implemented in 1997, and a subcommittee was established to direct the National Trauma Data Bank (NTDB), which would combine data from various trauma registry products.

Currently, the NTDB contains detailed data (see Appendix A) on over 2.7 million cases from over 900 U.S. trauma centers. The data have been shared with hundreds of researchers, and numerous articles have been published based upon the NTDB. The annual NTDB Call for Data (CFD) runs from February to May and all hospitals with trauma registries are encouraged to participate. After the conclusion of the CFD, the data are cleaned and summarized in the NTDB Annual Report distributed in the fall. Beginning with the 2008 Call for Data, the National Trauma Data Bank is adopting the National Trauma Data Standard (NTDS) as the basis for data collection. The NTDS is a standardized definition of the trauma injury information submitted to the NTDB by participating hospitals (see www.ntdsdictionary.org).

Additional information about the NTDB, annual reports, and this user manual is available at www.ntdb.org.

NTDB CONFIDENTIALITY POLICY

NTDB data are maintained in a secure database with limited internal access. External users must gain permission to the database and data are then supplied at the aggregate level only. Use of NTDB data is in strict compliance with the Health Insurance Portability and Accountability Act of 1996 (HIPAA).[7] The NTDB does not distribute or report hospital information in any manner that allows the reporting hospital to be identified without the express

written permission of the hospital. The dataset collected by NTDB is considered a limited dataset under HIPAA, and the research dataset that ACS releases is a de-identified dataset.

CURRENT LIMITATIONS OF NTDB DATA

1. Data quality in NTDB

The NTDB is a convenience sample— it consists solely of data submitted by participating hospitals and it is not a population data base. In addition, the NTDB inherits the individual deficiencies of its contributing trauma registries. However, the NTDB is continually cleaning and standardizing the data to improve data quality. Data files received from contributing hospitals are checked for completeness, logical consistency, and proper formatting. Any files not passing the checking system are either rejected or flagged, based upon the seriousness of the file's errors. A screening report is generated for each submitting facility and the facilities are given the opportunity to correct errors and resubmit their data.

Edit flags indicate invalid or out of range values for the most important variables in the data set. There are 27 edit flags, denoted by letters A through Z and the number 0. For further information about the edit flags please see Appendix B. The research data set provided includes all the data submitted to NTDB with ED admission year 2002-2006. We strongly suggest that you use these edit flags (or create your own) to screen out data that are not valid based on the criteria in Appendix B.

2. NTDB is not a population-based dataset

The NTDB is subject to the limitations of all "convenience samples." It includes a disproportionate number of larger hospitals with younger and more severely injured patients. The data may not be representative of all trauma hospitals in the nation and thus do not allow statistically valid inferences about national injury incidence and prevalence.

The NTDB National Sample Project (NSP), a nationally representative sample based on NTDB, is being created in a partnership between the Center for Disease Control National Center for Injury Prevention and Control (NCIPC) and the American College of Surgeons Committee on Trauma (ACSCOT). The goal of the NSP is to be able to make statistically valid inferences about patients cared for in Level I-II trauma centers in the US. More specifically, the NSP is to be used for producing national baseline estimates of variables and indices associated with hospitalized traumatic injuries such as pre-hospital diagnosis and management, trauma outcomes, and other variables that characterize the different dimensions of trauma treatment. The NSP is a stratified sample of 100 hospitals with admission data from years 2003–2005.The sample is not yet available for public use but qualified researchers are invited to help beta test the product. For further information and updates please check the NSP website:
http://www.facs.org/trauma/nsp/index.html

Researchers who wish to study the overall incidence of hospitalization at a national level can use samples constructed for this purpose, such as the National Hospital Discharge Survey (NHDS) obtainable free of charge through the National Center for Health Statistics

(http:/www.cdc.gov/nchs/about/major/hdasd/nhds.htm), or the Nationwide Inpatient Sample (NIS) obtainable at low cost through the Agency for Healthcare Research and Quality (www.ahrq.gov/data/hcup/hcupnis.htm).

3. Selection and information bias in NTDB

As a "convenience sample", NTDB is subject to various forms of bias. The NTDB data are submitted voluntarily from hospitals that have shown a commitment to monitoring and improving the care of injured patients. These may not be representative of all hospitals, and have not been systematically selected to represent any population base. By definition, cases not admitted to a hospital will not be included in the NTDB, including injury victims who die before they can be transported to a hospital. Hospitals may have differing criteria for including deaths on admission, deaths in the Emergency Department, or other cases, which should be evaluated before making comparisons.

Some of the theoretical issues resulting from the use of trauma registries to assess institutional performance were discussed as part of the Skamania Symposium on Trauma Systems in 1998[8-10]. The most obvious problems are selection bias, the inconsistency with which clinical variables can be measured, and inter-hospital differences other than quality of care. MTOS was limited to selected trauma centers and utilized centralized coding to maximize the consistency of data, while NTDB has become more inclusive and depends on decentralized data entry at contributing hospitals.

The variability in trauma registry inclusion criteria across the country has been noted,[11] and the ACSCOT has participated in the resulting national effort to standardize data elements for trauma registries. Focused review of "outlier" hospitals is expected to reveal differences in data entry and patient inclusion criteria that could be made more uniform before concluding that outcome differences among hospitals are truly related to quality differences.

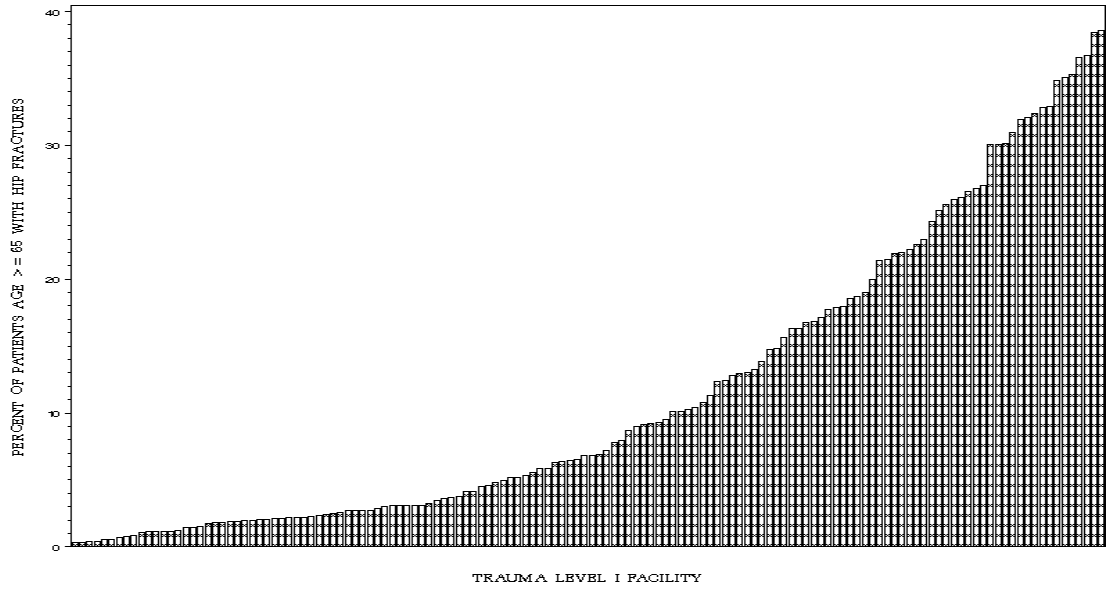
Selection bias refers to an apparent difference between two groups that is actually caused by different inclusion criteria. For example, if one trauma center includes isolated hip fractures in its registry and another does not, and if mortality for this injury is lower than for other injuries with the same severity score, the hospital that included isolated hip fractures will appear to have a lower "risk-adjusted" mortality. Any difference in inclusion/exclusion criteria could produce a selection bias.

The NTDB data have been evaluated with respect to several possible sources of selection bias, including the inclusion of hip fractures, transferred patients, or Dead on Arrival (DOA) patients in submitted data. Hip fractures comprise about 45% of injuries requiring hospitalization in the U.S. population over age 65[12]. As mentioned above, a difference in the mortality for this population could produce an apparent difference in mortality depending whether or not they were included. Some surgeons consider hip fractures a degenerative disease and "not really trauma", and some believe that the effort to gather data on this population may not be worthwhile for quality improvement by their trauma services. In NTDB 7.0 the percent of patients over 65 with hip fractures (ICD-9 code AIS code) for the 173 trauma level I centers ranges between 0 - 40% (Figure 1). Also, patients transferred from one institution to another have obviously been

able to survive an initial resuscitation, but the reason for transfer is often that the injuries are more severe or that other risk factors are present. Transferred patients thus represent a different population from those admitted directly. The proportion of patients in NTDB 7.0 which were transferred into or out of level I trauma centers ranges drastically (Figure 2). Lastly, patients may arrive at an institution only to be declared "Dead on Arrival" (DOA), but the definition of this term is itself unclear. Some hospitals exclude such cases, while some do not. The proportion of patients recorded as DOA in NTDB varies considerably for level trauma I centers in NTDB (Figure 3).

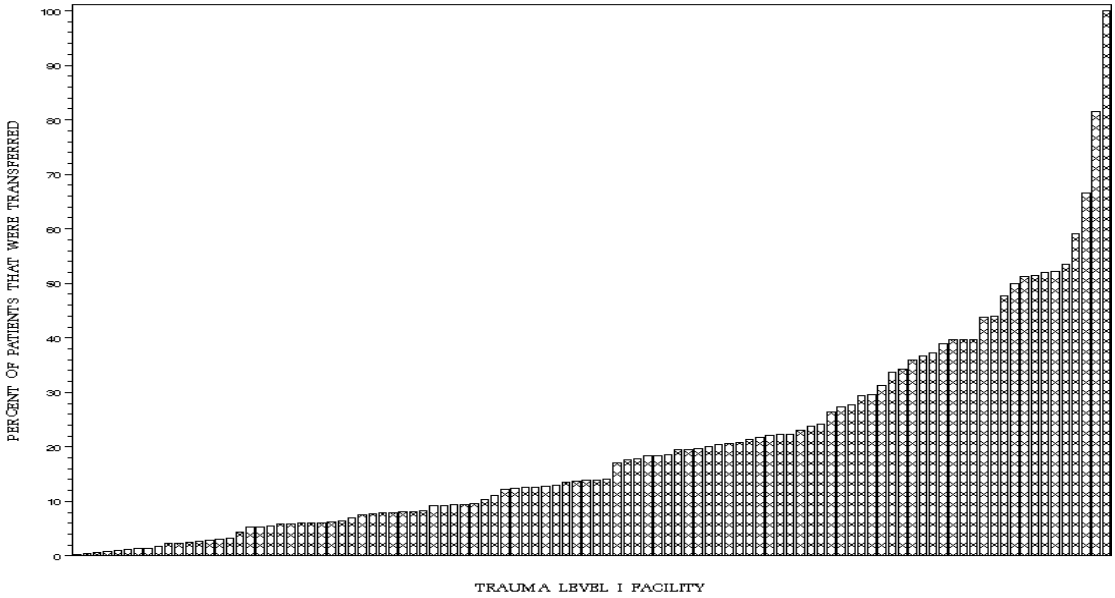
When analyzing NTDB data we encourage researchers to be aware of these limitations and use inclusion criteria for their analysis in order to create a homogenous population. Reviewing the "Facility" file may suggest subgroups of hospitals that are comparable. For certain types of analysis, a given injury (e.g., hip fractures) could either be excluded or analyzed separately; another approach would be to designate cases included by some but not all hospitals using an indicator term (0 if absent, 1 if present) added to a regression equation. For some analyses, all the data from hospitals with excessive missing or unreliable data might be excluded. These decisions are the most difficult part of conducting research on a database like NTDB, and require good judgment and scientific honesty more than computing skill or mathematical training.

Figure 1: Percent of incidents for patients ≥ 65 with hip fractures.



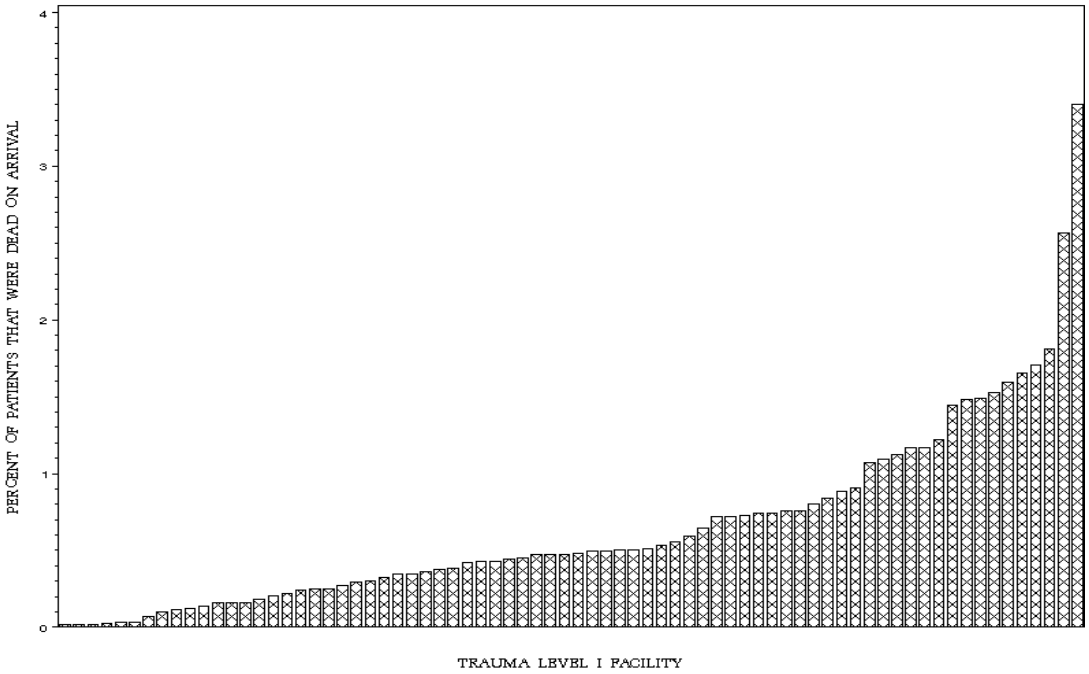
Note: 140 trauma centers out of the 173 level I trauma centers had 0% incidents with hip fractures in patients over 65 years old and were not included in the figure.

Figure 2: Percent of patients that were transferred per facility for level I trauma centers.



Note: 74 trauma centers out of the 173 level I trauma centers had 0% incidents transferred in, and were not included in the figure.

Figure 3: Percent of Dead on Arrival (DOA) per facility for level I trauma centers.

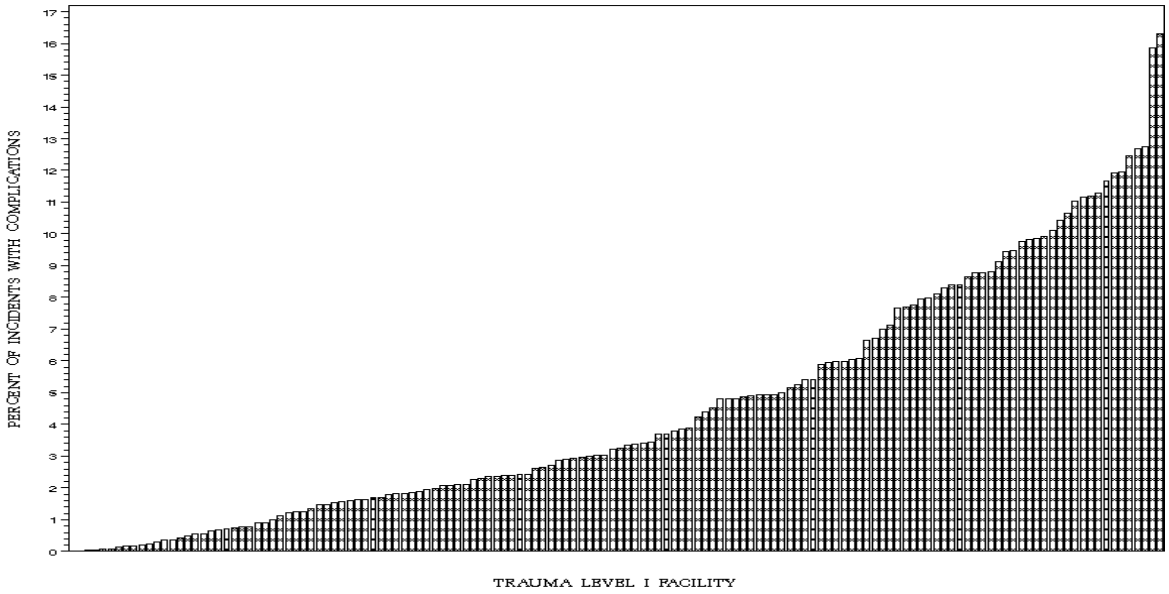


Note: 71 trauma centers out of the 173 level I trauma centers had 0% dead on arrival, and were not included in the figure.

Information bias refers to an apparent difference between two groups that is actually caused by a difference in the data available to compare them. Very few fields are absolutely required by the NTDB, and differences in the proportion of cases with missing data may be responsible for apparent differences among hospitals. Furthermore, Lucas et al, have found that injury severity scores are calculated differently by different registry programs. [13]

If one hospital has incomplete data on patients with complications, for example, it may falsely appear to be delivering better quality care than a hospital that diligently records every complication. For example, 31 of the 173 level I trauma centers in NTDB 7.0 submitted no complications associated with the trauma incidents at all, and the rest of level I trauma centers had percentages of complications that range from 0 – 17% (Figure 4).

Figure 4: Percent of incidents with complications per facility for level I trauma centers.



Note: 142 trauma centers out of the 173 level I trauma centers had 0% incidents with complications, and were not included in the figure.

4. Missing data in NTDB

The proportion of missing data varies across data elements in NTDB, but it is important to decide how to deal with missing data when doing analyses. In most cases NTDB data are not missing at random and analyses, therefore, are subject to bias if missing data are ignored. That is, the results may be misleading when excluding all observations with missing data. Excluding observations with missing values is the default for most software programs when running statistical analyses.

Another option is to provide plausible values for the missing data, either by single or multiple imputation. A single imputation of a value may be an educated guess at the value,

substitution of the mean value, or substitution based on a regression equation using other (observed) values. For example, one can assume that the verbal component of the Glasgow Coma Scale (GCS) for intubated patients would be approximately the same as for non-intubated patients with the same Motor and Eye GCS[14]. Most statistical software packages can do imputations without much difficulty. However, it is important to explore the impact of missing data with sensitivity analyses. That is, repeat an analysis with and without imputation and see whether there are any important differences.

For more resources on imputation, please consult the notes from the NTDB Subcommittee's Imputation Symposium at http://www.facs.org/trauma/symposia.html. In addition, NTDB 7.0 includes a file with imputed values for GCS components, FIM score components, respiratory rate and systolic blood pressure. These values were simply derived by rational substitution. That is, if one of the components of GCS is missing but the sum is 15 (normal) then the value for the missing component must also be normal; a similar logic can be used for components of the FIM score. The respiratory rate and systolic blood pressure were only imputed as zero for patients that were DOA. We are hoping that this imputed file will be used by researchers and that in the future we will be able to provide more advanced imputation data sets based on more advanced methods .

GETTING STARTED WITH NTDB DATA

The Research Dataset (RDS) is a set of relational tables and consists of 20 data files. These files are provided in ASCII-CSV format (comma separated value) and DBF format (DBASE version 2.0), which can be easily imported to most statistical software (i.e. SAS, SPSS and Stata). Fifteen of the data files include a unique incident identifier (inc_key) for merging the data files together. Two of the data files include the facility information for the 765 participating hospitals and this data can be merged to RDS_ ED, RDS_DEMO, RDS_DISCHARGE, and RDS_SCENE by using the unique facility identifier (Fac_key). The remaining three data files (RDS_DIAGNOSISDESC, RDS_MECHDESC and RDS_PROCEDUREDESC) are look-up tables with the description of the ICD-9 Ecode, Diagnosis code, and ICD-9 procedure codes, respectively. The look-up tables can be merged with the unique DCODE, ECODE, and PCODE.

Included on the downloading website are three sample programs to help researchers get started with merging files and creating statistical output. These sample programs are available for SAS and Stata. A copy of the source codes of these programs can be found in the Appendix F. We hope that you will contact us with any concerns or suggestions on how to make these sample programs more useful in the future. Table 1 is a listing of the NTDB files with a short description for each data file. A detailed data dictionary of each variable in the data sets can be found in Appendix A.

Table 1: Data files and descriptions

File name	Description
RDS_AISCODE	The AIS (Abbreviated Injury Scale) information for the trauma diagnosis.
RDS_COMORBID	Information pertaining to any pre-existing comorbid diseases the patient had upon arrival in the ED/hospital.
RDS_COMPLIC	Information pertaining to any complications that arose during the course of patient treatment at the facility.
RDS_DEMO	Includes information about the patient and incident demographics
RDS_DIAGNOS	ICD-9-CM Code of Diagnosis Information for the trauma incident
RDS_DIAGNOSISDESC	Look-up table of the description of the ICD-9-CM diagnosis codes .
RDS_DISCHARGE	Includes discharge and outcome information pertaining to the trauma incident.
RDS_ECODE	Includes the ICD-9 external cause of injury code.
RDS_ED	Includes information pertaining events and measurements that take place in the ED.
RDS_EDITFLAGS	Includes the 27 edit flags (see Appendix B) for each incident
RDS_FACILITY	Includes information about the participating facilities.
RDS_FACILITY_INC	Includes information about the participating facilities inclusion and exclusion criteria for trauma registry data.
RDS_IMPUTED	Includes the imputed values, if value is missing for selected variables.
RDS_INTUB	Information indicates whether endotracheal intubation was performed either at the scene or in the ED.
RDS_MECHDESC	Look-up table for the external cause of injury code (ICD-9 CM ECodes).
RDS_PREHPROC	Information pertaining to the procedure performed for a trauma incident prior to arriving at the hospital.
RDS_PROCEDUR	Information pertaining to the procedure performed for a trauma incident in the hospital.
RDS_PROCEDURDESC	Look-up table for the description of procedures performed for a trauma incident.
RDS_SAFETY	Information pertaining to the safety equipment used or worn by the patient at the time of the injury.
RDS_SCENE	Includes information pertaining to the scene of the trauma incident .

FREQUENTLY ASKED QUESTIONS ABOUT USING NTDB

1. What are the system requirements of downloading the NTDB?
Minimum of 2 GB for CSV version of years 2001-05
Minimum of 3 GB for DBF version of years 2001-05
Minimum of 512 MB of RAM strongly recommended

2. Can I estimate the number of patients based on NTDB?
The NTDB is an incident database and there are no patient identifiers in the database. If a patient has more than one trauma incident during an admission year, this patient will be in the database twice.

3. How can I merge the data sets in NTDB?
The NTDB data files can be merged by using the unique incident key for each incident (incident_key). There is also a unique facility key (facility_key) which can be used for hospital-level analysis.

4. What are the patient inclusion criteria for the NTDB?
All patients with ICD-9-CM discharge diagnosis 800.00–959.9

- Excluding 905-909 (late effects of injury)
- Excluding 910-924 (blisters, contusions, abrasion, and insect bites)
- Excluding 930-939 (foreign bodies)

AND who were admitted; or died after receiving any evaluation or treatment; or were dead on arrival.

5. Where can I find the external cause of injury and how many of them are available in the data set?
The ECODE table includes the primary (first-listed) ICD-9 external cause of injury code. There is only one ICD-9 external cause of injury code per incident. Appendix C contains the standard matrix of ICD-9 external-cause-of-injury code groupings used for reporting of injury mortality (defined by ICD-9 codes) and morbidity (defined by ICD-9-CM codes) data systems.

6. Where can I find the diagnosis and injury severity? How many diagnoses per incident are available in the data set?
The DIAGNOS table includes all of the ICD-9-CM Codes of Diagnosis for each incident. The AISCODE table includes all the AIS codes for each incident. These diagnosis codes are not listed in hierarchical order and there is no way to identify the principal diagnosis.

RESOURCES FOR EVALUATION OF NTDB DATA

1. Background of injury severity scoring

Classifying trauma incidents in terms of injury severity scoring has a long and interesting history, which has been reviewed in numerous publications[15-17]. When doing trauma research it

is important to classify trauma injuries in order to evaluate the effects of treatment. Some of the most frequently used methods to classify trauma data in the NTDB are described below:

A. Classification by anatomy

In 1971, the American Medical Association Committee on Medical Aspects of Automotive Safety published the **Abbreviated Injury Score** (AIS), which divided the body into five regions (head or neck, chest, abdomen, pelvis/extremities, and general) and classified the severity of injuries in each region based on clinical experience (1=minor; 2=moderate; 3=severe, not life-threatening; 4=severe, life-threatening, survival probable; 5=critical, survival uncertain; 6-9=fatal).[18] Three years later, Baker and colleagues[19] extended the AIS to account for multiple injuries by adding another body region (face), reclassifying each fatal injury to an AIS score less than 6, and squaring the maximum AIS value in each of the six body regions. The **Injury Severity Score** (ISS) was developed from AIS and is defined as the sum of the squares of the three highest AIS values.

The most publicized alternative to AIS and ISS has been the **ICD-9 Injury Severity Score** (ICISS), proposed in 1996.[20] ICISS was almost identical to the Estimated Survival Probability index originally proposed by Levy and colleagues in 1978.[21] Statewide discharge data from North Carolina were used to predict mortality in patients hospitalized after injury using the observed mortality of patients with the same ICD-9 principal diagnosis code. Osler, Rutledge, and colleagues[20] then extended this approach by calculating a "survival risk ratio (SRR)" for each of 2,034 principal or secondary injury diagnoses sustained by 314,402 patients in the 1990-1995 North Carolina data, and assumed that the probability of survival for a given patient could be estimated by the product of their "SRRs". One difficulty of the ICISS approach is that a reference database for calculation of SRRs must be defined. A table of SRRs (by Meredith, Kilgo, and Osler) has been developed based on a sample of 170,853 cases from a previous version of the NTDB. [22]

Sacco, MacKenzie, Champion and colleagues have recently advocated a Modified Anatomic Profile[23] using a new definition of AIS body regions, severity scores within these regions, and coefficients derived from data on 14,392 cases collected by four trauma centers from 1982–1987. Meredith and colleagues have compared this and several others anatomic scoring algorithms using an earlier version of the NTDB (containing 76,871 cases).[24] The latter study has stimulated further discussion about comparison of predictive models for trauma outcomes.[25]

B. Classification by mechanism

The Major Trauma Outcomes Study (MTOS)[5] considered only blunt versus penetrating injuries for injury classification. Since that time, the use of ICD-9 E-Codes for injury mechanisms has become much more common, and a standard categorization has been provided by the CDC.[26] Hannan and colleagues have suggested the use of separate prediction equations for different mechanisms.[27]

C. Classification by physiology

The **Glasgow Coma Scale** (GCS) was originally developed as a clinical tool, and is still widely used for this purpose, but has been useful in outcomes research as well.[28] This simple scale gives 1 to 6 points for motor activity, 1 to 5 points for verbal activity, and 1 to 4 points for eye-opening. The total GCS is simply the sum of the three components, therefore ranging from 3 (minimal or no neurologic function) to 15 (normal or nearly normal).

The **Revised Trauma Score** (RTS)[29] was based on systolic blood pressure, respiratory rate (RR), and total GCS on presentation to the ED, with a logistic regression equation derived from MTOS. A principal drawback is that many severely injured patients are intubated and sedated prior to arrival to the ED, so that observations of RR and GCS are of questionable accuracy. Because of the calculation requirements, the RTS has not been used as a clinical tool.

D. Classification by comorbidity

Charlson and colleagues[30] developed the widely-used **Charlson Score** for general medical patients, adding weights of 6 for the presence of AIDS or metastatic solid tumor, 3 for severe liver disease, 2 for any malignancy, renal failure, or complications of diabetes, and 1 for a history of myocardial infarction, peripheral vascular disease, dementia, chronic lung disease, rheumatic disease, mild liver disease, or uncomplicated diabetes. The Charlson Score has been used in trauma patients.[17,31] Morris, Mackenzie et al[32,33] developed a similar classification of pre-existing conditions, including coagulopathy, for trauma patients. NTDB records information on multiple comorbidities, most of which could be mapped to the Charlson or Morris/Mackenzie categories. The proper classification and modeling of their effects on injured patients is an important area for future research.[34-35]

2. Outcomes

Mortality is a fundamentally important outcome, and easy to clinically identify. However, hospital mortality is not necessarily the same as short-term mortality, especially in the older patients who are often discharged to long-term care facilities within a few days of injury.[12] Unfortunately, mortality after discharge from a hospital is not as easily determined and is generally not available in registry data. Hospital length of stay has been used as a measure of cost, but is likewise confounded by discharge destination and early mortality. Inter-hospital comparisons using any of these variables should be undertaken with an understanding of their limitations.[36]

Intermediate outcomes, such as hospital complications, are potential measures of quality; however, they may also be complicated by information bias due to incomplete case ascertainment or occurrence of the complication only after hospital discharge. It may be important to separate the incidence of a given complication from the ultimate outcome attributable to the quality of managing the complication ("rescue"). Functional measurements at the time of discharge or at a specified time after injury are also appealing,[37] but currently also have significant limitations; this remains an important area for future research.[38]

3. Analytic methods

In complicated clinical situations, it is rarely appropriate to compare the outcome of two groups using raw data without adjusting for potential differences in their risk factors. Sometimes it is possible to exclude cases from both groups until they are judged to be similar except for the one factor under study; sometimes, the factor of interest can be analyzed for several strata of a potentially confounding factor or factors (e.g., spleen injuries in stable patients with age<55 and ISS<16, age<55 and ISS≥16, age≥55 and ISS<16, and age≥55 and ISS≥16). However, most studies of injured patients have so many factors to analyze that the only practical way is to estimate a mathematical regression model in which the outcome (dependent variable) can be expressed in terms of multiple risk factors (independent variables).

For analysis of binary outcomes (e.g., mortality) influenced by multiple factors (e.g., injury severity, comorbidity, hospital) the standard analytic method is currently logistic regression. Many computer programs are now available to implement this approach, and excellent introductory textbooks have been published.[39-40] However, logistic regression does entail certain assumptions and potential misinterpretations, and a formal course and/or statistical consultation are highly desirable before using this methodology.

For certain mathematical reasons, results of logistic regression are generally expressed in terms of odds rather than probability. Odds are defined as

$$\text{Odds}\ (A) = \frac{P(A)}{P(\overline{A})} = \frac{P(A)}{1 - P(A)}$$

where P(A) means the probability that A is true, and $P(\overline{A})$ means the probability that A is not true. Note that when P(A) is small, there is not much difference between the probability and the odds. Also, note that the above equation can be rearranged as

$$P(A) = \frac{\text{Odds}\,(A)}{1 + \text{Odds}\,(A)}$$

The effect of a factor (e.g., a given hospital) on the outcome of interest can be expressed as an odds ratio, that is, the odds when the factor is present divided by the odds when the factor is not present. The odds ratio is generally a reasonable approximation for the risk ratio (the probability of an outcome when the factor is present divided by the probability when the factor is not present), especially when the outcome is relatively infrequent (for example, mortality).

The Trauma and Injury Severity Score (TRISS) was introduced by Champion and colleagues[41] and later described in detail by Boyd and colleagues.[42] The method is fundamentally a regression equation predicting the log odds of survival, as

$$bx = b_0 + (b_1 * \text{RTS}) + (b_2 * \text{ISS}) + (b_3 * \text{Age}\geq 55).$$

Raising the constant e (the base of natural logarithms, approximately 2.71828) to the power bx gives the predicted odds of survival, since by definition $e^{\log \text{odds}} = \text{odds}$, and the predicted probability of survival can then be calculated from the predicted odds using

$$\text{Probability} = \frac{\text{odds}}{1+\text{odds}} = \frac{e^{bx}}{1+e^{bx}} = \frac{1}{1+e^{-bx}}$$

TRISS was popularized as a result of MTOS[5], and has been a standard calculation by trauma registries since that time. Separate equations have been used for penetrating or blunt injuries. Although the developers of TRISS chose to predict the "probability of survival" rather than the "probability of death" after injury, it is easier to interpret a logistic regression model presented in terms of the less common binary event (e.g., death rather than survival). This results in odds that are nearly the same as the corresponding probabilities, and makes the effects of covariates more apparent. For example, if the probability of death is 5% or 0.05 then the odds of death is 0.05/0.95 = 0.053, whereas if the probability of survival is 90% or 0.90 then the odds of survival is 0.95/0.05 = 19.

It may be simpler to consider the RTS categories individually, that is:

GCS	SBP	RR	Coded value
13-15	>89	10-29	4
9-12	76-89	>29	3
6- 8	50-75	6- 9	2
4- 5	1-49	1- 5	1
3	0	0	0

Similarly, we can categorize ISS (as earlier suggested by MTOS researchers[43]), or create other groups of maximal AIS scores in different body regions. Using this approach, we can create multiple variables equal to 1 for patients belonging to a given category and 0 for those who do not. Then, logistic regression can be carried out and the coefficients exponentiated to present an odds ratio for each of these categories. This skips the intermediate step of calculating RTS, and the distraction of explaining logarithms and exponentials. It also removes the assumption of a linear effect on the log odds of survival due to stepwise increases in each category.

We should hesitate to discard the familiar scoring systems completely unless we can find methods that are significantly better (not just in the statistical sense of "significance", but in the practical sense). The increased number of data elements available in the NTDB may allow for improvements, and the availability of the data to multiple researchers should encourage progress in this area. Models that account for some of the new patient and institutional variables contained in NTDB need to be explored, as well as approaches based upon outcomes other than simply hospital survival.[44,45] It will take some time to reach consensus about whether another mortality model should be considered a standard to succeed TRISS.

Modeling may involve different equations for different injury mechanisms, or (equivalently) allowing for interaction terms between these mechanisms and other factors. Other clinically significant interactions could also be explored.[46] Approximating the effect of continuous covariates by splines or other polynomial functions has been suggested, but may

result in a model that is difficult to interpret.[47] A good mathematical model not only predicts an outcome with satisfactory precision, but also helps to explain the factors that affect the outcome.

Models must be kept reasonably simple so that they can be accurately interpreted and trusted by clinicians. There is generally more familiarity with ratio measurements (e.g., adjusted mortality rates) rather than difference measurements (e.g., the risk difference or "W statistic"). Computation of confidence intervals is more complicated with ratios, but most clinicians are not concerned with this aspect and the necessary mathematical formulas can be programmed for the computer to calculate.

4. Inter-hospital comparisons

MTOS proposed a "Definitive outcome-based evaluation" to compare hospital trauma mortality to a reference population.[5] Z-scores were calculated for individual hospitals by summing the TRISS "Probability of Survival" (p) for each patient to obtain an expected number of survivors, and comparing this to the observed number of survivors. It can be shown[48] that if p is known, this difference will theoretically have a normal distribution with variance equal to the sum of ((p)(1-p)) for each patient, and therefore that Z = (observed-expected) / $\sqrt{(\text{variance})}$ will have a normal distribution with mean zero and variance 1. As a consequence, 95% of hospitals would be expected to have a Z-score between -1.96 and +1.96.

While there is nothing mathematically wrong with the calculation of a Z-score using the method described by Flora[48] and popularized by MTOS, it may be easier to use the logistic regression methods. We can include a variable in the regression equation equal to 1 if the case is identified as coming from a particular hospital and 0 otherwise. The odds ratio and a test for its significance can then be estimated, for example from the equation

$$\log \text{odds (died)} = b_0 + (b_1 * \text{RTS}) + (b_2 * \text{ISS}) + (b_3 * \text{Age}\geq 55) + (b_4 * \text{Penetrating}) + (b_5 * \text{Hospital X}).$$

MTOS further proposed a "W statistic", defined as

$$W = (\text{observed-expected}) / (n/100)$$

which may be interpreted as the number of unexpected survivors (or deaths, if negative) per hundred cases, where n is the total number of cases for a given hospital and the "expected" number of survivors has been derived from TRISS. A "test-based" 95% confidence interval can be calculated for each W, consistent with the corresponding Z-scores[49,50] as

$$W \pm 1.96 \frac{\sqrt{\sum p(1-p)}}{n/100}$$

The ad hoc "W statistic" is essentially the same as a standard epidemiologic statistic called the Risk Difference (RD)[49]

$$RD = (\text{observed-expected}) / n$$

multiplied by a factor of 100. Hollis and colleagues[50] have proposed stratifying the W statistic based upon categories of survival probability, in order to give a better estimate of effect if the test population has a distribution of survival probabilities different from that of the reference population. The necessary strata for this adjustment are approximately as follows: 0.68% had $0 \leq p \leq .25$, 0.46% had $.25 < p \leq .50$, 0.70% had $.50 < p \leq .75$, 1.67% had $.75 < p \leq .90$, 3.27% had $.90 < p \leq .95$, and 93.21% had $.95 < p \leq 1$.

The clustering of individuals within units of observation (e.g., hospitals) also needs to be considered when analyzing the outcomes from a given unit.[51] The advantages of multilevel or hierarchical models for this purpose have been increasingly advocated for hospital profiling. Typically, these methods result in fewer outliers and allow the incorporation of smaller centers into the analysis.[52-53]

PUBLICATIONS

In addition to the studies specifically cited above, we are pleased to note the increasing number of publications utilizing the NTDB, a listing of which we try to keep updated on our website. We recognize that the quality of these studies is variable, and that some of them fail to acknowledge the limitations we have described above. We request that researchers using NTDB notify us of any publications, and hope that the criticism of these studies will also help us find ways to improve the quality of the database. Authors should be aware that the following recommendations have been provided to the editors of journals most likely to publish articles based upon NTDB data:

Recommendations for Peer Review of Studies using the NTDB
(from the NTDB Subcommittee, ACS Committee on Trauma, March 2007)

The ACS Committee on Trauma does not presume or desire to involve itself directly in the editorial process by which manuscripts are selected for publication. However, we do wish to inform this process and maximize the quality of these publications by making editors and reviewers aware of the obligations of licensees to the National Trauma Data Bank (NTDB®), as well as some of the technical issues posed by research involving this database.

Licensees have agreed to include a statement in their manuscripts acknowledging that "the NTDB remains the full and exclusive copyrighted property of the American College of Surgeons. The American College of Surgeons is not responsible for any claims arising from works based on the original Data, Text, Tables, or Figures."

Licensees have further agreed to include language indicating which version of the NTDB (e.g., Version 6.1 issued in January 2007) they are using. This is important since the database is updated frequently, and other researchers should be provided with sufficient information to allow replication of the findings using the same data set.

The NTDB files provide only general information about contributing institutions, such as trauma center verification status and categorical number of beds. We and our licensees are

committed to maintaining the confidentiality of contributing institutions and patients as mandated by federal law. Studies claiming to add information about hospitals or patients from sources outside the NTDB should therefore be evaluated with great caution. Reviewers may wish to verify assertions about the characteristics of contributing hospitals against the characteristics actually available in the research data set.

Like any large database, the NTDB does not have complete data for all cases; therefore authors should be expected to state how they dealt with missing data (exclusion, imputation, etc.) Similarly, the NTDB is not a population-based dataset; therefore statements about the incidence of specific conditions are inappropriate if based only on NTDB data. A Reference Manual, which describes these and other sources of potential bias inherent to the NTDB, has been provided to all researchers with the database files. Reviewers are advised to look for explicit discussion of these biases and their possible effects on the analysis.

Our web site (www.ntdb.org) includes the data use agreements, data dictionaries, a list of prior publications, the Reference Manual, and other related material. Please feel free to contact the NTDB office for further information.

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APPENDIX A:
VARIABLE DESCRIPTION LIST

This section includes the definition, format and length of each variable in each of the NTDB 7.2 data sets. The data sets are listed in alphabetic order.

NOTE: The Research Dataset may contain values that are not listed in the tables below. In most cases, these are invalid values submitted to NTDB and subsequently flagged by NTDB. The EDIT_FLAG table provides details on the flagging of invalid values.

File Name: RDS_AISCODE
Definition: The AIS (Abbreviated Injury Scale) information for the trauma diagnosis.
Frequency: Unlimited number of records per incident.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident key	N	10	
AISCODE	Represents the AIS Full Code that describes the diagnosis.	C	8	
AISSCORE	This represents the severity portion of the AIS Full Code.	N	10	
BODYREGION	Body region based on the AAAM (Association for the Advancement of Automotive Medicine)	C	30	1=Head , 2=Face, 3=Neck, 4=Thorax, 5=Abdomen, 6=Spin, 7=Upper Extremity, 8=Lower Extremity, 9=Unspecified

File Name: RDS_COMORBID
Definition: Information pertaining to any pre-existing comorbid diseases the patient had upon arrival in the ED/hospital.
Frequency: Unlimited number of per incident.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident Key.	N	10	
PREXCOMOR	Pertaining to a pre-existing comorbid factor present at the point of patient arrival in the ED.	C	100	A valid code as listed in Appendix E.

File Name: RDS_COMPLIC
Definition: Information pertaining to any complications during the course of patient treatment
Frequency: Unlimited number of records per incident.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident Key.	N	10	
COMP_DESCR	Pertaining to a complication description that arose during the course of treatment.	C	100	A valid code as listed in Appendix D

File Name: RDS_DEMO
Definition: Includes information about the patient and incident demographics.
Frequency: One record per incident.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident Key	N	10	
YOBIRTH	Year Of Birth. Patients with age > 89 are presented with a YOBIRTH = -1.	N	5	
AGE	The age of the patient on arrival to the hospital. Patients with age > 89 are presented with age = -1.	N	5	0 – 89 years, -1 represents patient 89 – 120 years old. Out of range values are flagged according to Appendix B.
GENDER	Gender	C	6	"Male", "Female"
RACE	Race	C	40	"Asian or Pacific Islander", "Black", "Hispanic","Native American or Alaskan Native", "Other", "White, not of Hispanic Origin"
FAC_KEY	Facility Key	N	10	

File Name: RDS_DIAGNOS
Definition: ICD-9-CM Code of Diagnosis Information for the trauma incident.
Frequency: Unlimited number of records per incident.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident Key.	N	10	
DCODE	ICD-9-CM Code of Diagnosis.	C	7	

File Name: RDS_DIAGNOSISDESC
Definition: Information pertaining to a diagnosis made about the trauma incident.
Frequency: One record per Diagnosis code.

Field Name	Definition	Data Type	Length	Standard Option
DCODE	ICD-9-CM Code of Diagnosis.	C	7	
DCODEDESCR	Description pertaining to the ICD-9-CM Code of Diagnosis.	C	255	

File Name: RDS_DISCHARGE
Definition: Includes discharge and outcome information pertaining to the trauma incident.
Frequency: Unlimited number of records per facility record.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident Key	N	10	
LOS	Length Of Stay In Hospital	N	10	0 – 364 days. Out of range values are flagged according to Appendix B.
ICUDAYS	Days Of Total Stay In ICU	N	10	Out of range values are flagged according to Appendix B.
VENTDAYS	Ventilator Support Days	N	10	Out of range values are flagged according to Appendix B.
FIMFEED	FIM Self-feeding Score At Discharge	N	10	1=Dependent-Total Help Required 2=Dependent-Partial Help Required 3=Independent with Device 4=Independent 8 = Not Applicable (e.g., < 7 yrs. old or died) 9=Unknown
FEEDSTATUS	Status Of FIM Self-feeding Score	C	9	"D"=Not Done/Not Documented "P" = Permanent "T" = Temporary
FIMLOCOT	FIM Locomotion Score At Discharge	N	10	1 = Dependent-Total Help Required 2 = Dependent-Partial Help Required 3 = Independent with Device 4 = Independent 8 = Not Applicable (e.g., < 7 yrs. old or died) 9=Unknown

Field Name	Definition	Data Type	Length	Standard Option
LOCOM STATU	Status Of FIM Locomotion Score	C	9	"D"=Not Done/Not Documented "P" = Permanent "T" = Temporary
FIMEXPRESS	FIM Expression Score At Discharge	N	10	1 = Dependent-Total Help Required 2 = Dependent-Partial Help Required 3 = Independent with Device 4 = Independent 8 = Not Applicable (e.g., < 7 yrs. old or died) 9=Unknown
EXPSTATUS	Status Of FIM Expression Score	C	9	"D"=Not Done/Not Documented "P" = Permanent "T" = Temporary
FIMTOTAL	Total FIM Score	N	10	Any integer between 1 and 12.
YODISCH	Year Of Discharge Or Death	N	5	
PAYMENT	Principal Payment Source	C	50	"Automobile Insurance", "Blue Cross/Blue Shield", "CHAMPUS", "Government/Military Insurance", "Liability Insurance/Under Litigation", "MCH and Crippled Children's", "Managed Care Organization", "Medicaid", "Medicare", "No Charge", "No Fault Insurance", "None", "Not Done/Not Doc", "Organ Donor Subsidy", "Other", "Other Commercial Indemnity Plan", "Pending", "Private Charity", "Self Pay", "Worker's Compensation"
CHARGES	Billed Hospital Charges in U.S. dollars.	N	10	
DISCHDISP	Discharge Disposition	C	30	"Burn", "Death", "Death (DOA)", "Died During Treatment", "Discharged, SNF", "Home", "Home Health", "Hosp Transfer", "Jail", "Nursing Home", "Other", "Rehab", "Unable to Complete Treatment"
DISSTATUS	Discharge Status	C	5	"Alive", "Dead"
FAC_KEY	Facility Key	N	10	

File Name: RDS_ECODE
Definition: Includes the ICD-9 external cause of injury code.
Frequency: One record per incident.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident Key	N	10	
ECODE	ICD-9 External-cause-of-injury code.	C	6	

File Name: RDS_ED
Definition: Information pertaining events and measurements that take place in the ED.
Frequency: One record per incident.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident Key	N	10	
YOADMIT	Year of First Recorded Patient's Arrival At Reporting Hospital ED	N	5	
EDARRTIME	First Recorded Time Of Patient's Arrival At Reporting Hospital ED	C	5	
TSTIMELY	Was Trauma Surgeon Arrival In ED Timely	C	3	"D"=Not Done / Not Documented "N" = No, "P" = Pending, "Y" = Yes
DAYTOADMIT	Days Between Injury And Admission	N	5	
EDSYSBP	The initial assessment in the ED of the systolic blood pressure	N	10	Any integer between 0 and 300. Out of range values are flagged according to Appendix B.
EDRESPRATE	First Unassisted Respiratory Rate In ED	N	10	Any integer between 0 and 99. Out of range values are flagged according to Appendix B.
EDTEMP	First Temperature In ED	N	15,1	Any real number between 0 and 110.
TEMPSCALE	Temperature Scale	C	1	"C" = Celsius "F" = Fahrenheit
EDHEADCT	Head CT Results	C	8	"D"=Not Done/Not Documented "Negative", "Positive"
EDABEVAL	Abdominal Evaluation	C	8	"D"=Not Done/Not Documented "Negative", "Positive"
ABEVALTYPE	Abdominal Evaluation Type	C	25	"CT", "CT ,DPL", "DPL", "Ultrasound"
EDBASEDEF	Base Deficit/Excess In ED	N	15,1	Any integer between –80 and +80.
EDGCSEYE	Lowest Glasgow Eye Component In ED	N	10	Values for Adults (>5 yrs old): 1 = Does Not Open Eyes 2 = Opens Eyes to Pain 3 = Opens Eyes to Commands 4 = Spontaneous Eye Opening Values for Infants and Children:

Field Name	Definition	Data Type	Length	Standard Option
				1 = No Response 2 = Pain 3 = Verbal Stimuli 4 = Spontaneous
EDGCSVERB	Lowest Glasgow Verbal Component In ED	N	10	Values for Adults (>5 yrs old): 1 = None 2 = Incomprehensible words 3 = Inappropriate Words 4 = Confused 5 = Oriented Values for Child: 1 = No Response 2 = Incomprehensible sounds 3 = Inappropriate Cries 4 = Confused 5 = Oriented Values for Infant: 1 = No Response 2 = Moans to Pain 3 = Cries to Pain 4 = Irritable Cries 5 = Coos, Babbles.
EDGCSMOTOR	Lowest Glasgow Motor Component In ED	N	10	Values for Adults (>5 yrs old): 1 = None 2 = Extensor posturing in response to painful stimulation 3 = Flexor posturing in response to painful stimulation 4 = General withdrawal in response to painful stimulation 5 = Localization of painful stimulation 6 = Obeys commands with appropriate motor response Values for Infants and Children: 1 = None 2 = Abnormal flexion (decerebrate) 3 = Abnormal flexion (decerebrate) 4 = Withdraws to pain

Field Name	Definition	Data Type	Length	Standard Option
				5 = Withdraws to touch 6 = Normal Spontaneous Movement
EDGCSTOTAL	Glasgow Coma Scale Total In ED	N	10	Any integer between 3 and 15. Out of range values are flagged according to Appendix B.
EDRTS	Revised Trauma Score In ED	N	15,4	Any number between 0 and 8.
ALCOHOLPRE	Alcohol Present In Blood?	C	3	"No", "Yes"
DRUGSPRE	Drugs Present?	C	3	"No", "Yes"
ADMITSERV	Admitting Service	C	20	"Burn", "Medical", "Neuro", "Ortho", "Other", "Pediatric", "Trauma"
EDDISP	Emergency Department Disposition	C	25	"Burn", "DOA (Death)", "Die in ED", "ED Observation", "Floor", "Home", "ICU", "Not Done/Doc", "OR", "Other", "Telemetry", "Transfer", "Unable to Complete Treatment", "Unknown"
ISS	Total Injury Severity Score	N	10	An integer between 0 and 75. Out of range values are flagged according to Appendix B.
TRISS_ PROB	TRISS Survival Probability	N	10	Any number between 0.00 and 1.00
ACS_EDRTS	Recalculated Revised Trauma Score In ED by ACS	N	10	Any number between 0 and 8.
ACS_PS	Recalculated TRISS Survival Probability by ACS.	N	38,30	Any real number between 0.00 and 1.00
RESPRATEAQ	Respiratory Rate Assessment Qualifier In ED	C	2	"L" = Initial respiratory rate in ED is a legitimate value, without interventions such as intubation and sedation. "S" = Patient chemically sedated when initially assessed in ED. "T" = Patient intubated when initially assessed in ED. "TP" = Patient intubated and chemically paralyzed when initially assessed in ED.

Field Name	Definition	Data Type	Length	Standard Option
EDGCS_AQ	GCS Assessment Qualifier In ED	C	2	"L" = Initial GCS components in ED are legitimate values, "S" = Patient chemically sedated when initial GCS components assessed in ED. "T" = Patient intubated when GCS components assess in ED. "TP" = Patient intubated and chemically paralyzed when GCS components assessed in ED.
FAC_KEY	Facility Key	N	10	

File Name: RDS_EDIT_FLAG
Definition: Includes the 27 edit flags (see Appedix B) for each incident
Frequency: One record per incident.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident Key	N	10	
EDITSCORE	Number of edit checks that were flagged for the incident	N	10	Any integer between 0 and 27
EDITDETAIL	A text string of all the edit checks that were flagged for the incident	C	27	See Appedix B for description of flags.
FLAG_A	Was the incident flagged for Edit check A	C	4	"Yes", "No"
FLAG_B	Was the incident flagged for Edit check B	C	4	"Yes", "No"
FLAG_C	Was the incident flagged for Edit check C	C	4	"Yes", "No"
FLAG_D	Was the incident flagged for Edit check D	C	4	"Yes", "No"
FLAG_E	Was the incident flagged for Edit check E	C	4	"Yes", "No"
FLAG_F	Was the incident flagged for Edit check F	C	4	"Yes", "No"
FLAG_G	Was the incident flagged for Edit check G	C	4	"Yes", "No"
FLAG_H	Was the incident flagged for Edit check H	C	4	"Yes", "No"
FLAG_I	Was the incident flagged for Edit check I	C	4	"Yes", "No"
FLAG_J	Was the incident flagged for Edit	C	4	"Yes",

Field Name	Definition	Data Type	Length	Standard Option
	check J			"No"
FLAG_K	Was the incident flagged for Edit check K	C	4	"Yes", "No"
FLAG_L	Was the incident flagged for Edit check L	C	4	"Yes", "No"
FLAG_M	Was the incident flagged for Edit check M	C	4	"Yes", "No"
FLAG_N	Was the incident flagged for Edit check N	C	4	"Yes", "No"
FLAG_O	Was the incident flagged for Edit check O	C	4	"Yes", "No"
FLAG_P	Was the incident flagged for Edit check P	C	4	"Yes", "No"
FLAG_Q	Was the incident flagged for Edit check Q	C	4	"Yes", "No"
FLAG_R	Was the incident flagged for Edit check R	C	4	"Yes", "No"
FLAG_S	Was the incident flagged for Edit check S	C	4	"Yes", "No"
FLAG_T	Was the incident flagged for Edit check T	C	4	"Yes", "No"
FLAG_U	Was the incident flagged for Edit check U	C	4	"Yes", "No"
FLAG_V	Was the incident flagged for Edit check V	C	4	"Yes", "No"
FLAG_W	Was the incident flagged for Edit check W	C	4	"Yes", "No"
FLAG_X	Was the incident flagged for Edit check X	C	4	"Yes", "No"
FLAG_Y	Was the incident flagged for Edit check Y	C	4	"Yes", "No"
FLAG_Z	Was the incident flagged for Edit check Z	C	4	"Yes", "No"
FLAG_0	Was the incident flagged for Edit check 0	C	4	"Yes", "No"

File Name: RDS_FACILITY
Definition: Includes information about the participating facilities.
Frequency: One record per Facility.

Field Name	Definition	Data Type	Length	Standard Option
FAC_KEY	Facility key	N	10	
ACSLEVEL	ACS verification level	C	15	"I"," II", "III", "IV" or "Not Applicable"
STATELEVEL	State Designation level	C	25	"I", "II", "III", "IV", "Other" or "Not Applicable"
NOADULTBED	Number of Adult Hospital Beds	N	10	
NOPEDBEDS	Number of Pediatric Hospital Beds	N	10	
NOBURNBEDS	Number of Burn Hospital Beds	N	10	
NOTRAICU	Number of ICU Beds Available for Trauma Patients	N	10	
NOBURNICU	No of ICU Beds for Burn Patients	N	10	
TEACHSTATU	Hospital Teaching Status	C	12	"Community", "Non-Teaching", "University"
TEACHTYPE	Hospital Type	C	12	"For profit", "N/A", "Non-profit"
BEDSIZE	Category for total number of Beds in hospital	C	30	"≤200", "201-400", "401-600", ">600", "Not provided"
REGION	Geographic region for the hospital	C	40	"Midwest", "Northeast", "South", "West"
TRA_LEVEL	Trauma level combining the ACS verification and State designation	C	30	"I"," II", "III", "IV" or "Not Applicable"
ACSPEDLEV	ACS verification level for pediatric hospital	C	50	"I"," II", "Not Applicable"
STATEPLEV	State Designation level for pediatric hospital	C	50	"I"," II", "Not Applicable"
NOREGISTRA	Number registrars that are certified	N	10	
NONEUROSUR	Number of neurosurgeons	N	10	
NOORTHSURG	Number of orthopedic surgeons	N	10	
NOTRAREGIS	Number of trauma registrars (FTEs)	N	10	
NOTRASURG	Number of core trauma surgeons	N	10	
PEDAGECUT	What is your age cutoff in years for pediatric patients?	N	10	"Yes"
PEDASSOC	Is the hospital associated with a pediatric hospital	C	3	"Yes", "No"

Field Name	Definition	Data Type	Length	Standard Option
PEDCAREALL	This hospital provide all acute care service to injured children	C	3	Yes", "No"
PEDCARENO	This hospital do not provide care to injured children (not applicable)	C	3	Yes", "No"
PEDCRSHARE	This hospital share role with another center when it comes to providing care to injured children. (Resuscitation and care of acute injuries, followed by transfer)	C	3	Yes", "No"
PED_ICU	Does the hospital have a pediatric ICU	C	3	Yes", "No"
PED_NONE	This hospital have none of the associations following to pediatric care: association with a pediatric hospital, pediatric ward, pediatric ICU, or transfer bulk of injured children.	C	3	Yes", "No"
PEDTRANSF	Does the hospital transfer bulk of severely injured children to other specialty centers	C	3	Yes", "No"
PED_WARD	Does the hospital have a pediatric ward	C	3	" Yes", "No"
COMOR_CODE	Comorbidity recording	C	50	"Derived from ICD-9 coding", "Chart abstraction by trauma registrar", "Calculated by software registry program", "Not collected"
COMPL_CODE	Complication recording	C	50	"Derived from ICD-9 coding", "Chart abstraction by trauma registrar", "Calculated by software registry program", "Not collected"

File Name: RDS_FACILITY_INC
Definition: Includes information about the participating facilities inclusion and exclusion criteria for trauma registry data..
Frequency: One record per Facility.

Field Name	Definition	Data Type	Length	Standard Option
FAC_KEY	Facility key	N	10	
HIPFRACAGE	The Age cutoff for including hip fractures in non-elderly patients, if applicable	C	10	

Field Name	Definition	Data Type	Length	Standard Option
HIPFRACALL	Were all isolated hip fractures included in data set	C	3	"Yes", "No"
HIPFRACELD	Were isolated hip fractures included in the non-elderly	C	3	"Yes", "No"
DOA_INC	Were Dead On Arrival (DOA) in ED included in data set	C	3	"Yes", "No"
DEATHSAFT	Were Deaths After Receiving Any Evaluation/Treatment Including Died in ED included in the data set	C	3	"Yes", "No"
TRANSIN	All patients transferred into hospital included in the data set	C	3	"Yes"
TRANSINWIT	Were only patients that were transferred into the hospital within specified number of hours included in the data set	C	3	"Yes", "No"
TRANSINWHR	Number of hours cutoff for patients to be included	N	10	
TRANSOUT	Were all patients transferred out included in the data set	C	3	"Yes"
ICD9EXC	ICD-9 Exclusion range	C	2000	
ICD9RANGE	ICD-9 Inclusion range	C	2000	
ICD_MAP	AIS coding is done with ICD-9 map	C	3	"Yes", "No"
AIS05_FULL	AIS coding is done with AIS 05 full code (description plus severity)	C	3	"Yes", "No"
AIS05_ONLY	AIS coding is done with AIS 05 only (severity only)	C	3	"Yes", "No"
AIS80_FULL	AIS coding is done with AIS 80 full code (description plus severity)	C	3	"Yes", "No"
AIS80_ONLY	AIS coding is done with AIS 80 only (severity only)	C	3	"Yes", "No"
AIS85_FULL	AIS coding is done with AIS 85 full code (description plus severity)	C	3	"Yes", "No"
AIS85_ONLY	AIS coding is done with AIS 85 only (severity only)	C	3	"Yes", "No"
AIS90_FULL	AIS coding is done with AIS 90 full code (description plus severity)	C	3	"Yes", "No"
AIS90_ONLY	AIS coding is done with AIS 90	C	3	"Yes", "No"

Field Name	Definition	Data Type	Length	Standard Option
	only (severity only)			
AIS95_FULL	AIS coding is done with AIS 95 full code (description plus severity)	C	3	"Yes", "No"
AIS95_ONLY	AIS coding is done with AIS 95 only (severity only)	C	3	"Yes", "No"
AIS98_FULL	AIS coding is done with AIS 98 full code (description plus severity)	C	3	"Yes", "No"
AIS98_ONLY	AIS coding is done with AIS 98 only (severity only)	C	3	"Yes", "No"
AISCODEEXC	AIS code exclusion range	C	2000	
AISCODEINC	AIS code inclusion range	C	2000	
AISNOTDONE	AIS coding was not done (not applicable)	C	3	"Yes", "No"
AIS_OTHER	AIS coding was done with other method	C	3	""Yes", "No"
AISOSPEC	Specify of other method used for AIS coding	C	50	
TRICODE	AIS coding is done with ICD-9 map	C	3	"Yes", "No"
LOSINC	What length of stay cutoff is used for including patient in data set	C	25	"23 hours hold", "≥24 hours", "≥48 hours", "≥72 hours", "All admissions"

File Name: RDS_IMPUTED
Definition: Includes the imputed values or the original value, if value is not missing.
Frequency: One record per incident.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident key	N	10	
SCENEEYE	Imputed or Original value for Lowest Glasgow Eye Component At The Scene. Imputation rule for missing values: GCS Eye=1 when GCS total = 3 GCS Eye=4 when GCS total = 15 GCS Eye = GCS total minus the sum of GCS verbal and GCS motor.	N	10	Values for Adults (> 5 yrs old): 1 = None 2 = Pain 3 = Voice 4 = Spontaneous Values for Children and Infants: 1 = No Response 2 = Pain 3 = Verbal Stimuli 4 = Spontaneous
SCENEVERB	Imputed or Original Lowest Glasgow	N	10	Values for Adults (>5 yrs old):

Field Name	Definition	Data Type	Length	Standard Option
	Verbal Component At The Scene Imputation rule for missing values: GCS Verbal=1 when GCS total = 3 GCS Verbal=5 when GCS total = 15 GCS Verbal = GCS total minus the sum of GCS Eye and GCS motor.			1 = None 2 = Incomprehensible words 3 = Inappropriate Words 4 = Confused 5 = Oriented Values for Child: 1 = No Response 2 = Incomprehensible sounds 3 = Inappropriate Cries 4 = Confused 5 = Oriented Values for Infant: 1 = No Response 2 = Moans to Pain 3 = Cries to Pain 4 = Irritable Cries 5 = Coos, Babbles
SCENEMOTOR	Imputed or Original Lowest Glasgow Motor Component At The Scene Imputation rule for missing values: GCS Motor=1 when GCS total = 3 GCS Motor=6 when GCS total = 15 GCS Motor = GCS total minus the sum of GCS Eye and GCS verbal.	N	10	Values for Adults (>5 yrs old): 1 = None 2 = Extensor posturing in response to painful stimulation 3 = Flexor posturing in response to painful stimulation 4 = General withdrawal in response to painful stimulation 5 = Localization of painful stimulation 6 = Obeys commands with appropriate motor response Values for Infants and Children: 1 = None 2 = Abnormal flexion (decerebrate) 3 = Abnormal flexion (decerebrate) 4 = Withdraws to pain 5 = Withdraws to touch 6 = Normal Spontaneous Movement
SCENETOTAL	Imputed or Original Glasgow Coma Scale Total At The Scene	N	10	Any integer between 3 and 15.

Field Name	Definition	Data Type	Length	Standard Option
	Imputation rule for missing values: GCS Total = sum of GCS Eye, GCS Motor and GCS verbal.			
EDSYSBP	Imputed or Original first systolic blood pressure value in the ED of the Imputation rule for missing values: A Systolic blood pressure of 0 was imputed when patient's discharge disposition from ED/Hospital was DOA (Dead on Arrival)	N	10	Any integer between 0 and 300.
EDRESPRATE	Imputed or Original First Unassisted Respiratory Rate In ED Imputation rule for missing values: A Systolic blood pressure of 0 was imputed when patient's discharge disposition from ED/Hospital was DOA (Dead on Arrival)	N	10	Any integer between 0 and 99.
EDGCSEYE	Imputed or Original Lowest Glasgow Eye Component In ED Imputation rule for missing values: GCS Eye=1 when GCS total = 3 GCS Eye=4 when GCS total = 15 GCS Eye = GCS total minus the sum of GCS verbal and GCS motor.	N	10	Values for Adults (> 5 yrs old): 1 = None 2 = Pain 3 = Voice 4 = Spontaneous Values for Children and Infants: 1 = No Response 2 = Pain 3 = Verbal Stimuli 4 = Spontaneous
EDGCSVERB	Imputed or Original Lowest Glasgow Verbal Component In ED Imputation rule for missing values: GCS Verbal=1 when GCS total = 3 GCS Verbal=5 when GCS total = 15 GCS Verbal = GCS total minus the sum of GCS Eye and GCS motor.	N	10	Values for Adults (>5 yrs old): 1 = None 2 = Incomprehensible words 3 = Inappropriate Words 4 = Confused 5 = Oriented Values for Child: 1 = No Response 2 = Incomprehensible sounds 3 = Inappropriate Cries 4 = Confused 5 = Oriented Values for Infant:

Field Name	Definition	Data Type	Length	Standard Option
				1 = No Response 2 = Moans to Pain 3 = Cries to Pain 4 = Irritable Cries 5 = Coos, Babbles
EDGCSMOTOR	Imputed or Original Lowest Glasgow Motor Component In ED Imputation rule for missing values: GCS Motor=1 when GCS total = 3 GCS Motor=6 when GCS total = 15 GCS Motor = GCS total minus the sum of GCS Eye and GCS verbal.	N	10	Values for Adults (>5 yrs old): 1 = None 2 = Extensor posturing in response to painful stimulation 3 = Flexor posturing in response to painful stimulation 4 = General withdrawal in response to painful stimulation 5 = Localization of painful stimulation 6 = Obeys commands with appropriate motor response Values for Infants and Children: 1 = None 2 = Abnormal flexion (decerebrate) 3 = Abnormal flexion (decerebrate) 4 = Withdraws to pain 5 = Withdraws to touch 6 = Normal Spontaneous Movement
EDGCSTOTAL	Imputed or Original Glasgow Coma Scale Total In ED Imputation rule for missing values: GCS Total = sum of GCS Eye, GCS Motor and GCS verbal.	N	10	Any integer between 3 and 15.
FIMFEED	Imputed or Original FIM Self-feeding Score At Discharge Imputation rule for missing values: FIM Feeding=1 when FIM total = 3 FIM Feeding =4 when GCS total = 12 FIM Feeding = FIM total minus the sum of FIM Locomotion and FIM Express.	N	10	1 = Dependent-Total Help Required 2 = Dependent-Partial Help Required 3 = Independent with Device 4 = Independent 8 = Not Applicable (e.g., < 7 yrs. old or died)
FIMLOCOMT	Imputed or Original FIM Locomotion	N	10	1 = Dependent-Total Help

Field Name	Definition	Data Type	Length	Standard Option
	Score At Discharge Imputation rule for missing values: FIM Locom=1 when FIM total = 3 FIM Locom =4 when GCS total = 12 FIM Locom = FIM total minus the sum of FIM Feeding and FIM Express.			Required 2 = Dependent-Partial Help Required 3 = Independent with Device 4 = Independent 8 = Not Applicable (e.g., < 7 yrs. old or died)
FIMEXPRESS	Imputed or Original FIM Expression Score At Discharge Imputation rule for missing values: FIM Express=1 when FIM total = 3 FIM Express =4 when GCS total = 12 FIM Express = FIM total minus the sum of FIM Feeding and FIM Locomotion.	N	10	1 = Dependent-Total Help Required 2 = Dependent-Partial Help Required 3 = Independent with Device 4 = Independent 8 = Not Applicable (e.g., < 7 yrs. old or died)
FIMTOTAL	Imputed or Original Total FIM Score Imputation rule for missing values: FIM total =sum of FIM Feeding, FIM FIM Locomotion, and FIM Express.	N	10	Any integer between 1 and 12.

File Name: RDS_INTUB
Definition: Information about intubation performed either at the scene or in the ED.
Frequency: Unlimited number of records per incident record.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident Key.	N	10	
INTUB_LOC	Location of where intubation took place	C	16	"Scene", "ED"
INTUB_TYPE	Intubation Type. Indicates the type of mechanical or surgical airway placed.	C	35	"Cricothyrotomy", "ETT Route Not Recordsed", "Nasal ETT", "No Airway Placed", "Not Done/Not Documented", "Oral ETT", "Tracheostomy", "Tracheostomy/ Cricothyrotomy","Unintentional Esphageal Intubation"

File Name: RDS_MECHDESC
Definition: Look-up table for the mechanism of injury
Frequency: One record per mechanism code.

Field Name	Definition	Data Type	Length	Standard Option
ECODE	External-cause-of-injury code	C	5	
PASSENGER	Indicates if patient was passenger	C	1	"Y"
DESCR	E code description	C	254	
MECH_CDC	CDC external cause of injury	C	50	Shown in Appendix C.
INTENT	Intent of injury	C	30	"Assault", "Other", "Self-Inflicted", "Undetermined", "Unintentional"

File Name: RDS_PREHPROC
Definition: Information pertaining to the procedure prior to arriving at the hospital.
Frequency: Unlimited per incident record.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident Key.	N	10	
PREHOSPPRO	Information pertaining to the pre-hospital procedure information	C	50	

File Name: RDS_PROCEDUR
Definition: Information pertaining to the procedure performed for a trauma incident.
Frequency: Unlimited per incident record.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident Key.	N	10	
PCODE	ICD-9-CM Code of Procedure. The ICD-9-CM code that describes the procedure.	C	7	
YOPROC	Year the patient underwent the operation or procedure.	N	15	
PROC_TIME	The time the patient underwent the operation or procedure.	C	5	
DAYTOPROC	The number of days after ED arrival the procedure was done.	N	15	DAYTOPROC is 0 for procedures occurring on same day as ED arrival.
HOURTOPRO	The number of hours within ED arrival that procedure was done.	N	15	Calculated hours are rounded up to closest integer.

File Name: RDS_PROCEDUREDESC
Definition: Look-up table for the procedure performed for a trauma incident..
Frequency: One record per procedure record.

Field Name	Definition	Data Type	Length	Standard Option
PCODE	The ICD-9-CM code that describes the procedure.	C	7	
PCODEDESCR	Description pertaining to the ICD-9-CM Code of Procedure.	C	255	

File Name: RDS_SAFETY
Definition: Information pertaining to the safety equipment used/worn at time of the injury.
Frequency: Unlimited per incident record.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident Key.	N	10	
SAFETY_DES	Safety equipment used. Identifies the protective/safety device(s) in use or worn by the patient at the time of injury.	C	25	

File Name: RDS_SCENE
Definition: Includes information pertaining to the scene of the trauma incident.
Frequency: One record per incident.

Field Name	Definition	Data Type	Length	Standard Option
INC_KEY	Incident Key (Primary key to identify an incident)	N	10	
YOINJ	Year of Injury	N	5	
INJURYCOU	Country In Which Injury Occurred	C	30	
HOSPTRANS	Inter-hospital Transfer	C	50	"Emergency: NOS" "Emergency: Trauma Level 1" "Emergency: Trauma Level 2" "Emergency: Trauma Level 3" "Emergency: Trauma Level 4" "Inpatient: Acute/Rehabilitation Facility" "Home Health: NOS"
WORKREL	Work Relatedness Of Injury	C	15	3 = Paid Work (Work Related) 4 = Unpaid Work (Non-work related) 99 = Unknown

Field Name	Definition	Data Type	Length	Standard Option
INJURYSITE	Site At Which Injury Occurred	C	50	Home Farm Mine and Quarry Industrial Places and Premises Place for Recreation and Sport Street and Highway Public Building Residential Institution Other Specified Places Unspecified Places
SCENE EYE	Lowest Glasgow Eye Component At The Scene	N	10	Values for Adults (> 5 yrs old): 1 = None 2 = Pain 3 = Voice 4 = Spontaneous Values for Children and Infants: 1 = No Response 2 = Pain 3 = Verbal Stimuli 4 = Spontaneous
SCENEVER	Lowest Glasgow Verbal Component At The Scene	N	10	Values for Adults (>5 yrs old): 1 = None 2 = Incomprehensible words 3 = Inappropriate Words 4 = Confused 5 = Oriented Values for Child: 1 = No Response 2 = Incomprehensible sounds 3 = Inappropriate Cries 4 = Confused 5 = Oriented Values for Infant: 1 = No Response 2 = Moans to Pain 3 = Cries to Pain 4 = Irritable Cries 5 = Coos, Babbles

Field Name	Definition	Data Type	Length	Standard Option
SCENEMOTOR	Lowest Glasgow Motor Component At The Scene	N	10	Values for Adults (>5 yrs old): 1 = None 2 = Extensor posturing in response to painful stimulation 3 = Flexor posturing in response to painful stimulation 4 = General withdrawal in response to painful stimulation 5 = Localization of painful stimulation 6 = Obeys commands with appropriate motor response 9 = Not Done/Not Documented Values for Infants and Children: 1 = None 2 = Abnormal flexion (decerebrate) 3 = Abnormal flexion (decerebrate) 4 = Withdraws to pain 5 = Withdraws to touch 6 = Normal Spontaneous Movement 9 = Not Done/Not Documented
SCENEGCSAQ	GCS Assessment Qualifier At The Scene	C	27	"L" = Initial GCS components at scene are legitimate values, without interventions such as intubation and sedation. "S" = Patient chemically sedated when initial GCS components assessed at scene. "T" = Patient intubated when GCS components assess at scene. "TP" = Patient intubated and chemically paralyzed when GCS components assessed at scene
SCENETOTAL	Glasgow Coma Scale Total At The Scene	N	10	Any integer between 3 and 15.
INJURYTYPE	Injury Type	C	10	"Blunt" , "Burn" , "Penetrating"
FAC_KEY	Facility Key	N	10	

APPENDIX B:
EDIT FLAGS FOR NTDB

Flag No	Data Field	Edit Check
0	Valid Trauma Diagnosis Code (ICD-9 Code or AISCODE)	All patients with ICD-9-CM discharge diagnosis 800.00 – 959.9, excluding 905-909, 910-924, and 930-939. Or any non-missing AIS code.
A	Date of Birth	Year of Birth must be non-missing and less than or equal to Date of Admission. Year of Birth plus 120 must not be greater than Year of Admission.
B	Gender	Gender must be non-missing and Male or Female.
C	E-Code	The E-code record must be non-missing or and cannot be E849.x
D	Injury Severity Score	ISS must be non-missing, an integer between 0 and 75, and the sum of three squares.
E	Length of Stay	Length of Stay must be non-missing and an integer between 0 to 364.
F	Discharge Disposition/Discharge Status	Discharge Disposition and Discharge Status must be non-missing and consistent (Alive/Died). Records with Discharge Disposition of "Other" or "Unknown" are not flagged.
G	Hospital Length of Stay < ICU length of stay	The Length of ICU stay must be non-missing and less than or equal to the Hospital Length of Stay.
H	Year of Admission	Year of Admission must be non-missing and greater than or equal to 1993.
I	Date of Injury	Date of Injury must be non-missing and less than or equal to Date of Admission.
J	ED Arrival Time	ED Arrival Time must be non-missing, based on 24-hour clock from 00:00 to 23:59, and with valid entries for hour and minute.
K	Initial ED systolic blood pressure	Initial ED systolic blood pressure must be non-missing and an integer between 0 and 299.
L	Initial ED respiratory rate	Initial ED Respiratory Rate must be non-missing and an integer between 0 and 59. Missing
M	ED Disposition	If ED disposition is equal to DOA, then final hospital disposition must be DOA and must have Initial ED Systolic Blood Pressure = 0, Initial ED Respiratory Rate = 0. In addition, missing ED disposition are flagged.
N	Discharge or Death Date	Date of Discharge or Death must be non-missing and greater than or equal to Date of Admission.

Flag No	Data Field	Edit Check
O	Lowest Glasgow Coma Scale Eye component in ED	Glasgow Coma Scale Eye component must be non-missing and an integer between 1 and 4.
P	Lowest Glasgow Coma Scale Verbal component in ED.	Glasgow Coma Scale Verbal component must be an integer between 1 and 5. If Glasgow Coma Scale qualifier indicates patient intubated then GCS Verbal must be missing. However, if qualified does not indicate patient intubated then missing will be flagged.
Q	Lowest Glasgow Coma Scale Motor component in ED	Glasgow Coma Scale Motor component must be non-missing and an integer between 1 and 6
R	Glasgow Coma Scale Qualifier	Glasgow Coma Scale qualifier must be non-missing and equal to T (intubated), TP (intubated and chemically paralyzed), S (chemically sedated), or L (legitimated value).
S	Number of Days to Admission	Number of Days to admission must be non-missing and an integer between 0 and 30.
T	Probability of Survival	Probability of Survival must be non-missing and a value between 0 and 1.
U	Ventilator Days	Ventilator Days must be non-missing and less than or equal to the Hospital Length of Stay.
V	FIM locomotion score at discharge	FIM locomotion score must be non-missing and an integer between 0 and 4.
W	FIM expression score at discharge	FIM expression score must be non-missing and an integer between 0 and 4.
X	FIM Score Total at discharge	Total FIM must be non-missing and an integer between 1 and 12.
Y	FIM self- feeding score at discharge	FIM self-feeding score must be non-missing and an integer between 0 and 4.
Z	Glasgow Coma Scale Total	Glasgow Coma Scale Total must be non-missing and sum of Glasgow Coma Scale Eye, Verbal, and Motor component. If one of the components are missing then the value is flagged since the total score is invalid.

APPENDIX C:
GROUPING FOR PRESENTING INJURY MORTALITY AND MORBIDITY DATA (FEB 2007)

This matrix contains the ICD-9 external-cause-of-injury codes used for coding of injury mortality data and additional ICD-9-CM external-cause-of-injury codes, designated in bold, only used for coding of injury morbidity data. Further details and access to SAS input statements set up to define these groupings can be found at http://www.cdc.gov/nchs/injury.htm.

Mechanism / Cause	Manner / Intent				
	Unintentional	**Self-inflicted**	**Assault**	**Undetermined**	**Other[1]**
Cut / pierce	E920.0-.9	E956	E966	E986	E974
Drowning / submersion	E830.0-.9, E832.0-.9 E910.0-.9	E954	E964	E984	
Fall	E880.0-E886.9, E888	E957.0-.9	E968.1	E987.0-.9	
Fire / burn[3]	E890.0-E899, E924.0-.9	E958.1,.2,.7	E961, E968.0,.3, **E979.3**	E988.1,.2,.7	
Fire / flame[3]	E890.0-E899	E958.1	E968.0, **E979.3**	E988.1	
Hot object / substance	E924.0-.9	E958.2,.7	E961, E968.3	E988.2,.7	
Firearm[3]	E922.0-.3,.8,.9	E955.0-.4	E965.0-4, **E979.4**	E985.0-.4	E970
Machinery	E919 (.0-.9)				
Motor vehicle traffic[2,3]	E810-E819 (.0-.9)	E958.5	**E968.5**	E988.5	
Occupant	E810-E819 (.0,.1)				
Motorcyclist	E810-E819 (.2,.3)				
Pedal cyclist	E810-E819 (.6)				
Pedestrian	E810-E819 (.7)				
Unspecified	E810-E819 (.9)				

Mechanism / Cause	Manner / Intent				
	Unintentional	**Self-inflicted**	**Assault**	**Undetermined**	**Other[1]**
Pedal cyclist, other	E800-E807 (.3) E820-E825 (.6), E826.1,.9 E827-E829(.1)				
Pedestrian, other	E800-807(.2) E820-E825(.7) E826-E829(.0)				
Transport, other	E800-E807 (.0,.1,.8,.9) E820-E825 (.0-.5,.8,.9) E826.2-.8 E827-E829 (.2-.9), E831.0-.9, E833.0-E845.9	E958.6		E988.6	
Natural / environmental	E900.0-E909, E928.0-.2	E958.3		E988.3	
Bites and stings[3]	E905.0-.6,.9 E906.0-.4,**.5**,.9				
Overexertion	E927				
Poisoning	E850.0-E869.9	E950.0-E952.9	E962.0-.9, **E979.6,.7**	E980.0-E982.9	E972
Struck by, against	E916-E917.9		E960.0; E968.2		E973, E975
Suffocation	E911-E913.9	E953.0-.9	E963	E983.0-.9	
Other specified and classifiable[3,4]	E846-E848, E914-E915 E918, E921.0-.9, **E922.4,.5** E923.0-.9, E925.0-E926.9 **E928(.3-.5)**, E929.0-.5	E955.5,**.6**,.**7**,.9 E958.0,.4	E960.1, E965.5-.9 E967.0-.9, E968.4,**.6, .7 E979 (.0-.2,.5,.8,.9)**	E985.5,**.6**,**.7** E988.0,.4	E971, E978, E990-E994, E996 E997.0-.2

Mechanism / Cause	Manner / Intent				
	Unintentional	**Self-inflicted**	**Assault**	**Undetermined**	**Other[1]**
Other specified, not elsewhere classifiable	E928.8, E929.8	E958.8, E959	E968.8, E969, E999.1	E988.8, E989	E977, E995, E997.8 E998, E999.0
Unspecified	E887, E928.9, E929.9	E958.9	E968.9	E988.9	E976, E997.9
All injury[3]	E800-E869, E880-E929	E950-E959	E960-E969, **E979,** E999.1	E980-E989	E970-E978, E990-E999.0
Adverse effects					E870-E879 E930.0-E949.9
Medical care					E870-E879
Drugs					E930.0-E949.9
All external causes					E800-E999

[1]Includes legal intervention (E970-E978) and operations of war (E990-E999).
[2]Three 4th-digit codes (.4 [occupant of streetcar], .5 [rider of animal], .8 [other specified person]) are not presented separately because of small numbers. However, because they are included in the overall motor vehicle traffic category, the sum of these categories can be derived by subtraction.
[3]Codes in bold are for morbidity coding only. For details see table 2.
[4]E849 (place of occurrence) has been excluded from the matrix. For mortality coding, an *ICD-9* E849 code does not exist. For morbidity coding, an *ICD-9-CM* E849 code should never be first-listed E code and should only appear as an additional code to specify the place of occurrence of the injury incident.

APPENDIX D:
COMPLICATIONS

Below is a list of complications as defined by the Committee on Trauma Quality Improvement Subcommittee. Each complication has been tagged with its identifying code which is used in field position 2 in the *Incident Complication Record*. If your system records complications in another format (e.g., Boolean Y/N fields), please translate each complication present for a patient incident to an *Incident Complication Record* that contains the appropriate complication code as defined in the table below.

COT Complication Name	File Format Complication Code	Definition	Related ICD-9-CM Codes
Acute Respiratory Distress Syndrome (ARDS)	"ARDS"	$PaO_2/flO_2 \geq 200$, decreased compliance, diffuse pulmonary infiltrates associated with normal capillary wedge pressure in an appropriate setting. "Decreased compliance" is defined as abnormal per criteria established by institution.	518.5
Aspiration Pneumonia	"ASPP"	History of aspiration of gastric contents followed by clinical and new radiologic findings of pneumonitis within 48 hours.	507
Bacteremia	"BACT"	Any positive blood culture (*not* contaminants).	790.7
Cardiac Arrest	"CARA"	Sudden cessation of cardiac activity *after arrival* in ED, resulting in deprivation of sufficient oxygen to maintain viability of heart and brain.	427.5
Coagulopathy	"COAG"	Uncontrolled diffuse bleeding in the presence of coagulation abnormalities, e.g., increased PT or PTT, decreased platelets, or DIC.-requires treatment.	286.6

COT Complication Name	File Format Complication Code	Definition	Related ICD-9-CM Codes
Compartment Syndrome	"COMS"	Clinical evidence of increased compartment pressure with or without development of sensory or motor deficit not present on admission in a patient following blunt or penetrating extremity injury.	958.8
DVT (Lower Extremity)	"DVTL"	Venous thrombosis proximal to or involving popliteal vein confirmed by autopsy, venogram, duplex scan or non-invasive vascular evaluation.	453.8
Disseminated Fungal Infection	"DFUI"	Clinical picture of sepsis with isolation of fungus from the blood, *or* two or more non-hematogenous sites, *or* tissue biopsy, *or* positive fundoscopic findings.	117.9
Dehiscence/+Evisceration	"DEEV"	Breakdown of fascial closure confirmed by discharge of peritoneal fluid, evisceration or palpable fascial defect.	998.3
Empyema	"EMPY"	Positive culture of purulent material form pleural space requiring thoracostomy tube drainage.	510.9
Esophageal Intubation	"ESOP"	Endotracheal tube in esophagus and not immediately repositioned. Esophageal location determined by physical examination, x-ray, capnography or endoscopy.	
Hypothermia	"HPOT"	Temperature ≤ 35 C.	780.9

COT Complication Name	File Format Complication Code	Definition	Related ICD-9-CM Codes
Intra-Abdominal Abscess	"INAA"	Localized collection of purulent material in the abdominal cavity confirmed by Gram stain or culture.	682.2
Jaundice	"JAUN"	Total bilirubin ≥ 2.5 and AST or ALT greater than twice normal.	774.4
Loss of Operative Reduction/Fixation	"LORF"	Configuration of reduced fracture changed enough to warrant reoperative reposition of fragments.	
Myocardial Infarction	"MYCI"	Acute, irreversible myocardial injury and necrosis documented by increased CK-MB isoenzyme and serial T wave, S-T segment; or Q wave ECG changes; or a diagnostic radionuclide scan.	410.9
Pancreatitis	"PANC"	Any hypermylasemia associated with ultrasound or CT findings compatible with pancreatic inflammation.	577.0
Pneumonia	"PNEU"	Presence of fever, leukocytosis, gram stain of sputum with a predominant organism and white blood cells, chest radiograph with a pneumonic infiltrate and culture of sputum demonstrating a pathogen.	482.9
Pneumothorax	"PNTH"	Presence of intra-pleural air.	512.99
Skin Breakdown	"SKBD"	Contact pressure induced skin breakdown	707
Progression Of Original Neurologic Insult	"PONI"	Deterioration of additional loss of function from that noted on arrival in ED.	

COT Complication Name	File Format Complication Code	Definition	Related ICD-9-CM Codes
Pulmonary Embolus	"PEMB"	Embolus to the lungs documented by arteriography, nuclear scan or autopsy	415.1
Renal Failure	"RENF"	Creatine ≥ 3.5 mg/dl or BUN ≥ 100 mg/dl	584.8
Urinary Tract Infection	"UNTI"	Clean voided or catheter urine specimen with ≥ 10 WBC/hpf or ≥ 50K organisms/ml on C/S.	any 599
Wound Infection	"WNDI"	Drainage of purulent material from wound or active treatment of the wound, including opening a closed wound or antibiotics for the wound.	958.3

APPENDIX E:
PRE-EXISTING COMORBIDITY FACTORS

Below is the list of factors that are applicable for the *Incident Pre-Existing Comorbidity Factors* record (*I-COMBDTY*). ICD-9-CM codes are listed for each comorbid factor. These codes are provided in the event that your system records comorbidities in the form of ICD-9-CM codes. If this is the case, please translate each comorbid ICD-9-CM code (if present for the patient incident) to create a *Pre-Existing Comorbidity Factors* record with the associated Data Submission File Format code as indicated in the first column.

Code	Name	Related ICD-9-CM Codes
A.01	History of Cardiac Surgery	V45.0, P35.00-39.99, V42.1, V42.2, V42.2, V43.3
A.02	Coronary Artery Disease	414.9, 414.0
A.03	Congestive Heart Failure	428.0, 425.0-425.9
A.04	Cor Pulmonale	416.8, 415.0, 416.9
A.05	Myocardial Infarction	410.0-412.0, 428, 429.0-429.3, 429.8, 429.9
A.06	Hypertension	any 401, 402.00, 402.10, 402.90
B.01	Insulin Dependent	250 (5^{th} digit assignment for each comorbid factor)
B.02	Non-Insulin Dependent	250 (5^{th} digit assignment for each comorbid factor)
C.01	Peptic Ulcer Disease	any 533
C.02	Gastric or Esophageal Varices	456.0-456.2
C.03	Pancreatitis	577.0
C.04	Inflammatory Bowel Disease	558.9
D.01	Acquired Coagulopathy	286.7
D.02	Coumadin Therapy	
D.03	Hemophilia	286.0-286.4
D.04	Pre-existing Anemia	285.0, 285.8, 285.9
E.00	History of Psychiatric Disorders	any V11, V40.2

Code	Name	Related ICD-9-CM Codes
F.01	HIV/AIDS	079.53
F.04	Active Chemotherapy	V58.1
G.01	Bilirubin > 2 mg % (on Admission)	
G.02	Documented History of Cirrhosis	571.2, 571.5
H.01	Undergoing Current Therapy	
H.02	Concurrent or Existence of Metastasis	
I.01	Rheumatoid Arthritis	714.0-714.9
I.02	Systemic Lupus Erythematosus	710.0
J.01	Spinal Cord Injury	any 806, 952-954
J.02	Multiple Sclerosis	340
J.03	Alzheimer's Disease	290.0-290.13, 331.0
J.04	Seizures	780.3
J.05	Chronic Demyelinating Disease	341.0-341.9
J.06	Chronic Dementia	290.10
J.07	Organic Brain Syndrome	310.9
J.08	Parkinson's Disease	332.0
J.09	CVA/Hemiparesis (Stroke with Residual)	342.0-342.9
K.00	Obesity	278.00-278.01
L.01	Documented Prior History of Pulmonary Disease with Ongoing Active Treatment	
L.02	Asthma	493.0-493.9
L.03	Chronic Obstructive Pulmonary Disease	493.2, 496
L.04	Chronic Pulmonary Condition	496
M.01	Serum Creatinine > 2 mg % (On Admission)	
M.02	Dialysis (Excludes Transplant Patients)	V56.0, V45.1, V56.8
N.01	Chronic Drug Abuse	304.0-304.9

Code	Name	Related ICD-9-CM Codes
N.02	Chronic Alcohol Abuse	303.9
P.00	Pregnancy	any V22

APPENDIX F:
SOURCE CODE FOR SAMPLE PROGRAMS

NTDB has created three sample programs to help researchers get started with merging files and creating statistical output. These sample programs are available for both SAS and Stata. A description of the three sample programs can be found in the table below:

Sample Program Name	Description
editflagA	This program identify incident with edit flag = A (Incidents when age is incorrect) and list the incidents with their corresponding age. The program merges the RDS_EDITFLAGS table with RDS_DEMO table for the incidents that are flagged by editflag A.
ISS_gender	This program calculates the ISS frequency by Gender. The program merges the RDS_ED table with RDS_DEMO table and creates a frequency table of the ISS by Gender.
Spinal_cord_demo	This program will create summary statistics for demographics (age, gender) for all spinal cord incidents. The program selects all the spine injuries from the RDS_AISCODE and RDS_DCODE table and the corresponding demographics is merged into that file by using the RDS_DEMO table. Frequency table of the demographic variables are created for these incidents.

A copy of the source code for both the SAS and Stata version of these programs are included in this appendix. We hope that you will contact us with any concerns or suggestions on how to make these sample programs more useful in the future

SAS Source code:

1) editflagA.sas

```
/*************************************************************************/
/*                                                                       */
/*      Title:          editflagA.sas                                    */
/*      Author:         S. Goble, Statitician NTDB                       */
/*                                                                       */
/*      Purpose: This program identify incident with edit flag = A and   */
/*        list the patients with their corresponding age                 */
/*                                                                       */
/*      Input data:     1. Data set with the edit flags per  incident    */
/*                              Name: RDS_EDITFLAGS                      */
/*                                      Variables needed:   Name:        */
/*                                      Incident ID         INC_KEY     */
/*                                      Edit flag A         FlAG_A       */
/*                                      Edit score          EDITSCORE    */
/*                                      Edit score details   EDITDETAIL  */
/*                                                                       */
/*          2. Data set with demographics for each incident              */
/*            Name: RDS_DEMO                                             */
/*                                      Variables needed:   Name:       */
/*                                      Incident ID         INC_KEY      */
/*                                      Age                 AGE          */
/*                                      Year of Birth       YOBIRTH      */
/*                                                                       */
/*      Output: Data set with the incidents, which were flagged for      */
/*       edit flag A (Age)                                               */
/*                              Name: FlagA                              */
/*                                      Variables Outputted:  Name:      */
/*                                      Incident ID         INC_KEY      */
/*                                      Age                 AGE          */
/*                                      Year of Birth       YOBIRTH      */
/*                                      Edit flag A         FlAG_A       */
/*                                      Edit score          EDITSCORE    */
/*                                      Edit score details  EDIT   DETAIL */
/*                                                                       */
/*      Created: November, 2007                                          */
/*                                                                       */
/*************************************************************************/

* Change the following:  'D:\data\RSD\NTDB7.0'          to  '\yourpathname\'; /*folder for
saving input data sets*/;
LIBNAME DAT 'D:\data\RDS\NTDB7.0';
```

```
*** Import data set with edit flags ***;
PROC IMPORT FILE="D:\data\RDS\NTDB7.0\RDS_EDITFLAGS.csv" OUT=EDIT
DBMS=csv REPLACE;
RUN;

PROC SORT DATA=EDIT;
BY INC_KEY;
RUN;
* RECORDS THAT WITH EDIT FLAG = A FLAG *;
DATA FLAGA;
  SET EDIT;
  IF FLAG_A='YES';
  KEEP INC_KEY FLAG_A EDITSCORE EDITDETAIL;
RUN;

**** Import the Age variable *****;
PROC IMPORT FILE="D:\data\RDS\NTDB7.0\RDS_DEMO.csv" OUT=DEMO DBMS=csv
REPLACE;
RUN;

PROC SORT DATA=DEMO;
BY INC_KEY;
RUN;
*** MERGE DATA SETS ***;
DATA FLAGA;
   MERGE FLAGA(IN=IN1) DEMO;
   BY INC_KEY;
   IF IN1;                    /* KEEP INCIDENTS WITH EDITFLAG = A */
  KEEP INC_KEY EDITSCORE EDITDETAIL YOBIRTH AGE FLAG_A;
RUN;

**** PRINT LIST OF RECORDS ***;
PROC PRINT DATA=FLAGA;
RUN;

*** OUTPUT DATA SET **;
PROC EXPORT OUTFILE="D:\data\RDS\NTDB7.0\FLAGA.csv" DATA=FLAGA
DBMS=csv REPLACE;
RUN;
```

2) ISS_gender.sas

```
/*************************************************************************/
/*                                                                       */
/*      Title:          ISS_gender.sas                                   */
/*      Author:         S. Goble, Statitician NTDB                       */
/*                                                                       */
/*      Purpose: This program calculates the ISS frequency by Gender     */
/*                                                                       */
/*      Input data:     1. Data set with the ED data and edit flags per  incident */
/*                      Name: RDS_ED                                     */
/*                              Variables needed:    Name:               */
/*                              Incident ID          INC_KEY             */
/*                              ISS score            ISS                 */
/*                                                                       */
/*          2. Data set with demographics for each incident              */
/*                              Name: DEMO                               */
/*                              Variables needed:    Name:               */
/*                              Incident ID          INC_KEY             */
/*                              Gender               GENDER              */
/*                                                                       */
/*      Output: Frequency count of the ISS by Gender                     */
/*                                                                       */
/*      Created: November, 2007                                          */
/*                                                                       */
/*************************************************************************/

* Change the following:  'D:\data\RDS\NTDB7.0'          to  '\yourpathname\'; /*folder for
saving input data sets*/;
LIBNAME DAT 'D:\data\RDS\NTDB7.0';

*** Import data set with ed data (ISS)  ***;
PROC IMPORT FILE="D:\data\RDS\NTDB7.0\RDS_ED.csv" OUT=ED DBMS=csv
REPLACE;
RUN;

PROC SORT DATA=ED;
BY INC_KEY;
RUN;

**** Import the demographic data (Gender) *****;
PROC IMPORT FILE="D:\data\RDS\NTDB7.0\RDS_DEMO.csv" OUT=DEMO DBMS=csv
REPLACE;
RUN;
PROC SORT DATA=DEMO;
BY INC_KEY;
```

```
RUN;
*** MERGE DATA SETS ***;
DATA ANALYZE;
   MERGE ED DEMO;
   BY INC_KEY;
  KEEP INC_KEY ISS GENDER;
RUN;

PROC FREQ DATA=ANALYZE;
TABLE ISS*GENDER;
TITLE 'ISS SCORE BY GENDER';
TITLE2 'NOTE: YOU MIGHT WANT TO FILTER OUT INVALID ISS SCORES (EDIT
CHECK D)';
RUN;
```

3) Spinal_cord_demo.sas

```
/*************************************************************************/
/*                                                                       */
/*      Title:          spinal_cord_demo.sas                             */
/*      Author:         S. Goble, Statitician NTDB                       */
/*                                                                       */
/*      Purpose: This program will create summary statistics for simple  */
/*        demographics (age, gender) for all spinal cord incidents       */
/*                                                                       */
/*      Input data:     1.      Data set with ICD-9 code for each incident */
/*                              Name: RDS_DIAGNOS                        */
/*                              Variables needed:       Name:            */
/*                              Incident ID             INC_KEY          */
/*                              Diagnosis code          DCODE            */
/*                                                                       */
/*          2. Data set with AIS coding for each incident                */
/*            Name: RDS_AISCODE                                          */
/*                              Variables needed:       Name:            */
/*                               Incident ID            INC_KEY          */
/*                               Body region            BODYREGION       */
/*                               AIS score              AISSCORE         */
/*                                                                       */
/*          3. Data set with demographics for each incident              */
/*            Name: RDS_DEMO                                             */
/*                              Variables needed:   Name:                */
/*                               Incident ID        INC_KEY              */
/*                               Gender             GENDER               */
/*                               Age                AGE                  */
/*                                                                       */
/*      Output: Frequency count and summary statistics for spinal cord   */
/*       injuries with outcome of paralysis                              */
/*                                                                       */
/*      Created: NOVEMBER, 2007                                          */
/*                                                                       */
/*************************************************************************/

* Change the following:  'D:\data\RDS\NTDB7.0'          to  '\yourpathname\'; /*folder for
saving input data sets*/;
LIBNAME DAT 'D:\data\RDS\NTDB7.0';

*** Import the data with diagnosis codes to identify the spinal cord injuries ***;
PROC IMPORT FILE="D:\data\RDS\NTDB7.0\RDS_AISCODE.csv" OUT=AISCODE
DBMS=csv REPLACE;
RUN;
```

```
**** KEEP INCIDENTS WITH SPINAL CORDS DIAGNOSIS***;
DATA AISCODE;
  SET AISCODE;
  IF BODYREGION='Spine' ;   /*spine injury */;
  KEEP INC_KEY;
  RUN;
***  ONE RECORD PER INCIDENT***;
PROC SORT DATA=AISCODE NODUPKEY;
BY INC_KEY;
RUN;

PROC IMPORT FILE="D:\data\RDS\NTDB7.0\RDS_DIAGNOS.csv" OUT=DIAGNOS
DBMS=csv REPLACE;
RUN;

**** SPINAL CORD INJURY USING ICD-9 ***;
DATA DIAGNOS;
 SET DIAGNOS;
 IF 806<=DCODE<807;                                  /*spine injury */;
 KEEP INC_KEY;
 RUN;
***ONE RECORD PER INCIDENT***;
PROC SORT DATA=DIAGNOS NODUPKEY;
BY INC_KEY;
RUN;
 *** ALL INCIDENTS WITH SPINAL CORD INJURY & SEVERITY = 5 ***;
 DATA SPINE;
   MERGE AISCODE DIAGNOS;
   BY INC_KEY;
 RUN;

**** Import the Age variable *****;
PROC IMPORT FILE="D:\data\RDS\NTDB7.0\RDS_DEMO.csv" OUT=DEMO DBMS=csv
REPLACE;
RUN;

PROC SORT DATA=DEMO;
BY INCIDENT_KEY;
RUN;
*** MERGE DATA SETS ***;
DATA ANALYZE;
   MERGE SPINE (IN=IN1) DEMO;
   BY INC_KEY;
   IF IN1;                    /*KEEP THE SPINAL CORD INCIDENTS */;
   KEEP INC_KEY AGE GENDER;
RUN;
```

```
PROC FREQ DATA=ANALYZE;
TABLE AGE GENDER;
TITLE 'AGE AND GENDER FOR SPINAL CORD INJURIES';
RUN;
PROC UNIVARIATE DATA=ANALYZE;
VAR AGE ;
TITLE 'SUMMARY STATISTICS FOR AGE FOR SPINAL CORD INJURIES';
RUN;
```

Stata Source code:

1) editflagA.do

```
/*****************************************************************************/
/*      Title:          editflagA.do                                         */
/*      Author:             S. Goble, Statitician NTDB                       */
/*      Purpose: This program identify incident with edit flag = A and       */
/*        list the patients with their corresponding age                     */
/*                                                                           */
/*      Input data:     1. Data set with the edit flags per  incident        */
/*                          Name: RDS_EDITFLAGS                              */
/*                              Variables needed:   Name:                    */
/*                              Incident ID         INCIDENT_KEY             */
/*                              Edit flag A         FlAG_A                   */
/*                              Edit score          EDIT_SCORE               */
/*                              Edit score details   EDIT_SCORE_DETAIL       */
/*                                                                           */
/*          2. Data set with demographics for each incident                  */
/*            Name: RDS_DEMO                                                 */
/*                              Variables needed:   Name:                    */
/*                              Incident ID         INCIDENT_KEY             */
/*                              Age                 AGE                      */
/*                              Year of Birth       YOBIRTH                  */
/*                                                                           */
/*      Output: Data set with the incidents, which were flagged for          */
/*       edit flag A (Age)                                                   */
/*                          Name: FlagA                                      */
/*                              Variables Outputted:  Name:                  */
/*                              Incident ID         INCIDENT_KEY             */
/*                              Age                 AGE                      */
/*                              Year of Birth       YOBIRTH                  */
/*                              Edit flag A         FlAG_A                   */
/*                              Edit score          EDIT_SCORE               */
/*                              Edit score details  EDIT_SCORE_DETAIL        */
/*                                                                           */
/*      Created: November, 2007                                              */
/*****************************************************************************/
clear
set memory 700000
set debug on

* Change the following:'D:\data\RDS\NTDB7.0\'          to '\yourpathname\'  /*folder for saving input data sets*/
* Change the following:'D:\data\Stata\RDS7.0\Sample_programs' to '\yourpathname\'/*folder for saving output data set*/
```

```
*Import data set with edit flags
insheet using D:\data\RDS\NTDB7.0\RDS_EDITFLAGS.csv
*observations with edit flag A
keep if flag_a=="YES"
keep inc_key flag_a editscore editdetail
sort inc_key
save D:\data\Stata\RDS7.0\Sample_programs\eda.dta, replace
clear

insheet using D:\data\RDS\NTDB7.0\RDS_DEMO.csv
keep inc_key age yobirth
sort inc_key
save D:\data\Stata\RDS7.0\Sample_programs\Demo.dta, replace

*MERGE FILES
* KEEP ONLY RECORDS FROM BOTH DATA SETS
merge inc_key using D:\data\Stata\RDS7.0\Sample_programs\eda.dta
keep if _merge==3
drop _merge

*save data file
save D:\data\Stata\RDS7.0\Sample_programs\flaga.dta, replace
```

2) ISS_gender.do

```
/*****************************************************************************/
/*      Title:   ISS_gender.do                                                */
/*      Author: S. Goble, Statitician NTDB                                    */
/*      Purpose: This program calculates the ISS frequency by Gender          */
/*                                                                            */
/*      Input data:     1. Data set with the ED data and edit flags per  incident */
/*                      Name: RDS_ED                                          */
/*                              Variables needed:       Name:                 */
/*                              Incident ID             INC_KEY               */
/*                              ISS score               ISS                   */
/*                                                                            */
/*          2. Data set with demographics for each incident                   */
/*                       Name: DEMO                                           */
/*                              Variables needed:       Name:                 */
/*                              Incident ID             INC_KEY               */
/*                              Gender                  GENDER                */
/*                                                                            */
/*      Output: Frequency count of the ISS by Gender                          */
/*                                                                            */
/*      Created: November, 2007                                               */
/*                                                                            */
/*****************************************************************************/
```

```
clear
set memory 700000
set debug on

* Change the following:'D:\data\RDS\NTDB7.0\'            to '\yourpathname\'  /*folder for saving
input data sets*/
* Change the following:'D:\data\Stata\RDS7.0\Sample_programs' to '\yourpathname\'/*folder for
saving output data set*/

*Import data set with ed data (ISS)
insheet using D:\data\RDS\NTDB7.0\RDS_ED.csv
sort inc_key
save D:\data\Stata\RDS7.0\Sample_programs\ed.dta, replace
clear

*Import Demo data
insheet using D:\data\RDS\NTDB7.0\RDS_DEMO.csv
sort inc_key

*MERGE FILES
* KEEP ONLY RECORDS FROM BOTH DATA SETS
merge inc_key using D:\data\Stata\RDS7.0\Sample_programs\ed.dta
keep if _merge==3
drop _merge

* ISS SCORE BY GENDER
tab iss gender
```

3) Spinal_cord_demo.do

```
/*****************************************************************************/
/*                                                                           */
/*      Title:          spinal_cord_demo.do                                  */
/*      Author:         S. Goble, Statitician NTDB                           */
/*                                                                           */
/*      Purpose: This program will create summary statistics for simple      */
/*        demographics (age, gender) for all spinal cord incidents           */
/*                                                                           */
/*      Input data:     1.      Data set with ICD-9 code for each incident   */
/*                              Name: RDS_DIAGNOS                            */
/*                              Variables needed:       Name:                */
/*                              Incident ID             INC_KEY              */
/*                              Diagnosis code          DCODE                */
/*                                                                           */
/*          2. Data set with AIS coding for each incident                    */
/*            Name: RDS_AISCODE                                              */
/*                              Variables needed:       Name:                */
/*                               Incident ID            INC_KEY              */
/*                               Body region            BODYREGION           */
/*                               AIS score              AISSCORE             */
/*                                                                           */
/*          3. Data set with demographics for each incident                  */
/*            Name: RDS_DEMO                                                 */
/*                              Variables needed:   Name:                    */
/*                               Incident ID        INC_KEY                  */
/*                               Gender             GENDER                   */
/*                               Age                AGE                      */
/*                                                                           */
/*      Output: Frequency count and summary statistics for spinal cord       */
/*       injuries with outcome of paralysis                                  */
/*                                                                           */
/*      Created: NOVEMBER, 2007                                              */
/*                                                                           */
/*****************************************************************************/
clear
set memory 700000
set debug on

* Change the following:'D:\data\RDS\NTDB7.0\'          to '\yourpathname\'  /*folder for saving input data sets*/
* Change the following:'D:\data\Stata\RDS7.0\Sample_programs' to '\yourpathname\'/*folder for saving output data set*/

*** Import the data with diagnosis codes to identify the spinal cord injuries
insheet using D:\data\RDS\NTDB7.0\RDS_AISCODE.csv
```

```
keep if bodyregion=="Spine"
keep inc_key
sort inc_key
** delete duplicate observations
quietly by inc_key: gen dup = cond(_N==1,0,_n)
drop if dup>1
save D:\data\Stata\RDS7.0\Sample_programs\aisscode.dta, replace
clear

insheet using D:\data\RDS\NTDB7.0\RDS_DIAGNOS.csv
*** convert dcode to nummeric ****
describe
destring dcode, replace force
describe
keep if inrange(dcode,806,806.99)
keep inc_key
sort inc_key
** delete duplicate observations
quietly by inc_key: gen dup = cond(_N==1,0,_n)
drop if dup>1

*MERGE FILES
merge inc_key using D:\data\Stata\RDS7.0\Sample_programs\aisscode.dta
drop _merge
sort inc_key
save D:\data\Stata\RDS7.0\Sample_programs\spinaldata.dta, replace
clear

**** Import the Age variable *****;
insheet using D:\data\RDS\NTDB7.0\RDS_DEMO.csv
keep inc_key age gender
sort inc_key
save D:\data\Stata\RDS7.0\Sample_programs\Demo.dta, replace

*** MERGE DATA SETS *
* KEEP ONLY RECORDS FROM BOTH DATA SETS
merge inc_key using D:\data\Stata\RDS7.0\Sample_programs\spinaldata.dta
keep if _merge==3
drop _merge

*SUMMARY STATISTICS FOR AGE FOR SPINAL CORD INJURIES
tab age
tab gender
tab age gender
sum age
```