Kentucky Traumatic Brain & Spinal Cord Injury Surveillance Project

Fiscal Year 2006 Final Report

1 July 2006

This project is located at the Kentucky Injury Prevention and Research Center, University of Kentucky, and funded by the Kentucky Traumatic Brain Injury Trust Fund

FOR MORE INFORMATION

This report was prepared by Michael Singleton, Huifang Qin and Shannon Beaven of the Kentucky Injury Prevention and Research Center (Director: Dr. Julia Costich), with funding from the Kentucky Traumatic Brain Injury Trust Fund Board. Data requests, questions, or other correspondence should be directed to the address/phone numbers below.

Address: 333 Waller Avenue, Suite 202
Lexington, KY 40504

Telephone: (859) 257-5809

Fax: (859) 257-3909

E-mail: msingle@email.uky.edu

FIGURES AND TABLES

Figures **Page**

Tables **Page**

Introduction

In 2003, traumatic brain injury (TBI) was a factor in the deaths of 1,140 Kentuckians (compared to 1,087 in 2002), as well as the live discharges of 3,940 (2002: 3,713) Kentuckians from licensed, acute-care hospitals across the state. TBI played a role in the death or hospitalization of 14 state residents per day. Acquired brain injury (ABI) was diagnosed in 1,233 (2002: 1,266) deaths and 2,232 (2002: 2,193) live discharges (more than 9 ABI per day), and spinal cord injury (SCI) was reported in 77 (2002: 64) deaths and 193 (2002: 204) live discharges, or just over 5 SCI per week. See Tables 1, 17, and 32 for details.

The results of this year's report, combined with the two previous year's reports, clearly suggest that further exploration of the following causes of TBI, ABI, and SCI are needed, in order to pinpoint the risk factors involved and develop prevention strategies:

- *Motor vehicle traffic crashes (TBI and SCI), especially among ages 15-24*
- *Falls (TBI and SCI), especially among ages 0-4 and 65 and older*
- *Anoxia/hypoxia (ABI), especially among ages 45 and older*
- *Exposure to toxic substances (ABI), especially among ages 25-44*

Furthermore, the following counties have been identified as top priorities for prevention activities and programs., For the past two reporting years, all have ranked in the top quarter of Kentucky counties in terms of both the number of cases reported and the age-adjusted rate per 100,000 residents:

- *TBI: Breathitt, Letcher, Nelson and Perry*
- *ABI: Bell, Hopkins, Knox, McCracken, Perry and Whitley*
- *SCI: There were not enough total reported cases of SCI statewide to support a reliable geographic analysis.*

Motor vehicle traffic crashes in persons aged 15-24, and falls in persons aged 65 and older, again emerged as the leading causes of TBI. Anoxia/hypoxia was most common among persons aged 65 and older, whereas exposure to toxic substances was greatest among those aged 25-44. Combined, these two were the cause of nearly 99% of fatal ABI and 92% of nonfatal, hospitalized ABI.

Geographically, rates of TBI and ABI were both highest in eastern Kentucky. The west-central part of the state is also high for TBI, and the western part is high for ABI. We identified counties that ranked in the top thirty in both frequency and rate of TBI and ABI. For TBI the counties that met these criteria for 2003 were Breathitt, Clay, Graves, Grayson, Laurel, Letcher, Madison, McCracken, Montgomery, Nelson, Perry, and Whitley. For ABI they were Bell, Harlan, Hopkins, Jessamine, Knott, Knox, Madison, McCracken, Muhlenberg, Perry, Pike, and Whitley. These can be considered excellent candidates for in-depth pilot studies leading to interventions to prevent and control TBI, ABI, and SCI. In

particular, Perry, Nelson, and McCracken would represent a good geographic coverage of the most-affected areas. Jefferson county would also be a good choice because it represented 19% of all TBI in 2003 and had an age-adjusted rate that was higher than the statewide rate, and 32% higher than the rate for Fayette county, which had the second highest number of TBI.

There were 53 (5%) more TBI deaths in 2003 than in 2002. The 3,940 nonfatal TBI hospitalizations represent an increase of 227 (6%) from last year. After an unexpected decrease in TBI hospitalizations last year (7%), this brings us back in line with reported hospitalizations from the previous year (2001). We do not know for certain whether the decline in TBI hospitalizations in 2002 reflects a true decrease, an artifact of inconsistent reporting practices, or normal year-to-year variation. In general, we have refrained from drawing conclusions about year-to-year trends, preferring to wait until several years of stable data are available before making inferences about trends.

Methods

Data collection

Data used for surveillance were all received electronically. Hospital Discharge Data files from the Kentucky Department for Public Health (KDPH) are routinely received by the Kentucky Injury Prevention and Research Center (KIPRC) for surveillance purposes, as are trauma registry databases from the three American College of Surgeons-certified Level 1 trauma centers in Kentucky: University of Kentucky Hospital, University of Louisville Hospital, and Kosair Children's Hospital. The National Center for Health Statistics' Multiple Cause of Death File (NCHS Death) was required, as this data set contains information on up to 20 supplemental causes of death, whereas the Kentucky computerized death certificate data file generally includes only the external cause of injury (E-code) for trauma cases. In addition to these data sets, we were able to obtain data on Kentucky residents treated in Tennessee from that state's TBI registry. We have reported the number of TBI identified on that dataset. However, those cases were not included in the data linkage or in the final count or rates.

Traumatic brain injury case definition

The Centers for Disease Control and Prevention (CDC) have established standards for TBI case identification (CDC, 1995). Hospitals and trauma registries commonly use ICD-9 codes for injury coding. For death certificates, state and federal authorities use ICD-10 codes. The following ICD-9 diagnosis codes (n-codes) were used for identifying TBI in HDD and trauma registry data:

- Fracture of vault or base of skull: 800.0-801.9
- Other, unqualified, and multiple fractures of skull: 803.0-804.9

- Intracranial injury, including concussion, cerebral laceration, subdural hemorrhage, unspecified intracranial injury, etc: 850.0-854.1
- Head injury, unspecified: 959.01

ICD-10 codes were used to identify TBI in mortality data:

- Open wound of head: S01.0-S02.9
- Fracture of skull and facial bones: S02.0-S02.1, S02.3, S02.7-S02.9
- Intracranial injury: S06.0, S06.2-S06.9
- Crushing injury of head: S07.0-S07.1, S07.8-S07.9
- Other unspecified injuries of head: S09.7-S09.9
- Open wounds involving head with neck: T01.0
- Fractures involving head with neck: T02.0
- Crushing injuries involving head with neck: T04.0
- Injuries of brain and cranial nerve with injuries of nerves and spinal cord at neck level: T06.0
- Sequelae of injuries of head: T90.1-T90.2, T90.4-T90.5, T90.8-T90.9

If one or more of these codes was found in any of the diagnosis code fields in HDD, NCHS Death, or trauma registry data, the record was determined to be a TBI.

Acquired brain injury case definition

In addition to CDC-defined TBI, there are many brain injuries that have non-traumatic etiologies. These we have classified as ABI. Because these diagnoses are not included in the CDC definition of TBI, they have been linked and analyzed separately. These conditions were also identified by ICD-9 diagnosis codes, as follows:

- Anoxia/Hypoxia: 348.1, 668.2, 669.4, 768.1, 768.5, 768.6, 768.9, 799.0, 994.1, 994.7, 997.0
- Allergy/Anaphylaxis: 995.0, 999.4, 999.5
- Acute Medical Clinical Incidents: 320.0-320.9, 321.0-321.8
- Toxic Substances: 964.2, 967.0-967.9, 968.0-968.9, 980.0-980.9, 985, 986, 988.0-988.2, 989.0, 995.4, 995.5, 998.0

The following ICD-10 codes were used to identify ABI in NCHS death records:

- Anoxia/Hypoxia: G93.1, O29.2, O74.3, O75.4, O89.2, P20.1, P21.0, P21.1, P21.9, R09.0, T71, T75.1
- Allergy/Anaphylaxis: T78.0, T78.2, T80.5, T80.6, T88.1, T88.6
- Acute Medical Clinical Incidents: G00.0, G00.1, G00.2, G00.3, G00.8, G01, G07, G02.0, G02.1, G02.8, G04.2, G04.8, G05.0, G05.1, G06.2
- Toxic Substances: G03.8, G03.9, G97.1, G97.2, G97.8, G97.9, N14.3, R29.1, T40.5, T41.0, T41.1, T41.2, T41.3, T41.4, T42.3, T42.4, T42.6, T42.7, T45.5, T49.0, T51.0, T51.1, T51.2, T51.3, T51.8, T51.9, T56.1, T56.2, T56.3, T56.4, T56.5, T56.6, T56.7, T56.8, T57.0, T57.2, T57.3,

T57.8, T58, T60.4, T61.9, T62.0, T62.1, T62.2, T62.8, T62.8, T64, T65.0, T65.8, T65.9, T81.1, T88.2, T88.5

If one or more of these codes was found in any of the diagnosis code fields in HDD, NCHS Death, or trauma registry data, the record was classified as an ABI.

Note: The code T71 was reclassified from 'Toxic Substances' to 'Anoxia/Hypoxia'. The definition of T71 is 'Asphyxiation', and includes 'suffocation (by strangulation)' and 'systemic oxygen deficiency due to low oxygen content in ambient air or mechanical threat to breathing'.

Spinal cord injury case definition

The CDC defines SCI by the following ICD-9 diagnosis codes (CDC, 1995):

- Fracture of vertebral column with spinal cord injury: 806.0-806.9
- Spinal cord injury without evidence of spinal bone injury: 952.0-952.9

The following ICD-10 codes were used to identify SCI in mortality records:

- Fracture of neck: S12.0-S12.2, S12.7, S12.9
- Fracture of thoracic vertebra and thoracic spine: S22.0-S22.1
- Fracture of lumbar spine: S32.0, S32.7
- Injury of nerves and spinal cord at neck level: S14.0-S14.1
- Injury of nerves and spinal cord at thorax level: S24.0-S24.1
- Injury of nerves and lumbar spinal cord at abdomen, lower back, and pelvis level: S34.0-S34.1, S34.3
- Fracture of spine, level unspecified: T08
- Injury of nerves and spinal cord involving other multiple body regions: T06.1
- Injury of spinal cord, level unspecified: T09.3
- Sequelae of injury of spinal cord: T91.3

For this report, SCI records had to contain one of these codes in one of the first three diagnosis code fields in HDD, NCHS Death, or trauma registry data.

Probabilistic data linkage

Probabilistic data linkage (PDL) has been described in scholarly depth by Jaro (1995, 1989). Briefly, PDL is a statistical method for matching records in unrelated databases. By comparing the frequencies of all individuals' characteristics, such as age, birth date, and zip code, the data linkage software decides which records in the different databases probably pertain to the same person. Thus, we avoid counting these cases more than once when calculating incidence. For this project, the ratio of authentic to spurious links was set to 99:1.

Standardized variables were created from variables necessary for linkage. These included dates (of injury, admission, discharge, death, birth), geographic variables (resident county, resident state, zip codes), and demographic characteristics (age, gender, race, martial status) and others (hospital ID, TBI indicator, cause of injury).

Self match: As a first step, we matched each file against itself to determine the extent of duplication of cases within the datasets. We found that less than 0.5% of the HDD records, and almost none of the NCHS death and trauma registry records, appeared to be a duplicate. In other words, duplication of cases within the datasets appeared to be minimal.

File linkages and master dataset: Next we linked the HDD and trauma registry datasets, then the HDD and NCHS death datasets, and finally the trauma registry and NCHS death datasets. We then created a master dataset containing three sections: one for the HDD portion of the record; one for the trauma registry portion, and one for the NCHS death portion. For example, if a case was identified by data linkage in both the HDD and trauma registry files, the master file would contain a single record with an HDD and a trauma registry portion. If it was found in the HDD only, the master file would contain a single record with only the HDD portion populated, and so on.

Create analytical file: From the master dataset we created a simplified dataset from which the tables and figures in this report were derived. In doing so we made several choices which we outline briefly here. First, we defined a master record to represent a TBI, ABI, or SCI case if there was a TBI, ABI, or SCI diagnosis on any of the three files. Second, we declared a master record to represent a fatality if there was an NCHS death record present, or if there was a HDD or a trauma registry record with a patient disposition indicating death. Third, we established rules of precedence for the data source. For fatalities, if a NCHS death record was found its values were used to populate the analytical file. If a death was indicated on the HDD or trauma registry files but no death record was found, then those files were used to populate the analytical file. For non-fatal injuries, the HDD was the preferred data source. If a value was missing on that file and a trauma registry record was available, then the value from that file was used.

Using these rules we reduced the master file to an analytical file with a single value for each data element (age, gender, diagnosis codes, etc.).

Incidence rates

Crude incidence rates were calculated for each injury type by dividing the number of injuries by 4,118,189, the estimated 2003 population of Kentucky according to the Kentucky State Data Center, and then multiplying by 100,000.

This figure represents the number of TBI, ABI, or SCI that occurred per 100,000 residents of Kentucky. Age-adjusted rates were calculated using the Year 2000 Standard Population.

Data analysis

All data analysis, including mapping, was performed using SAS Version 9.1.

Results

Traumatic brain injury

There were 5,080 Kentucky-resident TBI cases identified for 2003 (Table 1). This number is 5.8% higher than the 4,801 cases identified in 2002, but nearly identical to the 5,070 cases identified in 2001. The crude incidence rate was 123.4 per 100,000 population, which represents a 5.2% increase from 117.3/100,000 for 2002. (Residents who were treated out-of-state are not included in any of any of the estimate in this report.)

The Venn diagram in Figure 1 shows the distribution of cases among the three databases. All but 407 (8%) of the 5,081 TBI cases for 2003 came from the HDD or MCOD files. Some of the 407 cases that were identified only in the trauma registry had lengths of stay equal to zero, suggesting that they were non-admissions – and some were patients who died before they could be admitted. After all such factors are taken into account, it appears that the trauma registry contributes very few cases – maybe a couple hundred per year – that are not captured through the HDD. However, a great deal of effort and time is involved in cleaning, standardizing, and linking the trauma registry database with the other two data sources, for this minimal gain. For this reason, *we recommend not including the Kentucky trauma registries in future CNSI surveillance, and using of the time saved to do more in-depth analyses on certain topics.*

The demographics of TBI in 2003 were consistent with those for 2002. Table 1 shows that the highest rates of TBI were again found among those aged 65 and over and 15-24. From Table 2 we find that 59% of non-fatal and 73% of fatal TBI occurred in males. The leading mechanisms of injury were also consistent with last year's report. Motor vehicle traffic crashes (MVTC) were the cause of 41% of all TBI, and falls caused 23% (Table 3). The top three mechanisms varied by age group (Tables 4 to 9). For those aged 65 and over, falls were the leading cause (48%). MVTC's contributed to just over half (57%) of TBI in those aged 15-24, and were the leading cause from ages 5 to 64. Falls led among young children (ages 0-4).

As one would expect, the incidence of TBI was highest in the larger counties (Figure 2). The four most populous counties in 2003 (Jefferson, Fayette, Kenton, Hardin) were among the top five in TBI incidence. A notable exception was Clinton County, which was 42nd in TBI incidence but 102nd in population. Unsurprisingly, Clinton County had the highest age-adjusted rate in the state. This is a jump from 11th in age adjusted rate in 2002. Another notable exception was Christian county, which was 10th in population but 39th in frequency of TBI. Because it borders Tennessee, we can reasonable infer that a substantial number of TBI cases in Christian county residents are not treated in Kentucky. This conclusion is supported by Figure 4, which shows that 24 Christian county residents appeared in the 2003 Tennessee TBI registry. In general, Figure 4

shows that several southern border counties have significant numbers of residents treated in Tennessee hospitals. Prominent examples, in addition to Christian, include McCreary, Bell, Whitley, and Warren. This illustrates an important point: if this report shows a county to have a high rate of TBI, we can be confident that this is a county in need. Conversely, however, if a county is shown to have a low rate we cannot conclude that there is not a significant problem in that county, particularly if it is located on or near the state border.

Viewing the state in terms of age-adjusted rates (Figure 3), again there were clusters of high-incidence counties in the eastern and west-central regions. The eastern cluster for 2003 was inclusive of and more expansive than the 2002 cluster. A west-central cluster was again evident, with some variation in counties involved. One useful way of determining priority counties is to find those that ranked among the top thirty in both frequency and age-adjusted rate of TBI. For 2003 there were twelve such counties: Breathitt, Clay, Graves, Grayson, Laurel, Letcher, Madison, McCracken, Montgomery, Nelson, Perry, and Whitley. Five of these counties – Breathitt, Clay, Letcher, Nelson, and Perry – met these criteria in 2002 as well.
Tables 10 through 12 show the frequency and rates of TBI by county, ranked in order by county, frequency, and age-adjusted rate respectively.

Nearly 4 out of 5 TBI (78%) were non-fatal (Table 1). We attempted by several means to estimate the number of the non-fatal TBI that inclined toward the higher end of the severity spectrum. All of the three methods placed the number somewhere between 1,200 and 1,600, or 30% to 49%. This finding is consistent with the 2001 report.

Table 13 indicates that 1,293 non-fatal TBI discharges had a disposition other than “routine”. The three most frequent non-routine discharges, as in 2002, were “skilled nursing facility”, “home health”, and “inpatient – other type of facility”. A total of 877 discharges had one of these three dispositions.

Table 14 shows that 1,564 non-fatal TBI discharges had an injury severity score (ISS) of “severe” or “critical”. It must be noted that ISS is based on injuries to six designated body regions, not only head injuries. It is therefore possible for a high ISS to result from, for example, a relatively mild head injury plus major injuries to the torso and/or lower extremities. So a high ISS does not necessarily indicate a severe head injury.

Table 15 presents an analysis of TBI in terms defined by the Barell Injury Diagnosis Matrix (Barell et al 2002). The definitions are as follows:

- A Type I TBI is one in which there is “recorded evidence of an intracranial injury or a moderate or a prolonged loss of consciousness (LOC), Shaken Infant Syndrome, or injuries to the optic nerve pathways.”

- A Type 2 TBI is one in which there is "no recorded evidence of intracranial injury, and LOC of less than one hour, or LOC of unknown duration, or unspecified level of consciousness."
- A Type 3 TBI is one in which there is "no evidence of intracranial injury and no LOC."

From this Table we see that 1,483 non-fatal TBI discharges had a principal diagnosis indicating a "Type I" TBI.

Commercial (42%) or government (40%) sources were the primary payers billed for acute care charges in 82% of nonfatal TBI, based on discharges identified from the HDD (Table 16). Commercial payers were billed almost $64 million in 2003, and government payers over $32 million. *There was a notable shift, compared to 2001 and 2002, in both the number of TBI discharges and the total charges billed first to government sources as compared to commercial payors.* Please note that the amount billed by the hospital will generally be larger than the amount actually paid after adjudication of the claim.

Figures 9 through 13 demonstrate that the leading mechanism of TBI varies according to the primary insurance source billed. For example, MVTC was the mechanism of injury in 66% of TBI for which 'Commercial Insurance' was the primary payer billed. Falls were the leading mechanism of TBI when "Government" was the primary payer, at 45%. These insurers should be viewed as stakeholders in programs to prevent those injuries that result in a substantial portion of their claims.

Acquired brain injury

There were 3,465 ABI cases for Kentucky residents identified in 2003 (Table 17). This is an increase of only 6 cases (6.7%) over 2002. The crude incidence rate for 2003 was 84.1 per 100,000 population, compared to 84.5 in 2002. The Venn diagram in Figure 5 shows the distribution of cases among the three databases. Nearly all of the nonfatal ABI cases came from the HDD.

ABI was skewed toward the middle and older age groups, with 86% occurring in persons aged 25 and older, compared to 73% of TBI (Table 17). Also in contrast to TBI, of which 62% occurred in males, ABI affected the genders in closer to equal proportions (Table 18). Just under two thirds (64%) of ABI were nonfatal, compared to 78% of TBI.

As shown in Table 22, nearly all ABI (99% of fatal and 92% of nonfatal, hospitalized) were a result of either anoxia/hypoxia or exposure to toxic substances (ETS). Anoxia/hypoxia tends to affect older people (ages 45 and over) considerably more often than younger people, where as ETS affects persons 15 and older with at similar rates, and is most common among persons aged 25-44 (Tables 23 and 24). Diagnosis codes (Tables 25-28) provide minimal

information about the circumstances of injury. Asphyxia was the leading cause in both fatal and nonfatal anoxia/hypoxia. Complications related to medical care were a close second for nonfatal anoxia/hypoxia, but were much less common in fatal cases. Alcohol and drugs were involved in most of the nonfatal ETS. They were common in fatal ETS as well, as were carbon monoxide poisoning and postoperative shock.

Among those ABI discharges that were reported to have some relationship with an injury (i.e., included an E-code), 79% of the non-fatal ones were poisonings. Poisoning, suffocation or drowning was indicated in 7 out of 10 of the fatal, injury-related ABI (Table 29). (Note that we are making a distinction here between "injury-related" and traumatic, with trauma being considered one of several forms of injury. ABI is, by the statutory definition, non-traumatic).

In general, as with TBI, the more populous counties had high numbers of ABI (Figure 6). The four most populous counties in 2003 (Jefferson, Fayette, Kenton, and Hardin) were among the top ten in ABI incidence. However, with the exception of McCracken (which ranked 22nd in rate), the ten most populous counties did not appear in the top forty counties when ranked by age-adjusted rate.

The counties with the highest rates were strongly concentrated in eastern Kentucky, and there was a second, smaller group of high-rate counties in the western part of the state (Figure 7). As with TBI, we located the counties that ranked among the top thirty in both frequency and age-adjusted rate of ABI. There were twelve counties that met both criteria in 2002: Bell, Harlan, Hopkins, Jessamine, Knott, Knox, Madison, McCracken, Muhlenberg, Perry, Pike, and Whitley. Six of these counties, Bell, Hopkins, Knox, McCracken, Perry, and Whitley met these criteria in 2002 as well. These can be considered leading candidates for further study and intervention. Tables 19 through 21 show the frequency and rates of ABI cases by county, ranked in order by county, frequency, and age-adjusted rate respectively.

Table 30 indicates that 38% of ABI discharges were other than "routine" – i.e., to destinations other than the home. The three most frequent non-routine discharges were "home health", "skilled nursing facility", and "inpatient – other type of facility".

Government (55%) or commercial (21%) sources were the primary payer billed for hospital charges in 3 out of every 4 non-fatal ABI, based on discharges identified from the HDD (Table 31). Government payers were billed almost $34 million in 2003, and commercial payers over $13 million.

Spinal cord injury

SCI patients often are readmitted for problems stemming from the original injury. In an effort to avoid double counting in such cases, for SCI we looked only at the first three listed diagnosis codes. There were 270 SCI cases for Kentucky residents identified in 2003 (Table 32). This number is just 2 more than the number of cases identified in 2002. The crude incidence rate was 6.6 per 100,000 population. The Venn diagram in Figure 8 shows the distribution of cases among the three databases. All but 11 of the hospitalized cases were found in the HDD.

Age groups 65 and over had the highest age-specific rates of SCI (Table 32). Rates for persons aged 15-64 were similar, and were the next highest. Males had nearly triple the SCI rate of females, and had 78% of the non-fatal SCI (Table 33).

Table 34 presents the number of SCI per county. Due to the small number of cases per county, we did not attempt a graphical analysis of SCI rates by county, as the rates would be unstable.

Among SCI's for which an E-code was reported, MVTC and falls were the leading mechanisms of injury (Table 35). Unfortunately, for over one-third of the non-fatal SCI discharges, no E-code was reported.

Over half (59%) of the non-fatal SCI discharges had dispositions other than "routine", compared to one-third for TBI (Table 36). In terms of ISS, about 44% were "severe" or "critical" (Table 37).

Commercial (43%) or government (39%) sources were the primary payer billed for acute care charges in 81% of nonfatal SCI, based on discharges identified from the HDD (Table 38). As with TBI, this represents a pronounced narrowing of the gap between commercial and government payers as the primary source of payment. Commercial payers were billed almost $7 million in 2003, and government payers just over $3 million.

Limitations

Numbers and rates for fatal TBI, ABI and SCI have been relatively stable since 1999, because the MCOD system from which we take the cases is a mature data system. The nonfatal statistics, however, have increased substantially over the same period. The explanation is the same: the HDD and trauma registry databases were less developed, and have only begun to stabilize in recent years (Table 39). As a result, with 2001, 2002, and 2003 we now have three years of complete fatality and in-state hospitalization data on which to base our conclusions.

The methodology used in this report under-represents the incidence of ABI. The reason is that the injury subset of the HDD used in this and previous years included only those cases of ABI that were comorbid with at least one injury diagnosis.

Double counting of cases is possible for several reasons, including multiple representation of cases within individual data sets (e.g., transfers between hospitals), or across linked data sets (due to failure of data linkage to identify duplicate records).

“Non-fatal” in this report refers to Kentucky-resident inpatients discharged alive from a licensed, acute-care hospital *in Kentucky* (including trauma centers). It does not include those treated and released at emergency departments (with the exception of certain cases treated and released from ED’s at certified trauma centers), those treated by emergency medical services who refused transport to a hospital, or those hospitalized outside of Kentucky. The incidence of non-fatal TBI in Kentucky residents, in that larger sense, is certainly several times larger than the results reported here.

References

Dryden DM, Saunders LD, Rowe BH, May LA, Yiannakoulias N, Svenson LW, Schopflocher DP, Voaklander DC. *The epidemiology of traumatic spinal cord injury in Alberta, Canada*. Can J Neurol Sci, 2003; 30(2): 113-121.

Jaro M. *Advances in record-linkage methodology as applied to matching the 1985 census of Tampa, Florida*. Journal of the American Statistical Association, 1989; 84(406): 16-21.

Jaro M. *Probabilistic linkage of large public health data files*. Statistics in Medicine, 1995; 14: 491-498.

PMIC. *International Classification of Diseases: 9th Revision, Clinical Modification (5th Edition)*. Los Angeles, California: Practice Management Information Corporation, 1998.

Sekhon LHS, Fehlings MG. *Epidemiology, demographics, and pathophysiology of acute spinal cord injury*. Spine, 2001; 26(24S): S2-S12.

Singleton M. *Deaths of Kentucky Residents Due to Unintentional Poisoning and Poisoning of Undetermined Intent*.
http://www.kiprc.uky.edu/projects/State_inj_surveillance/pubs.htm
Kentucky Injury Prevention and Research Center, August 2003.

Thomas C, Butler J, Davies M, Johnson R. *State Injury Indicators Report, Second Edition – 1999 Data.* Atlanta (GA): Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 2004.

CDC. Thurman DJ, Sniezek JE, Johnson D, Greenspan A, Smith SM. *Guidelines for Surveillance of Central Nervous System Injury*. Atlanta: Centers for Injury Prevention and Control, 1995.

CDC. *Traumatic brain injury—Colorado, Missouri, Oklahoma, and Utah, 1990-1993*. *MMWR*, 1997; 46(1): 8-11.

CDC. *Recommended Framework for Presenting Injury Mortality Data*. MMWR 1997; 46 (No. RR-14).

CDC. *Unintentional and Undetermined Poisoning Deaths – 11 States, 1990-2001*. MMWR 2004;53:233-237.

References

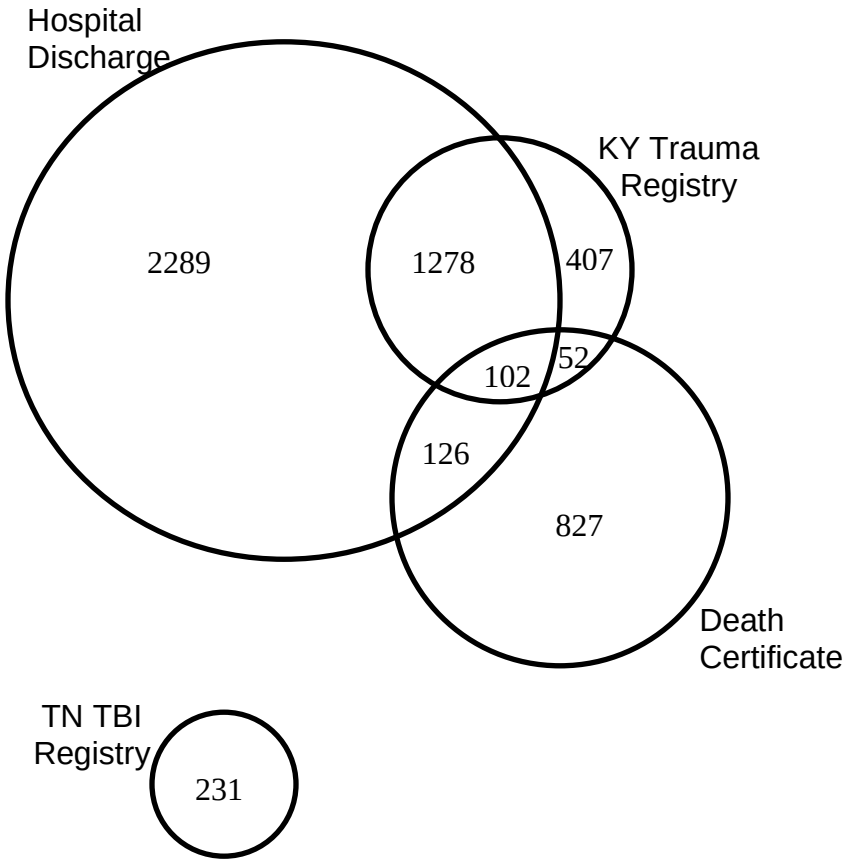
Thurman DJ, Alverson C, Dunn KA, Guerrero J, Sniezek JE. *Traumatic brain injury in the United States: a public health perspective.* Journal of Head Trauma Rehabilitation, 1999; 14(6): 602-615.

Barell V, Aharonson-Daniel L, Fingerhut LA, Mackenzie EJ, Ziv A, Boyko V, Abargel A, Avitzour M, Heruti R. *An introduction to the Barell body region by nature of injury diagnosis matrix.* Injury Prevention, June 2002 v8 i2 p91(6).

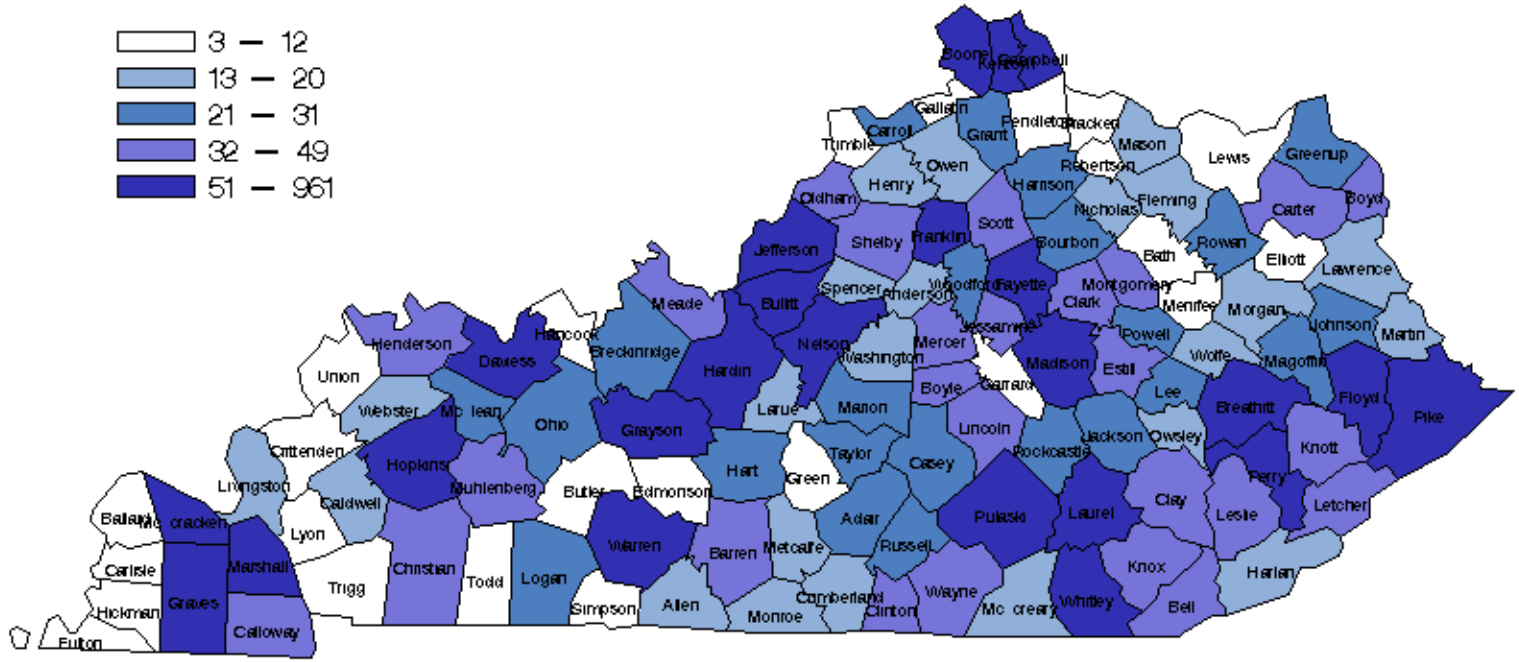
WHO. *International Statistical Classification of Diseases and Related Health Problems* – 10 Revision. Geneva, Switzerland: World Health Organization, 1992.

FIGURES

Figure 1. Distribution of TBI among databases, 2003

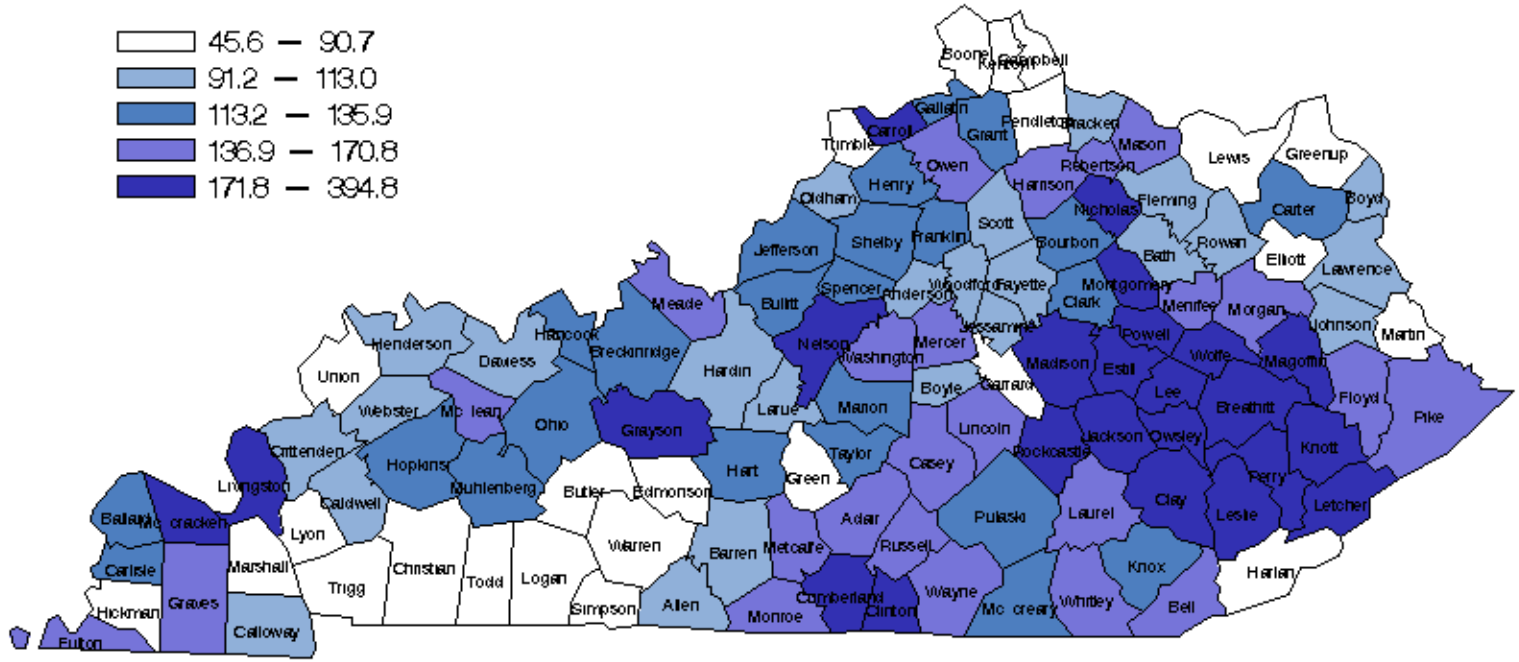


TBI Cases by County, Kentucky 2003



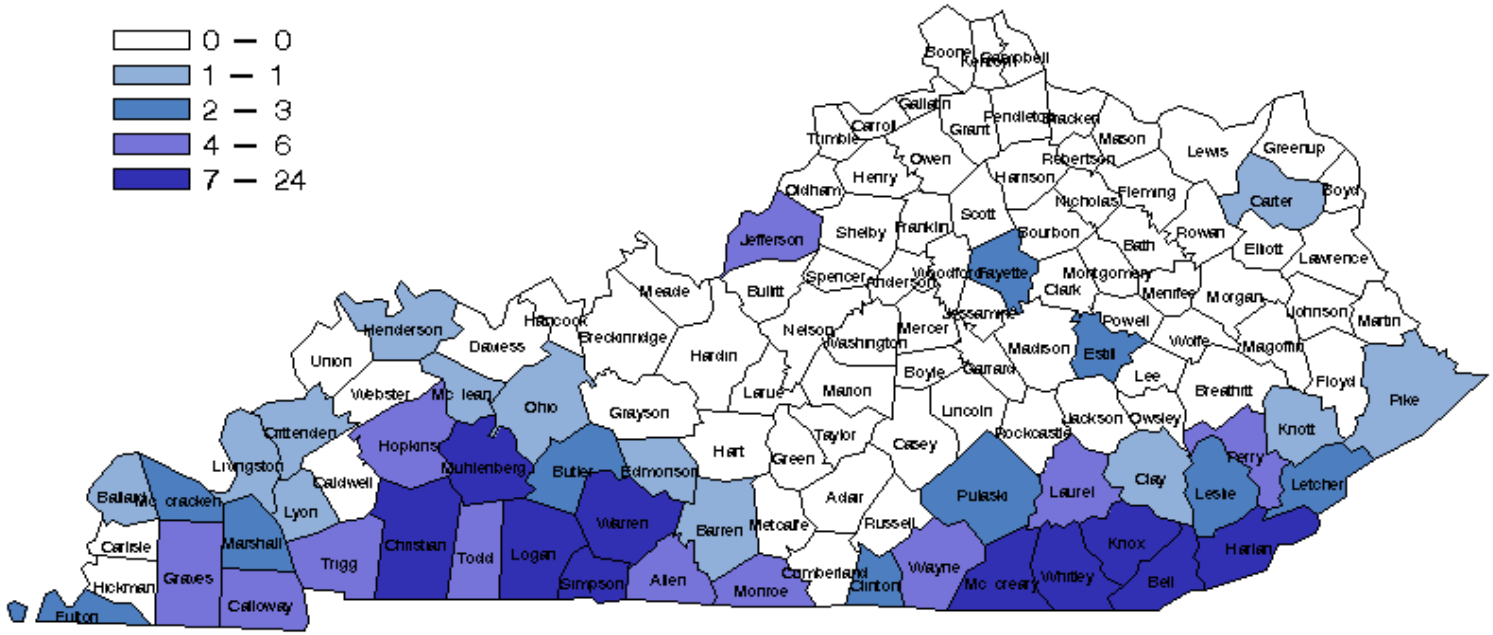
Source: Kentucky TBI Surveillance Project 2003.

Age–Adjusted TBI Rates by County, Kentucky 2003



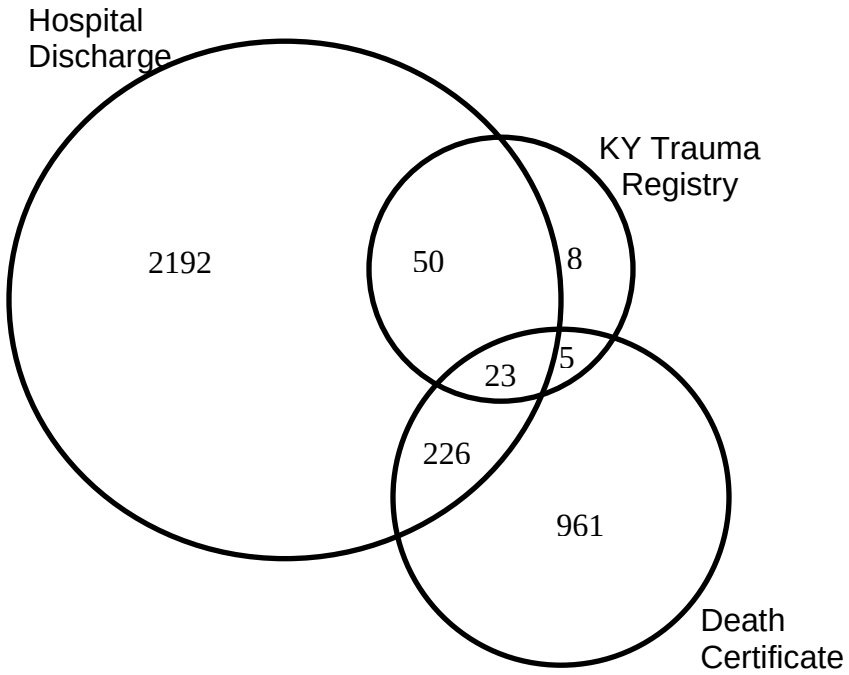
Source: Kentucky TBI Surveillance Project 2003.

Kentucky TBI Cases by County, Seen in Tennessee 2003

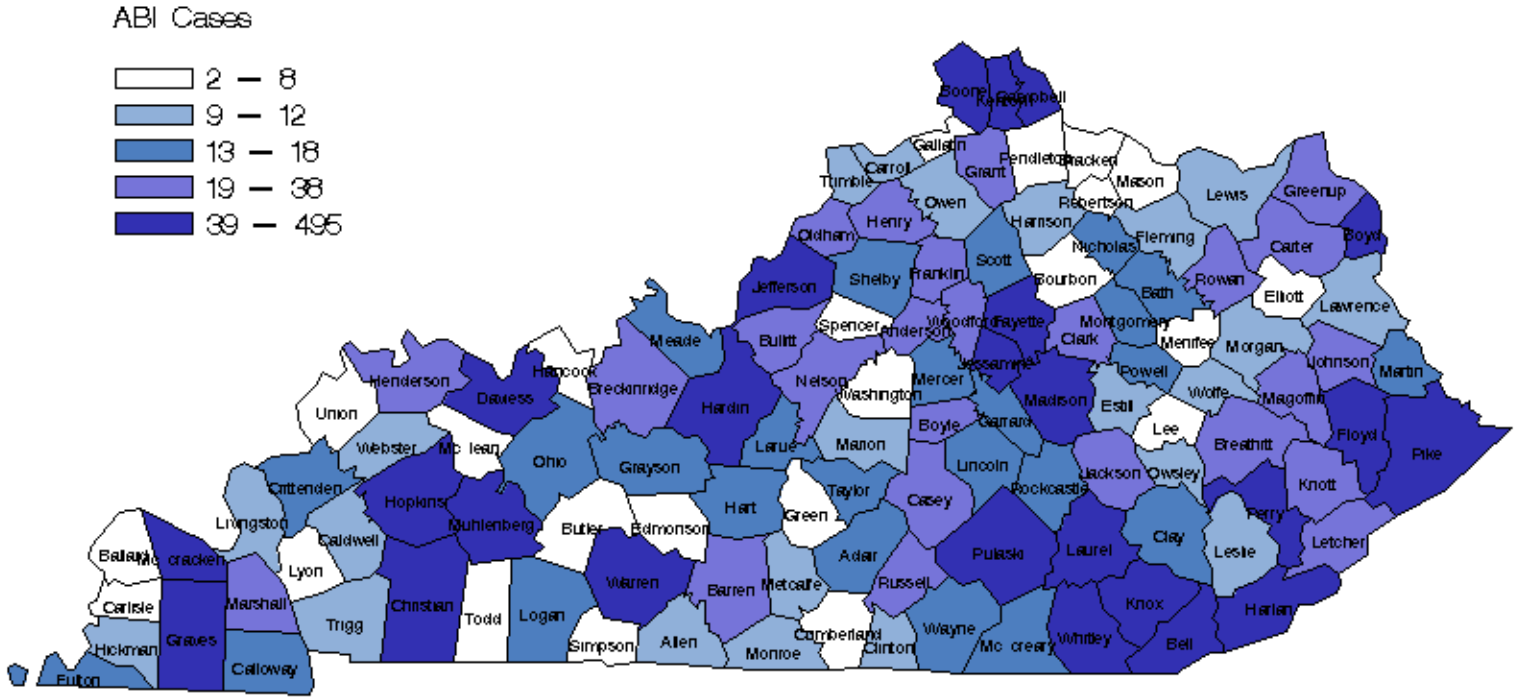


Source: Kentucky TBI Surveillance Project 2003.

Figure 5. Distribution of ABI among databases, 2003

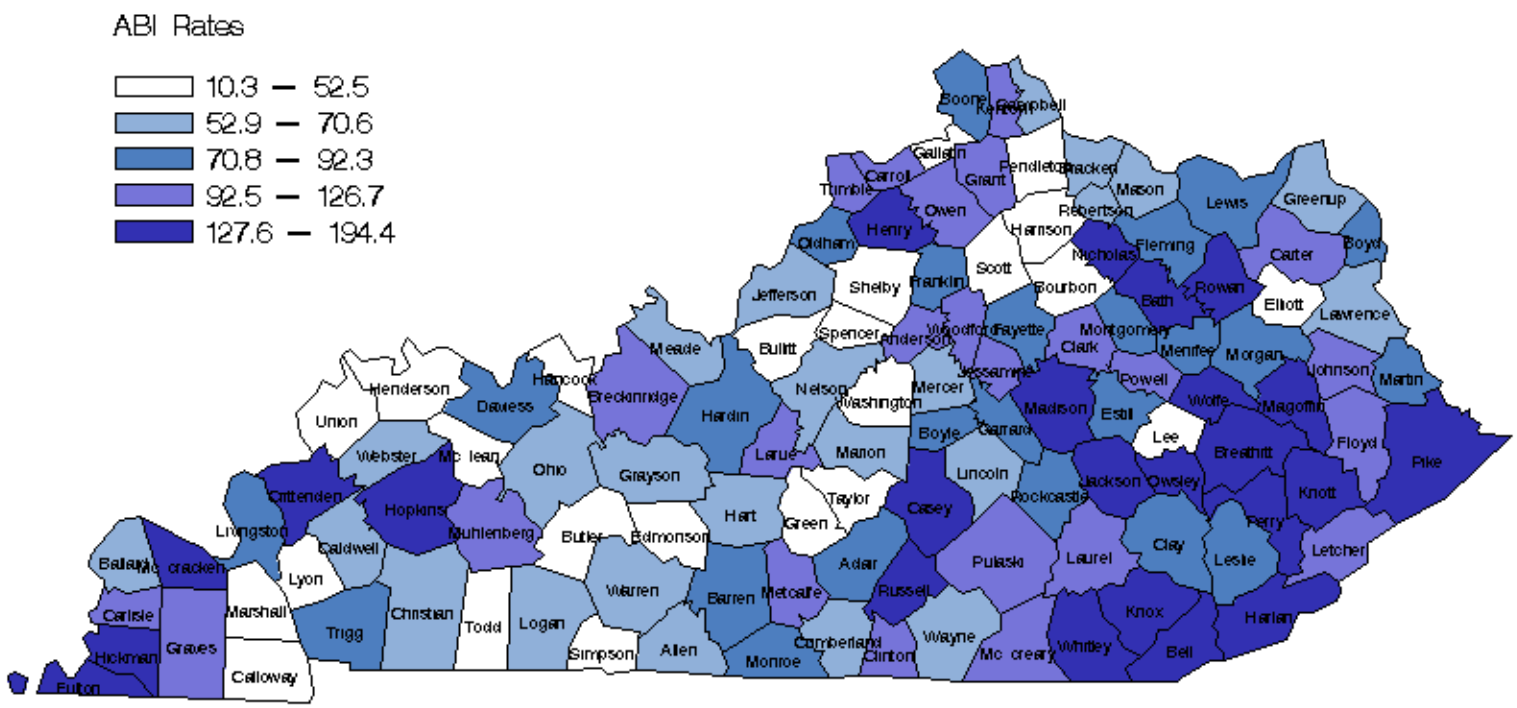


ABI Cases by County, Kentucky 2003



Source: Kentucky TBI Surveillance Project 2003.

Age–Adjusted ABI Rates by County, Kentucky 2003



Source: Kentucky TBI Surveillance Project 2003.

Figure 8. Distribution of SCI among databases, 2003

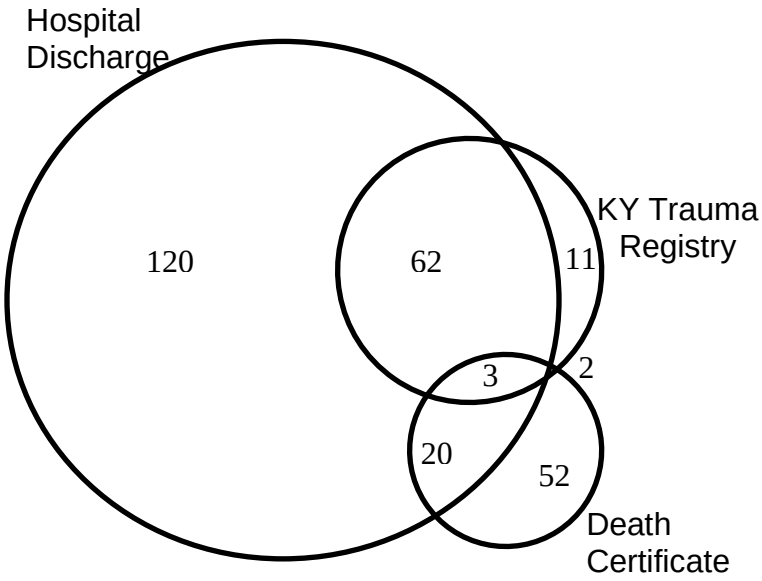


Figure 9. Mechanism of injury for self-pay TBI, 2003

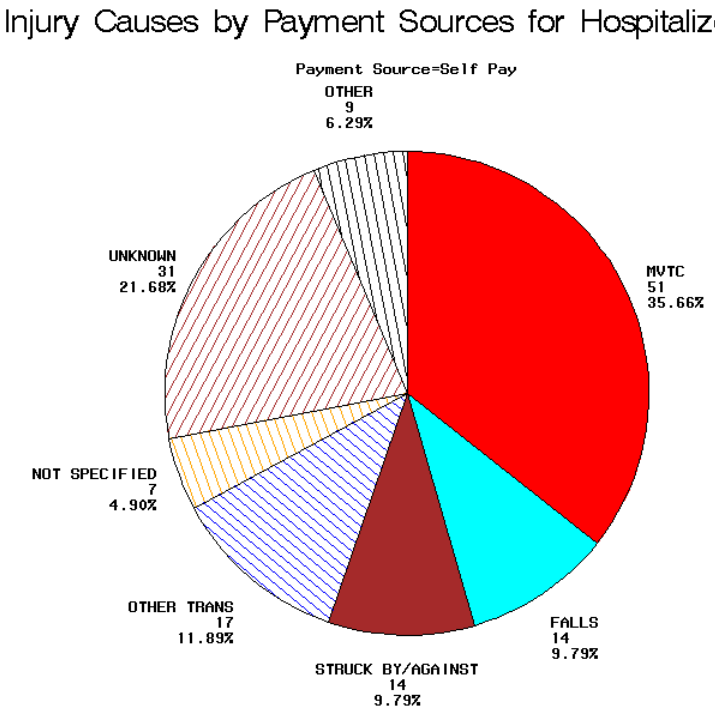


Figure 10. Mechanism of injury for TBI having 'Commercial Insurance' as primary payer, 2003

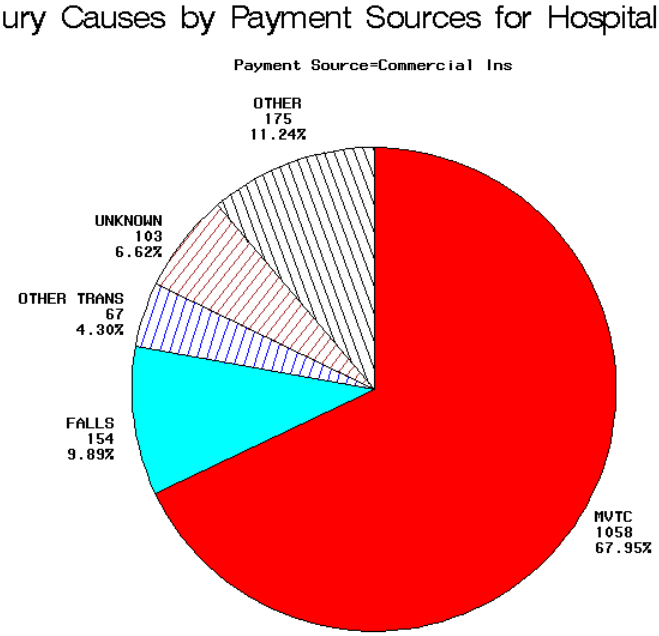


Figure 11. Mechanism of injury for TBI having 'Government' as primary payer, 2003

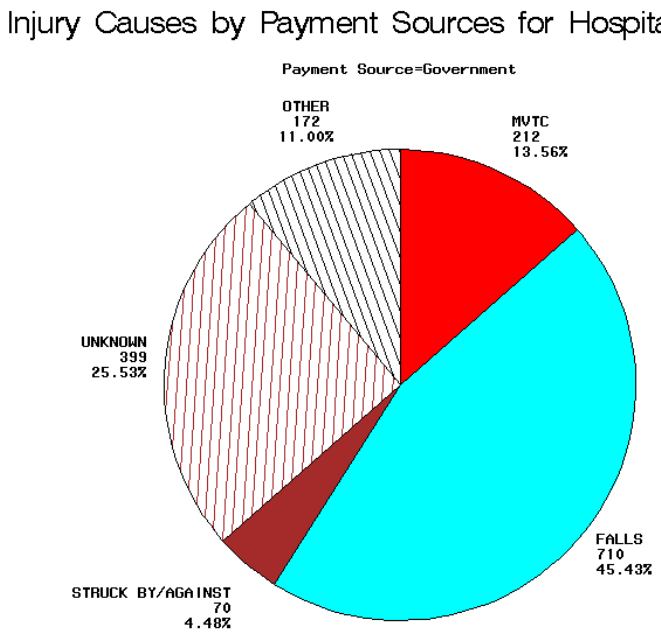


Figure 12. Mechanism of injury for TBI having 'Worker's Compensation' as primary payer, 2003

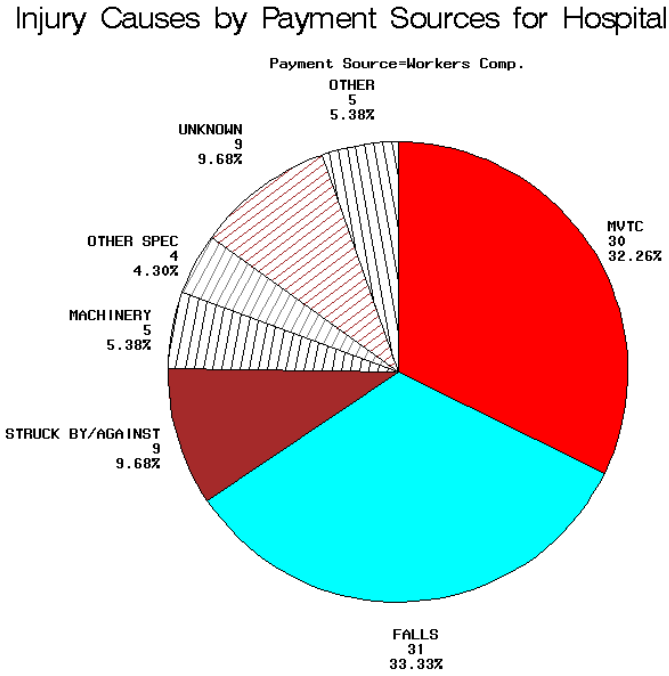
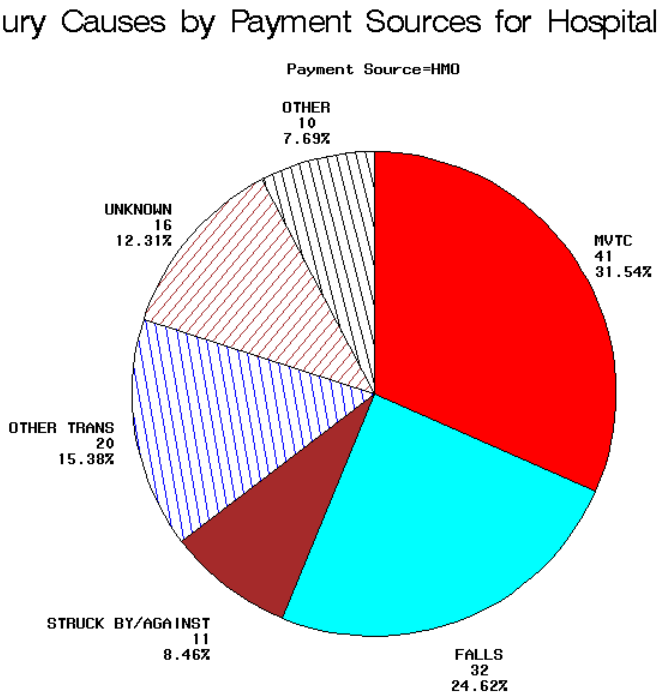


Figure 13. Mechanism of injury for TBI having 'HMO' as primary payer, 2003



TABLES

Table 1. TBI by age, 2003

	Fatal			Non-fatal			Total		
Age	Number	Percent	Rate	Number	Percent	Rate	Number	Percent	Rate
0-4	20	10.1	7.5	178	89.9	66.8	198	100.0	74.3
5-14	24	8.4	4.3	261	91.6	47.3	285	100.0	51.6
15-24	167	19.0	28.8	713	81.0	122.9	880	100.0	151.7
25-44	314	24.1	26.4	990	75.9	83.3	1,304	100.0	109.7
45-64	279	28.0	27.4	716	72.0	70.4	995	100.0	97.9
65+	336	23.7	65.3	1082	76.3	210.4	1,418	100.0	275.7
Total	1,140	22.4	27.7	3,940	77.6	95.7	5,080	100.0	123.4

* For one observation, the individual's age was not reported

Table 2. TBI by gender, 2003

	Fatal			Non-fatal			Total		
Age	Number	Percent	Rate	Number	Percent	Rate	Number	Percent	Rate
Male	827	26.4	41.0	2,304	73.6	114.1	3,131	100.0	155.1
Female	313	16.1	14.9	1,637	83.9	78.0	1,950	100.0	92.9
Total	1,140	22.4	27.7	3,941	77.6	95.7	5,081	100.0	123.4

Table 3. Leading causes of TBI, all ages, 2003

	Fatal			Non-fatal			Total		
Mechanism of Injury	Number	Pct.	Rate	Number	Pct.	Rate	Number	Pct.	Rate
Motor vehicle traffic crash	394	19.0	9.6	1,681	81.0	40.8	2,075	100.0	50.4
Fall	180	15.8	4.4	961	84.2	23.3	1,141	100.0	27.7
Firearm	356	93.2	8.6	26	6.8	0.6	382	100.0	9.3
Non-traffic land transport	39	16.3	0.9	201	83.8	4.9	240	100.0	5.8
Struck by object or person	15	7.4	0.4	187	92.6	4.5	202	100.0	4.9
Non-traffic pedal cycle	1	2.3	0.0	43	97.7	1.0	44	100.0	1.1
Machinery	7	29.2	0.2	17	70.8	0.4	24	100.0	0.6
Other	103	28.7	2.5	256	71.3	6.2	359	100.0	8.7
Unknown (missing E-code)	45	7.3	1.1	569	92.7	13.8	614	100.0	14.9
Total	1,140	22.4	27.7	3,941	77.6	95.7	5,081	100.0	123.4

Table 4. Leading causes of TBI for ages 0-4, 2003

	Fatal		Non-fatal		Total	
Mechanism of Injury	Number	Percent	Number	Percent	Number	Percent
Fall	0	0.0	67	37.6	67	33.8
Motor vehicle traffic crash	10	50.0	52	29.2	62	31.3
Struck by or against object or person	0	0.0	7	3.9	7	3.5
Non-traffic land transportation	1	5.0	3	1.7	4	2.0
Other (including non-specific codes)	8	40.0	38	21.3	46	23.2
Unknown (missing E-code)	1	5.0	11	6.2	12	6.1
Total	20	100.0	178	100.0	198	100.0

Table 5. Leading causes of TBI for ages 5-14, 2003

	Fatal		Non-fatal		Total	
Mechanism of Injury	Number	Percent	Number	Percent	Number	Percent
Motor vehicle traffic crash	13	54.2	98	37.5	111	38.9
Fall	1	4.2	41	15.7	42	14.7
Non-traffic land transportation	2	8.3	40	15.3	42	14.7
Struck by or against object or person	0	0.0	18	6.9	18	6.3
Other pedal cycle	0	0.0	31	11.9	31	10.9
Firearm	4	16.7	1	0.4	5	1.8
Other (including non-specific codes)	4	16.7	24	9.2	28	9.8
Unknown (missing E-code)	0	0.0	8	3.1	8	2.8
Total	24	100.0	261	100.0	285	100.0

Table 6. Leading causes of TBI for ages 15-24, 2003

	Fatal		Non-fatal		Total	
Mechanism of Injury	Number	Percent	Number	Percent	Number	Percent
Motor vehicle traffic crash	96	57.5	488	68.4	584	66.4
Firearm	52	31.1	8	1.1	60	6.8
Non-traffic land transportation	7	4.2	64	9.0	71	8.1
Struck by or against object or person	0	0.0	33	4.6	33	3.8
Fall	3	1.8	41	5.8	44	5.0
Other (including non-specific codes)	9	5.4	36	5.0	45	5.1
Unknown (missing E-code)	0	0.0	43	6.0	43	4.9
Total	167	100.0	713	100.0	880	100.0

Table 7. Leading causes of TBI for ages 25-44, 2003

	Fatal		Non-fatal		Total	
Mechanism of Injury	Number	Percent	Number	Percent	Number	Percent
Motor vehicle traffic crash	115	36.6	577	58.3	692	53.1
Firearm	138	43.9	8	0.8	146	11.2
Fall	7	2.2	109	11.0	116	8.9
Struck by or against object or person	7	2.2	68	6.9	75	5.8
Non-traffic land transportation	16	5.1	55	5.6	71	5.4
Machinery	2	0.6	4	0.4	6	0.5
Other (including non-specific codes)	27	8.6	72	7.3	99	7.6
Unknown (missing E-code)	2	0.6	97	9.8	99	7.6
Total	314	100.0	990	100.0	1,304	100.0

Table 8. Leading causes of TBI for ages 45-64, 2003

	Fatal		Non-fatal		Total	
Mechanism of Injury	Number	Percent	Number	Percent	Number	Percent
Motor vehicle traffic crash	103	36.9	302	42.2	405	40.7
Fall	26	9.3	155	21.6	181	18.2
Firearm	103	36.9	7	1.0	110	11.1
Non-traffic land transportation	7	2.5	33	4.6	40	4.0
Struck by or against object or person	4	1.4	36	5.0	40	4.0
Other (including non-specific codes)	28	10.0	67	9.4	95	9.5
Unknown (missing E-code)	8	2.9	116	16.2	124	12.5
Total	279	100.0	716	100.0	995	100.0

Table 9. Leading causes of TBI for ages 65+, 2003

	Fatal		Non-fatal		Total	
Mechanism of Injury	Number	Percent	Number	Percent	Number	Percent
Fall	143	42.6	548	50.6	691	48.7
Motor vehicle traffic crash	57	17.0	164	15.2	221	15.6
Firearm	59	17.6	2	0.2	61	4.3
Struck by or against object or person	4	1.2	25	2.3	29	2.0
Non-traffic land transportation	6	1.8	6	0.6	12	0.8
Other (including non-specific codes)	33	9.8	34	3.1	67	4.7
Unknown (missing E-code)	34	10.1	303	28.0	337	23.8
Total	336	100.0	1,082	100.0	1,418	100.0

Table 10. Incidence of TBI by county, sorted by county name, 2003

County	Freq	Percent	Age-Adjusted Rate	Crude Rate	County	Freq	Percent	Age-Adjusted Rate	Crude Rate	County	Freq	Percent	Age-Adjusted Rate	Crude Rate
ADAIR	27	0.5	144.2	153.6	GRANT	23	0.5	113.2	94.6	MCLEAN	28	0.6	148.6	149.5
ALLEN	17	0.3	91.2	91.7	GRAVES	62	1.2	157.1	165.8	MEADE	40	0.8	155.7	141.3
ANDERSON	18	0.4	92.8	89.6	GRAYSON	55	1.1	217.2	220.0	MENIFEE	9	0.2	142.4	133.0
BALLARD	10	0.2	123.3	120.6	GREEN	10	0.2	72.1	85.7	MERCER	32	0.6	145.1	148.9
BARREN	37	0.7	92.5	93.7	GREENUP	30	0.6	79.3	80.5	METCALFE	14	0.3	140.6	137.7
BATH	10	0.2	92.8	86.7	HANCOCK	10	0.2	125.5	118.2	MONROE	17	0.3	146.8	145.8
BELL	45	0.9	147.4	151.7	HARDIN	102	2.0	113.0	106.2	MONTGOMERY	49	1.0	214.0	207.4
BOONE	52	1.0	73.9	51.3	HARLAN	19	0.4	57.8	59.5	MORGAN	20	0.4	140.0	139.3
BOURBON	26	0.5	131.2	132.5	HARRISON	27	0.5	147.4	147.9	MUHLENBERG	43	0.8	123.7	135.4
BOYD	49	1.0	92.7	98.5	HART	24	0.5	129.9	131.6	NELSON	67	1.3	179.3	165.8
BOYLE	32	0.6	108.9	113.3	HENDERSON	47	0.9	103.3	103.5	NICHOLAS	14	0.3	197.4	197.9
BRACKEN	9	0.2	104.6	103.4	HENRY	18	0.4	117.7	114.1	OHIO	31	0.6	133.6	131.6
BREATHITT	53	1.0	338.6	332.6	HICKMAN	5	0.1	77.8	96.7	OLDHAM	44	0.9	105.6	84.5
BRECKINRIDGE	26	0.5	131.0	135.6	HOPKINS	57	1.1	115.0	121.7	OWEN	15	0.3	139.8	132.7
BULLITT	70	1.4	119.8	105.0	JACKSON	28	0.6	200.8	205.6	OWSLEY	16	0.3	350.3	336.9
BUTLER	11	0.2	80.2	82.3	JEFFERSON	961	18.9	135.9	137.3	PENDLETON	7	0.1	51.1	46.3
CALDWELL	14	0.3	110.8	108.7	JESSAMINE	45	0.9	110.3	106.4	PERRY	100	2.0	341.4	336.0
CALLOWAY	35	0.7	94.0	100.6	JOHNSON	25	0.5	107.3	104.8	PIKE	100	2.0	145.7	149.1
CAMPBELL	51	1.0	58.4	58.4	KENTON	114	2.2	80.2	74.6	POWELL	28	0.6	213.9	205.7
CARLISLE	7	0.1	119.4	131.8	KNOTT	42	0.8	236.8	238.9	PULASKI	81	1.6	135.8	137.9
CARROLL	21	0.4	210.1	203.0	KNOX	40	0.8	125.6	125.3	ROBERTSON	*	-	-	-
CARTER	32	0.6	115.3	116.5	LARUE	15	0.3	112.0	111.2	ROCKCASTLE	31	0.6	177.9	184.7
CASEY	23	0.5	141.9	143.2	LAUREL	82	1.6	154.5	146.4	ROWAN	26	0.5	101.3	117.2
CHRISTIAN	39	0.8	63.4	55.2	LAWRENCE	17	0.3	110.8	105.9	RUSSELL	28	0.6	161.9	166.3
CLARK	39	0.8	120.2	113.4	LEE	23	0.5	284.9	295.4	SCOTT	34	0.7	93.0	89.4
CLAY	46	0.9	187.2	189.7	LESLIE	40	0.8	338.6	332.1	SHELBY	45	0.9	130.5	120.9
CLINTON	38	0.7	394.8	397.6	LETCHER	46	0.9	187.2	186.4	SIMPSON	9	0.2	52.7	53.3
CRITTENDEN	11	0.2	112.2	122.2	LEWIS	12	0.2	87.0	86.8	SPENCER	18	0.4	130.6	121.4
CUMBERLAND	16	0.3	215.5	223.2	LINCOLN	39	0.8	160.1	157.1	TAYLOR	31	0.6	126.3	132.0
DAVIESS	96	1.9	100.7	103.7	LIVINGSTON	19	0.4	188.0	194.6	TODD	9	0.2	75.5	75.9
EDMONSON	9	0.2	72.9	75.5	LOGAN	24	0.5	86.0	88.7	TRIGG	12	0.2	90.7	90.6
ELLIOTT	*	-	-	-	LYON	*	-	-	-	TRIMBLE	*	-	-	-
ESTILL	32	0.6	210.6	211.0	MADISON	60	1.2	199.7	194.7	UNION	10	0.2	57.3	63.7
FAYETTE	266	5.2	103.1	99.9	MAGOFFIN	27	0.5	223.9	219.0	WARREN	81	1.6	87.3	83.4
FLEMING	16	0.3	111.5	110.5	MARION	22	0.4	125.9	129.9	WASHINGTON	16	0.3	136.9	142.0
FLOYD	58	1.1	137.5	136.9	MARSHALL	61	1.2	87.9	94.3	WAYNE	34	0.7	165.7	166.7
FRANKLIN	53	1.0	113.3	110.1	MARTIN	15	0.3	87.4	88.0	WEBSTER	14	0.3	95.5	99.1
FULTON	11	0.2	152.0	149.5	MASON	13	0.3	137.2	130.2	WHITLEY	62	1.2	170.8	165.0
GALLATIN	9	0.2	118.6	112.8	MCCRACKEN	111	2.2	171.8	145.7	WOLFE	17	0.3	238.1	241.3
GARRARD	11	0.2	70.3	68.1	MCCREARY	18	0.4	132.0	133.8	WOODFORD	21	0.4	92.5	87.6

* At least one but fewer than five

- Percentage or rate suppressed to prevent disclosure of the value on which it was based

Table 11. Incidence of TBI by county, sorted by frequency, 2003

County	Freq	Percent	Age-Adjusted Rate	Crude Rate	County	Freq	Percent	Age-Adjusted Rate	Crude Rate	County	Freq	Percent	Age-Adjusted Rate	Crude Rate
JEFFERSON	961	18.9	135.9	137.3	LINCOLN	39	0.8	160.1	157.1	ALLEN	17	0.3	91.2	91.7
FAYETTE	266	5.2	103.1	99.9	CLINTON	38	0.7	394.8	397.6	LAWRENCE	17	0.3	110.8	105.9
KENTON	114	2.2	80.2	74.6	BARREN	37	0.7	92.5	93.7	MONROE	17	0.3	146.8	145.8
MCCRACKEN	111	2.2	171.8	145.7	CALLOWAY	35	0.7	94.0	100.6	WOLFE	17	0.3	238.1	241.3
HARDIN	102	2.0	113.0	106.2	SCOTT	34	0.7	93.0	89.4	CUMBERLAND	16	0.3	215.5	223.2
PERRY	100	2.0	341.4	336.0	WAYNE	34	0.7	165.7	166.7	FLEMING	16	0.3	111.5	110.5
PIKE	100	2.0	145.7	149.1	BOYLE	32	0.6	108.9	113.3	OWSLEY	16	0.3	350.3	336.9
DAVIESS	96	1.9	100.7	103.7	CARTER	32	0.6	115.3	116.5	WASHINGTON	16	0.3	136.9	142.0
LAUREL	82	1.6	154.5	146.4	ESTILL	32	0.6	210.6	211.0	LARUE	15	0.3	112.0	111.2
PULASKI	81	1.6	135.8	137.9	MERCER	32	0.6	145.1	148.9	MARTIN	15	0.3	87.4	88.0
WARREN	81	1.6	87.3	83.4	OHIO	31	0.6	133.6	131.6	OWEN	15	0.3	139.8	132.7
BULLITT	70	1.4	119.8	105.0	ROCKCASTLE	31	0.6	177.9	184.7	CALDWELL	14	0.3	110.8	108.7
NELSON	67	1.3	179.3	165.8	TAYLOR	31	0.6	126.3	132.0	METCALFE	14	0.3	140.6	137.7
GRAVES	62	1.2	157.1	165.8	GREENUP	30	0.6	79.3	80.5	NICHOLAS	14	0.3	197.4	197.9
WHITLEY	62	1.2	170.8	165.0	JACKSON	28	0.6	200.8	205.6	WEBSTER	14	0.3	95.5	99.1
MARSHALL	61	1.2	87.9	94.3	MCLEAN	28	0.6	148.6	149.5	MASON	13	0.3	137.2	130.2
MADISON	60	1.2	199.7	194.7	POWELL	28	0.6	213.9	205.7	LEWIS	12	0.2	87.0	86.8
FLOYD	58	1.1	137.5	136.9	RUSSELL	28	0.6	161.9	166.3	TRIGG	12	0.2	90.7	90.6
HOPKINS	57	1.1	115.0	121.7	ADAIR	27	0.5	144.2	153.6	BUTLER	11	0.2	80.2	82.3
GRAYSON	55	1.1	217.2	220.0	HARRISON	27	0.5	147.4	147.9	CRITTENDEN	11	0.2	112.2	122.2
BREATHITT	53	1.0	338.6	332.6	MAGOFFIN	27	0.5	223.9	219.0	FULTON	11	0.2	152.0	149.5
FRANKLIN	53	1.0	113.3	110.1	BOURBON	26	0.5	131.2	132.5	GARRARD	11	0.2	70.3	68.1
BOONE	52	1.0	73.9	51.3	BRECKINRIDGE	26	0.5	131.0	135.6	BALLARD	10	0.2	123.3	120.6
CAMPBELL	51	1.0	58.4	58.4	ROWAN	26	0.5	101.3	117.2	BATH	10	0.2	92.8	86.7
BOYD	49	1.0	92.7	98.5	JOHNSON	25	0.5	107.3	104.8	GREEN	10	0.2	72.1	85.7
MONTGOMERY	49	1.0	214.0	207.4	HART	24	0.5	129.9	131.6	HANCOCK	10	0.2	125.5	118.2
HENDERSON	47	0.9	103.3	103.5	LOGAN	24	0.5	86.0	88.7	UNION	10	0.2	57.3	63.7
CLAY	46	0.9	187.2	189.7	CASEY	23	0.5	141.9	143.2	BRACKEN	9	0.2	104.6	103.4
LETCHER	46	0.9	187.2	186.4	GRANT	23	0.5	113.2	94.6	EDMONSON	9	0.2	72.9	75.5
BELL	45	0.9	147.4	151.7	LEE	23	0.5	284.9	295.4	GALLATIN	9	0.2	118.6	112.8
JESSAMINE	45	0.9	110.3	106.4	MARION	22	0.4	125.9	129.9	MENIFEE	9	0.2	142.4	133.0
SHELBY	45	0.9	130.5	120.9	CARROLL	21	0.4	210.1	203.0	SIMPSON	9	0.2	52.7	53.3
OLDHAM	44	0.9	105.6	84.5	WOODFORD	21	0.4	92.5	87.6	TODD	9	0.2	75.5	75.9
MUHLENBERG	43	0.8	123.7	135.4	MORGAN	20	0.4	140.0	139.3	CARLISLE	7	0.1	119.4	131.8
KNOTT	42	0.8	236.8	238.9	HARLAN	19	0.4	57.8	59.5	PENDLETON	7	0.1	51.1	46.3
KNOX	40	0.8	125.6	125.3	LIVINGSTON	19	0.4	188.0	194.6	HICKMAN	5	0.1	77.8	96.7
LESLIE	40	0.8	338.6	332.1	ANDERSON	18	0.4	92.8	89.6	ELLIOTT	*	-	-	-
MEADE	40	0.8	155.7	141.3	HENRY	18	0.4	117.7	114.1	LYON	*	-	-	-
CHRISTIAN	39	0.8	63.4	55.2	MCCREARY	18	0.4	132.0	133.8	TRIMBLE	*	-	-	-
CLARK	39	0.8	120.2	113.4	SPENCER	18	0.4	130.6	121.4	[illegible]BERTSON	*	-	-	-

* At least one but fewer than five

\- Percentage or rate suppressed to prevent disclosure of the value on which it was based

Table 12. Incidence of TBI by county, sorted by age-adjusted rate, 2003

County	Freq	Percent	Age-Adjusted Rate	Crude Rate	County	Freq	Percent	Age-Adjusted Rate	Crude Rate	County	Freq	Percent	Age-Adjusted Rate	Crude Rate
CLINTON	38	0.7	394.8	397.6	MENIFEE	9	0.2	142.4	133.0	JOHNSON	25	0.5	107.3	104.8
OWSLEY	16	0.3	350.3	336.9	CASEY	23	0.5	141.9	143.2	OLDHAM	44	0.9	105.6	84.5
PERRY	100	2.0	341.4	336.0	METCALFE	14	0.3	140.6	137.7	BRACKEN	9	0.2	104.6	103.4
BREATHITT	53	1.0	338.6	332.6	MORGAN	20	0.4	140.0	139.3	HENDERSON	47	0.9	103.3	103.5
LESLIE	40	0.8	338.6	332.1	OWEN	15	0.3	139.8	132.7	FAYETTE	266	5.2	103.1	99.9
LEE	23	0.5	284.9	295.4	FLOYD	58	1.1	137.5	136.9	ROWAN	26	0.5	101.3	117.2
WOLFE	17	0.3	238.1	241.3	MASON	13	0.3	137.2	130.2	DAVIESS	96	1.9	100.7	103.7
KNOTT	42	0.8	236.8	238.9	WASHINGTON	16	0.3	136.9	142.0	WEBSTER	14	0.3	95.5	99.1
MAGOFFIN	27	0.5	223.9	219.0	JEFFERSON	961	18.9	135.9	137.3	CALLOWAY	35	0.7	94.0	100.6
GRAYSON	55	1.1	217.2	220.0	PULASKI	81	1.6	135.8	137.9	SCOTT	34	0.7	93.0	89.4
CUMBERLAND	16	0.3	215.5	223.2	OHIO	31	0.6	133.6	131.6	ANDERSON	18	0.4	92.8	89.6
MONTGOMERY	49	1.0	214.0	207.4	MCCREARY	18	0.4	132.0	133.8	BATH	10	0.2	92.8	86.7
POWELL	28	0.6	213.9	205.7	BOURBON	26	0.5	131.2	132.5	BOYD	49	1.0	92.7	98.5
ESTILL	32	0.6	210.6	211.0	BRECKINRIDGE	26	0.5	131.0	135.6	WOODFORD	21	0.4	92.5	87.6
CARROLL	21	0.4	210.1	203.0	SPENCER	18	0.4	130.6	121.4	BARREN	37	0.7	92.5	93.7
JACKSON	28	0.6	200.8	205.6	SHELBY	45	0.9	130.5	120.9	ALLEN	17	0.3	91.2	91.7
MADISON	60	1.2	199.7	194.7	HART	24	0.5	129.9	131.6	TRIGG	12	0.2	90.7	90.6
NICHOLAS	14	0.3	197.4	197.9	TAYLOR	31	0.6	126.3	132.0	MARSHALL	61	1.2	87.9	94.3
LIVINGSTON	19	0.4	188.0	194.6	MARION	22	0.4	125.9	129.9	MARTIN	15	0.3	87.4	88.0
CLAY	46	0.9	187.2	189.7	KNOX	40	0.8	125.6	125.3	WARREN	81	1.6	87.3	83.4
LETCHER	46	0.9	187.2	186.4	HANCOCK	10	0.2	125.5	118.2	LEWIS	12	0.2	87.0	86.8
NELSON	67	1.3	179.3	165.8	MUHLENBERG	43	0.8	123.7	135.4	LOGAN	24	0.5	86.0	88.7
ROCKCASTLE	31	0.6	177.9	184.7	BALLARD	10	0.2	123.3	120.6	BUTLER	11	0.2	80.2	82.3
MCCRACKEN	111	2.2	171.8	145.7	CLARK	39	0.8	120.2	113.4	KENTON	114	2.2	80.2	74.6
WHITLEY	62	1.2	170.8	165.0	BULLITT	70	1.4	119.8	105.0	GREENUP	30	0.6	79.3	80.5
WAYNE	34	0.7	165.7	166.7	CARLISLE	7	0.1	119.4	131.8	HICKMAN	5	0.1	77.8	96.7
RUSSELL	28	0.6	161.9	166.3	GALLATIN	9	0.2	118.6	112.8	TODD	9	0.2	75.5	75.9
LINCOLN	39	0.8	160.1	157.1	HENRY	18	0.4	117.7	114.1	BOONE	52	1.0	73.9	51.3
GRAVES	62	1.2	157.1	165.8	CARTER	32	0.6	115.3	116.5	EDMONSON	9	0.2	72.9	75.5
MEADE	40	0.8	155.7	141.3	HOPKINS	57	1.1	115.0	121.7	GREEN	10	0.2	72.1	85.7
LAUREL	82	1.6	154.5	146.4	FRANKLIN	53	1.0	113.3	110.1	GARRARD	11	0.2	70.3	68.1
FULTON	11	0.2	152.0	149.5	GRANT	23	0.5	113.2	94.6	CHRISTIAN	39	0.8	63.4	55.2
MCLEAN	28	0.6	148.6	149.5	HARDIN	102	2.0	113.0	106.2	CAMPBELL	51	1.0	58.4	58.4
HARRISON	27	0.5	147.4	147.9	CRITTENDEN	11	0.2	112.2	122.2	HARLAN	19	0.4	57.8	59.5
BELL	45	0.9	147.4	151.7	LARUE	15	0.3	112.0	111.2	UNION	10	0.2	57.3	63.7
MONROE	17	0.3	146.8	145.8	FLEMING	16	0.3	111.5	110.5	SIMPSON	9	0.2	52.7	53.3
PIKE	100	2.0	145.7	149.1	CALDWELL	14	0.3	110.8	108.7	ELLIOTT	*	-	-	-
ROBERTSON	*	-	-	-	LAWRENCE	17	0.3	110.8	105.9	PENDLETON	7	0.1	51.1	46.3
MERCER	32	0.6	145.1	148.9	JESSAMINE	45	0.9	110.3	106.4	LYON	*	-	-	-
ADAIR	27	0.5	144.2	153.6	BOYLE	32	0.6	108.9	113.3	[illegible]MBLE	*	-	-	-

* At least one but fewer than five

\- Percentage or rate suppressed to prevent disclosure of the value on which it was based

Table 13. Hospital discharges by disposition for non-fatal TBI, 2003

Discharge Disposition	Number	Percent
Routine discharge (home/self care)	2,636	67.1
Inpatient-other short-term hospital	76	1.9
Skilled nursing facility (SNF)	346	8.8
Intermediate care facility (ICF)	35	0.9
Inpatient-other type facility	214	5.4
Home health	317	8.1
Rehab (from trauma registry data)	45	1.1
Other	260	6.6
Total	3,929	100.0

Table 14. Injury Severity Score by mechanism for non-fatal TBI, 2003

	Injury Severity Score										
	Mild		Moderate		Severe		Critical		Unknown		
Injury Mechanism	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Total
Motor vehicle traffic crash	461	44.7	377	50.5	405	31.7	187	65.4	251	41.9	1,681
Falls	257	24.9	165	22.1	357	27.9	42	14.7	140	23.4	961
Non-traffic land transportation	57	5.5	45	6.0	52	4.1	12	4.2	35	5.8	201
Struck by or against object or person	55	5.3	36	4.8	71	5.6	6	2.1	19	3.2	187
Firearm	1	0.1	7	0.9	16	1.3	2	0.7	0	0.0	26
Non-traffic pedal cycle	14	1.4	6	0.8	10	0.8	1	0.3	12	2.0	43
Other	58	5.6	37	5.0	99	7.7	15	5.2	63	10.5	272
Unknown	128	12.4	74	9.9	268	21.0	21	7.3	79	13.2	570
Total	1,031	100.0	747	100.0	1,278	100.0	286	100.0	599	100.0	3,941

Table 15. Barrell Matrix Type I/II/III TBI by mechanism for non-fatal TBI, 2003

	Type of TBI								
	Type I		Type II		Type III		Other		
Injury Mechanism	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Total
Motor vehicle traffic crash	457	30.8	274	44.6	23	21.9	567	66.9	1,321
Falls	474	32.0	148	24.1	42	40.0	104	12.3	768
Non-traffic land transportation	62	4.2	51	8.3	7	6.7	50	5.9	170
Struck by or against object or person	81	5.5	45	7.3	10	9.5	13	1.5	149
Non-traffic pedal cycle	15	1.0	10	1.6	1	1.0	12	1.4	38
Firearm	36	2.4	1	0.2	6	5.7	1	0.1	44
Other	118	8.0	32	5.2	11	10.5	64	7.5	225
Unknown	240	16.2	53	8.6	5	4.8	37	4.4	335
Total	1,483	100.0	614	100.0	105	100.0	848	100.0	3,050

Table 16. Primary payers for hospitalized TBI, 2003
(Hospital Discharge Dataset only)

Payer	Number of Discharges	Percent of Discharges	Total Hospital Charges
Commercial Ins	1,468	41.5	$63,649,137
Government	1,419	40.1	$32,449,184
Self Pay	141	4.0	$1,494,069
Workers Compensation	92	2.6	$2,890,429
HMO	127	3.6	$2,320,870
Other	292	8.3	$6,242,517
Total	3,539	100.0	$109,046,206

Table 17. ABI by age, 2003

	Fatal			Non-fatal			Total		
Age	Number	Percent	Rate	Number	Percent	Rate	Number	Percent	Rate
0-4	59	44.7	22.1	73	55.3	27.4	132	100.0	49.5
5-14	18	25.4	3.3	53	74.6	9.6	71	100.0	12.9
15-24	98	34.6	16.9	185	65.4	31.9	283	100.0	48.8
25-44	217	25.6	18.2	630	74.4	53.0	847	100.0	71.2
45-64	323	33.6	31.8	639	66.4	62.9	962	100.0	94.6
65+	518	44.3	100.7	652	55.7	126.8	1,170	100.0	227.5
Total	1,233	35.6	29.9	2,232	64.4	54.2	3,465	100.0	84.1

Table 18. ABI by gender, 2003

	Fatal			Non-fatal			Total		
Age	Number	Percent	Rate	Number	Percent	Rate	Number	Percent	Rate
Male	721	41.0	35.7	1,037	59.0	51.4	1,758	100.0	87.1
Female	512	30.0	24.4	1,195	70.0	56.9	1,707	100.0	81.3
Total	1,233	35.6	29.9	2,232	64.4	54.2	3,465	100.0	84.1

Table 19. Incidence of ABI by county, sorted by county name, 2003

County	Freq	Percent	Age-Adjusted Rate	Crude Rate	County	Freq	Percent	Age-Adjusted Rate	Crude Rate	County	Freq	Percent	Age-Adjusted Rate	Crude Rate
ADAIR	18	0.5	92.3	102.4	GRANT	23	0.7	104.4	94.6	MCLEAN	*	-	-	-
ALLEN	10	0.3	52.9	53.9	GRAVES	44	1.3	108.3	117.6	MEADE	15	0.4	64.7	53.0
ANDERSON	19	0.5	105.5	94.5	GRAYSON	16	0.5	62.2	64.0	MENIFEE	5	0.1	83.6	73.9
BALLARD	6	0.2	61.2	72.3	GREEN	7	0.2	48.6	60.0	MERCER	13	0.4	59.6	60.5
BARREN	36	1.0	85.3	91.2	GREENUP	27	0.8	67.8	72.4	METCALFE	11	0.3	108.3	108.2
BATH	18	0.5	147.6	156.0	HANCOCK	*	-	-	-	MONROE	10	0.3	73.7	85.8
BELL	41	1.2	133.4	138.2	HARDIN	72	2.1	82.5	74.9	MONTGOMERY	17	0.5	70.8	71.9
BOONE	66	1.9	73.4	65.1	HARLAN	43	1.2	128.4	134.7	MORGAN	12	0.3	86.3	83.6
BOURBON	7	0.2	32.2	35.7	HARRISON	10	0.3	52.5	54.8	MUHLENBERG	39	1.1	113.2	122.8
BOYD	44	1.3	85.0	88.5	HART	13	0.4	68.7	71.3	NELSON	21	0.6	53.9	52.0
BOYLE	21	0.6	71.1	74.4	HENDERSON	20	0.6	43.5	44.0	NICHOLAS	13	0.4	165.6	183.7
BRACKEN	5	0.1	58.5	57.4	HENRY	23	0.7	155.4	145.8	OHIO	16	0.5	67.4	67.9
BREATHITT	30	0.9	191.9	188.2	HICKMAN	11	0.3	155.3	212.7	OLDHAM	27	0.8	72.1	51.8
BRECKINRIDGE	21	0.6	102.3	109.6	HOPKINS	67	1.9	135.3	143.1	OWEN	11	0.3	95.0	97.3
BULLITT	26	0.8	45.5	39.0	JACKSON	22	0.6	165.2	161.5	OWSLEY	9	0.3	194.4	189.5
BUTLER	6	0.2	46.5	44.9	JEFFERSON	495	14.3	68.5	70.7	PENDLETON	7	0.2	52.3	46.3
CALDWELL	11	0.3	68.2	85.4	JESSAMINE	42	1.2	114.8	99.3	PERRY	56	1.6	186.8	188.2
CALLOWAY	17	0.5	45.6	48.9	JOHNSON	26	0.8	105.4	109.0	PIKE	90	2.6	130.1	134.2
CAMPBELL	62	1.8	70.5	71.1	KENTON	138	4.0	92.5	90.3	POWELL	13	0.4	99.7	95.5
CARLISLE	8	0.2	126.7	150.7	KNOTT	32	0.9	181.9	182.0	PULASKI	62	1.8	99.9	105.6
CARROLL	11	0.3	105.4	106.3	KNOX	49	1.4	152.6	153.5	ROBERTSON	*	-	-	-
CARTER	28	0.8	102.8	102.0	LARUE	14	0.4	92.6	103.8	ROCKCASTLE	15	0.4	86.0	89.4
CASEY	23	0.7	127.6	143.2	LAUREL	57	1.6	105.3	101.8	ROWAN	29	0.8	129.6	130.8
CHRISTIAN	39	1.1	64.3	55.2	LAWRENCE	9	0.3	56.0	56.1	RUSSELL	26	0.8	143.4	154.4
CLARK	34	1.0	96.0	98.9	LEE	*	-	-	-	SCOTT	14	0.4	41.1	36.8
CLAY	17	0.5	75.0	70.1	LESLIE	11	0.3	88.1	91.3	SHELBY	16	0.5	46.7	43.0
CLINTON	12	0.3	116.9	125.5	LETCHER	23	0.7	93.0	93.2	SIMPSON	6	0.2	36.1	35.5
CRITTENDEN	14	0.4	147.4	155.6	LEWIS	12	0.3	90.0	86.8	SPENCER	6	0.2	48.0	40.5
CUMBERLAND	6	0.2	58.6	83.7	LINCOLN	17	0.5	70.1	68.5	TAYLOR	13	0.4	47.7	55.4
DAVIESS	71	2.0	74.2	76.7	LIVINGSTON	9	0.3	85.4	92.2	TODD	6	0.2	47.6	50.6
EDMONSON	6	0.2	45.2	50.3	LOGAN	17	0.5	62.9	62.9	TRIGG	10	0.3	72.4	75.5
ELLIOTT	*	-	-	-	LYON	*	-	-	-	TRIMBLE	10	0.3	120.9	110.5
ESTILL	12	0.3	80.6	79.1	MADISON	49	1.4	148.0	159.0	UNION	7	0.2	39.8	44.6
FAYETTE	214	6.2	85.5	80.3	MAGOFFIN	24	0.7	191.5	194.7	WARREN	61	1.8	66.0	62.8
FLEMING	12	0.3	83.1	82.9	MARION	10	0.3	55.8	59.0	WASHINGTON	*	-	-	-
FLOYD	47	1.4	106.9	110.9	MARSHALL	32	0.9	43.8	49.5	WAYNE	13	0.4	60.9	63.7
FRANKLIN	38	1.1	78.0	78.9	MARTIN	15	0.4	90.5	88.0	WEBSTER	11	0.3	70.6	77.8
FULTON	13	0.4	157.9	176.7	MASON	7	0.2	69.0	70.1	WHITLEY	52	1.5	139.9	138.4
GALLATIN	*	-	-	-	MCCRACKEN	88	2.5	129.2	115.5	WOLFE	10	0.3	151.1	141.9
GARRARD	14	0.4	87.3	86.6	MCCREARY	15	0.4	115.4	111.5	WODFORD	21	0.6	93.9	87.6

* At least one but fewer than five

- Percentage or rate suppressed to prevent disclosure of the value on which it was based

Table 20. Incidence of ABI by county, sorted by frequency, 2003

County	Freq	Percent	Age-Adjusted Rate	Crude Rate	County	Freq	Percent	Age-Adjusted Rate	Crude Rate	County	Freq	Percent	Age-Adjusted Rate	Crude Rate
JEFFERSON	495	14.3	68.5	70.7	GRANT	23	0.7	104.4	94.6	CALDWELL	11	0.3	68.2	85.4
FAYETTE	214	6.2	85.5	80.3	HENRY	23	0.7	155.4	145.8	CARROLL	11	0.3	105.4	106.3
KENTON	138	4.0	92.5	90.3	LETCHER	23	0.7	93.0	93.2	HICKMAN	11	0.3	155.3	212.7
PIKE	90	2.6	130.1	134.2	JACKSON	22	0.6	165.2	161.5	LESLIE	11	0.3	88.1	91.3
MCCRACKEN	88	2.5	129.2	115.5	BOYLE	21	0.6	71.1	74.4	METCALFE	11	0.3	108.3	108.2
HARDIN	72	2.1	82.5	74.9	BRECKINRIDGE	21	0.6	102.3	109.6	OWEN	11	0.3	95.0	97.3
DAVIESS	71	2.0	74.2	76.7	NELSON	21	0.6	53.9	52.0	WEBSTER	11	0.3	70.6	77.8
HOPKINS	67	1.9	135.3	143.1	WOODFORD	21	0.6	93.9	87.6	ALLEN	10	0.3	52.9	53.9
BOONE	66	1.9	73.4	65.1	HENDERSON	20	0.6	43.5	44.0	HARRISON	10	0.3	52.5	54.8
CAMPBELL	62	1.8	70.5	71.1	ANDERSON	19	0.5	105.5	94.5	MARION	10	0.3	55.8	59.0
PULASKI	62	1.8	99.9	105.6	ADAIR	18	0.5	92.3	102.4	MONROE	10	0.3	73.7	85.8
WARREN	61	1.8	66.0	62.8	BATH	18	0.5	147.6	156.0	TRIGG	10	0.3	72.4	75.5
LAUREL	57	1.6	105.3	101.8	CALLOWAY	17	0.5	45.6	48.9	TRIMBLE	10	0.3	120.9	110.5
PERRY	56	1.6	186.8	188.2	CLAY	17	0.5	75.0	70.1	WOLFE	10	0.3	151.1	141.9
WHITLEY	52	1.5	139.9	138.4	LINCOLN	17	0.5	70.1	68.5	LAWRENCE	9	0.3	56.0	56.1
KNOX	49	1.4	152.6	153.5	LOGAN	17	0.5	62.9	62.9	LIVINGSTON	9	0.3	85.4	92.2
MADISON	49	1.4	148.0	159.0	MONTGOMERY	17	0.5	70.8	71.9	OWSLEY	9	0.3	194.4	189.5
FLOYD	47	1.4	106.9	110.9	GRAYSON	16	0.5	62.2	64.0	CARLISLE	8	0.2	126.7	150.7
BOYD	44	1.3	85.0	88.5	OHIO	16	0.5	67.4	67.9	BOURBON	7	0.2	32.2	35.7
GRAVES	44	1.3	108.3	117.6	SHELBY	16	0.5	46.7	43.0	GREEN	7	0.2	48.6	60.0
HARLAN	43	1.2	128.4	134.7	MCCREARY	15	0.4	115.4	111.5	MASON	7	0.2	69.0	70.1
JESSAMINE	42	1.2	114.8	99.3	MARTIN	15	0.4	90.5	88.0	PENDLETON	7	0.2	52.3	46.3
BELL	41	1.2	133.4	138.2	MEADE	15	0.4	64.7	53.0	UNION	7	0.2	39.8	44.6
CHRISTIAN	39	1.1	64.3	55.2	ROCKCASTLE	15	0.4	86.0	89.4	BALLARD	6	0.2	61.2	72.3
MUHLENBERG	39	1.1	113.2	122.8	CRITTENDEN	14	0.4	147.4	155.6	BUTLER	6	0.2	46.5	44.9
FRANKLIN	38	1.1	78.0	78.9	GARRARD	14	0.4	87.3	86.6	CUMBERLAND	6	0.2	58.6	83.7
BARREN	36	1.0	85.3	91.2	LARUE	14	0.4	92.6	103.8	EDMONSON	6	0.2	45.2	50.3
CLARK	34	1.0	96.0	98.9	SCOTT	14	0.4	41.1	36.8	SIMPSON	6	0.2	36.1	35.5
KNOTT	32	0.9	181.9	182.0	FULTON	13	0.4	157.9	176.7	SPENCER	6	0.2	48.0	40.5
MARSHALL	32	0.9	43.8	49.5	HART	13	0.4	68.7	71.3	TODD	6	0.2	47.6	50.6
BREATHITT	30	0.9	191.9	188.2	MERCER	13	0.4	59.6	60.5	BRACKEN	5	0.1	58.5	57.4
ROWAN	29	0.8	129.6	130.8	NICHOLAS	13	0.4	165.6	183.7	MENIFEE	5	0.1	83.6	73.9
CARTER	28	0.8	102.8	102.0	POWELL	13	0.4	99.7	95.5	GALLATIN	*	-	-	-
GREENUP	27	0.8	67.8	72.4	TAYLOR	13	0.4	47.7	55.4	WASHINGTON	*	-	-	-
OLDHAM	27	0.8	72.1	51.8	WAYNE	13	0.4	60.9	63.7	ELLIOTT	*	-	-	-
BULLITT	26	0.8	45.5	39.0	CLINTON	12	0.3	116.9	125.5	HANCOCK	*	-	-	-
JOHNSON	26	0.8	105.4	109.0	ESTILL	12	0.3	80.6	79.1	LEE	*	-	-	-
RUSSELL	26	0.8	143.4	154.4	FLEMING	12	0.3	83.1	82.9	LYON	*	-	-	-
MAGOFFIN	24	0.7	191.5	194.7	LEWIS	12	0.3	90.0	86.8	MCLEAN	*	-	-	-
CASEY	23	0.7	127.6	143.2	MORGAN	12	0.3	86.3	83.6	ROBERTSON	*	-	-	-

* At least one but fewer than five

\- Percentage or rate suppressed to prevent disclosure of the value on which it was based

Table 21. Incidence of ABI by county, sorted by age-adjusted rate, 2003

County	Freq	Percent	Age-Adjusted Rate	Crude Rate	County	Freq	Percent	Age-Adjusted Rate	Crude Rate	County	Freq	Percent	Age-Adjusted Rate	Crude Rate
OWSLEY	9	0.3	194.4	189.5	PULASKI	62	1.8	99.9	105.6	OHIO	16	0.5	67.4	67.9
BREATHITT	30	0.9	191.9	188.2	POWELL	13	0.4	99.7	95.5	WARREN	61	1.8	66.0	62.8
MAGOFFIN	24	0.7	191.5	194.7	CLARK	34	1.0	96.0	98.9	ROBERTSON	*	-	-	-
PERRY	56	1.6	186.8	188.2	OWEN	11	0.3	95.0	97.3	MEADE	15	0.4	64.7	53.0
KNOTT	32	0.9	181.9	182.0	WOODFORD	21	0.6	93.9	87.6	CHRISTIAN	39	1.1	64.3	55.2
NICHOLAS	13	0.4	165.6	183.7	LETCHER	23	0.7	93.0	93.2	LOGAN	17	0.5	62.9	62.9
JACKSON	22	0.6	165.2	161.5	LARUE	14	0.4	92.6	103.8	GRAYSON	16	0.5	62.2	64.0
FULTON	13	0.4	157.9	176.7	KENTON	138	4.0	92.5	90.3	BALLARD	6	0.2	61.2	72.3
HENRY	23	0.7	155.4	145.8	ADAIR	18	0.5	92.3	102.4	WAYNE	13	0.4	60.9	63.7
HICKMAN	11	0.3	155.3	212.7	MARTIN	15	0.4	90.5	88.0	MERCER	13	0.4	59.6	60.5
KNOX	49	1.4	152.6	153.5	LEWIS	12	0.3	90.0	86.8	CUMBERLAND	6	0.2	58.6	83.7
WOLFE	10	0.3	151.1	141.9	LESLIE	11	0.3	88.1	91.3	BRACKEN	5	0.1	58.5	57.4
MADISON	49	1.4	148.0	159.0	GARRARD	14	0.4	87.3	86.6	LAWRENCE	9	0.3	56.0	56.1
BATH	18	0.5	147.6	156.0	MORGAN	12	0.3	86.3	83.6	MARION	10	0.3	55.8	59.0
CRITTENDEN	14	0.4	147.4	155.6	ROCKCASTLE	15	0.4	86.0	89.4	NELSON	21	0.6	53.9	52.0
RUSSELL	26	0.8	143.4	154.4	FAYETTE	214	6.2	85.5	80.3	ALLEN	10	0.3	52.9	53.9
WHITLEY	52	1.5	139.9	138.4	LIVINGSTON	9	0.3	85.4	92.2	HARRISON	10	0.3	52.5	54.8
HOPKINS	67	1.9	135.3	143.1	BARREN	36	1.0	85.3	91.2	PENDLETON	7	0.2	52.3	46.3
BELL	41	1.2	133.4	138.2	BOYD	44	1.3	85.0	88.5	GALLATIN	*	-	-	-
PIKE	90	2.6	130.1	134.2	MENIFEE	5	0.1	83.6	73.9	GREEN	7	0.2	48.6	60.0
ROWAN	29	0.8	129.6	130.8	FLEMING	12	0.3	83.1	82.9	SPENCER	6	0.2	48.0	40.5
MCCRACKEN	88	2.5	129.2	115.5	HARDIN	72	2.1	82.5	74.9	TAYLOR	13	0.4	47.7	55.4
HARLAN	43	1.2	128.4	134.7	ESTILL	12	0.3	80.6	79.1	TODD	6	0.2	47.6	50.6
CASEY	23	0.7	127.6	143.2	FRANKLIN	38	1.1	78.0	78.9	SHELBY	16	0.5	46.7	43.0
CARLISLE	8	0.2	126.7	150.7	CLAY	17	0.5	75.0	70.1	BUTLER	6	0.2	46.5	44.9
TRIMBLE	10	0.3	120.9	110.5	DAVIESS	71	2.0	74.2	76.7	CALLOWAY	17	0.5	45.6	48.9
CLINTON	12	0.3	116.9	125.5	MONROE	10	0.3	73.7	85.8	BULLITT	26	0.8	45.5	39.0
MCCREARY	15	0.4	115.4	111.5	BOONE	66	1.9	73.4	65.1	EDMONSON	6	0.2	45.2	50.3
JESSAMINE	42	1.2	114.8	99.3	TRIGG	10	0.3	72.4	75.5	MARSHALL	32	0.9	43.8	49.5
MUHLENBERG	39	1.1	113.2	122.8	OLDHAM	27	0.8	72.1	51.8	HENDERSON	20	0.6	43.5	44.0
METCALFE	11	0.3	108.3	108.2	BOYLE	21	0.6	71.1	74.4	SCOTT	14	0.4	41.1	36.8
GRAVES	44	1.3	108.3	117.6	MONTGOMERY	17	0.5	70.8	71.9	UNION	7	0.2	39.8	44.6
FLOYD	47	1.4	106.9	110.9	WEBSTER	11	0.3	70.6	77.8	SIMPSON	6	0.2	36.1	35.5
ANDERSON	19	0.5	105.5	94.5	CAMPBELL	62	1.8	70.5	71.1	WASHINGTON	*	-	-	-
CARROLL	11	0.3	105.4	106.3	LINCOLN	17	0.5	70.1	68.5	BOURBON	7	0.2	32.2	35.7
JOHNSON	26	0.8	105.4	109.0	MASON	7	0.2	69.0	70.1	ELLIOTT	*	-	-	-
LAUREL	57	1.6	105.3	101.8	HART	13	0.4	68.7	71.3	LYON	*	-	-	-
GRANT	23	0.7	104.4	94.6	JEFFERSON	495	14.3	68.5	70.7	LEE	*	-	-	-
CARTER	28	0.8	102.8	102.0	CALDWELL	11	0.3	68.2	85.4	HANCOCK	*	-	-	-
BRECKINRIDGE	21	0.6	102.3	109.6	GREENUP	27	0.8	67.8	72.4	MCLEAN	*	-	-	-

* At least one but fewer than five

\- Percentage or rate suppressed to prevent disclosure of the value on which it was based

Table 22. Causes of ABI (based on diagnosis code), 2003

	Fatal		Non-fatal	
ABI Category	Number	Percent	Number	Percent
Anoxia/hypoxia	981	79.0	1,024	45.6
Exposure to toxic substances	245	19.7	1,032	46.0
Allergy/anaphylaxis	3	0.2	134	6.0
Acute medical clinical incidents	12	1.0	54	2.4

* Because there are multiple diagnoses and/or causes of death listed for each individual, it is possible for the same case to fall into more than one ABI category. Therefore, the column sums in this table are slightly higher than the total number of ABI cases shown in Table 17.

Table 23. Anoxia/hypoxia by age group, 2003

	Fatal			Non-fatal			Total		
Age	Number	Percent	Rate	Number	Percent	Rate	Number	Percent	Rate
0-4	51	62.2	19.1	31	37.8	11.6	82	100.0	30.8
5-14	14	46.7	2.5	16	53.3	2.9	30	100.0	5.4
15-24	77	67.0	13.3	38	33.0	6.6	115	100.0	19.8
25-44	126	45.2	10.6	153	54.8	12.9	279	100.0	23.5
45-64	246	44.2	24.2	310	55.8	30.5	556	100.0	54.7
65+	467	49.5	90.8	476	50.5	92.6	943	100.0	183.4
Total	981	48.9	23.8	1,024	51.1	24.9	2,005	100.0	48.7

Table 24. Exposure to toxic substances by age group, 2003

	Fatal			Non-fatal			Total		
Age	Number	Percent	Rate	Number	Percent	Rate	Number	Percent	Rate
0-4	6	19.4	2.3	25	80.6	9.4	31	100.0	11.6
5-14	3	9.1	0.5	30	90.9	5.4	33	100.0	6.0
15-24	20	13.2	3.4	132	86.8	22.8	152	100.0	26.2
25-44	97	18.4	8.2	431	81.6	36.2	528	100.0	44.4
45-64	74	21.2	7.3	275	78.8	27.1	349	100.0	34.3
65+	45	24.5	8.8	139	75.5	27.0	184	100.0	35.8
Total	245	19.2	5.9	1,032	80.8	25.1	1,277	100.0	31.0

Table 25. Diagnoses in non-fatal anoxia/hypoxia, 2003

Diagnosis	Description	Number	Percent	Cumulative Percent
799.0	Asphyxia	432	42.2	42.2
997.0	Nervous system complications (related to medical care) - Anoxic brain damage - Cerebral hypoxia - Postoperative stroke - Other	426	41.6	83.8
348.1	Anoxic brain damage (related to hereditary and degenerative diseases of the central nervous system)	121	11.8	95.6
994.1	Drowning and nonfatal submersion	32	3.1	98.7
669.4	Cerebral anoxia following ceserean	9	0.9	99.6
768 (.1,.5,.6,.9)	Birth asphyxia	2	0.2	99.8
668.2	Cerebral anoxia following anesthesia …	2	0.2	100.0
Total		1,024	100.0	100.0

Table 26. Diagnoses in fatal anoxia/hypoxia, 2003

Diagnosis	Description	Number	Percent	Cumulative Percent
R09.0	Asphyxia	313	31.9	31.9
G93.1	Anoxic brain damage, not elsewhere classified	255	26.0	57.9
T71	Asphyxiation	155	15.8	73.7
348.1	Anoxic brain damage (related to hereditary and degenerative diseases of the central nervous system)	88	9.0	82.7
T75.1, 994.1	Drowning	86	8.8	91.4
997.0	Nervous system complications (related to medical care) - Anoxic brain damage - Cerebral hypoxia - Postoperative stroke - Other	48	4.9	96.3
P21	Birth asphyxia	19	1.9	98.3
799.0	Asphyxia	16	1.6	99.9
O75	Other complications (including cerebral anoxia) following caesarean or other obstetric surgery or procedures	1	0.1	100.0
Total		981	100.0	100.0

Table 27. Diagnoses in non-fatal exposures to toxic substances, 2003

Diagnosis	Description	Number	Percent	Cumulative Percent
967	Poisoning by sedatives and hypnotics	310	30.0	30.0
980	Toxic effect of alcohol	288	27.9	57.9
968	Poisoning by other central nervous system depressants and anesthetics	159	15.4	73.3
964.2	Poisoning by anticoagulants	86	8.3	81.6
998	Post-operative shock	61	5.9	87.5
986	Toxic effect of carbon monoxide	56	5.4	92.9
995.4,995.5	Shock due to anesthesia; Child Maltreatment Syndrome	53	5.1	98.1
985	Toxic effect of other metals	19	1.8	99.9
988.0-988.2	Toxic effect of noxious substances eaten as food	1	0.1	100.0
Total		1033	100.0	100.0

Table 28. Diagnoses in fatal exposures to toxic substances, 2003

Diagnosis	Description	Number	Percent	Cumulative Percent
T58, 986	Toxic effect of carbon monoxide	66	26.9	26.9
T42 (.3,.4,.6,.7), 967	Poisoning by barbiturates, benzodiazepines, or anti-epileptic and sedative-hypnotic drugs	54	22.0	49.0
T40.5	Poisoning by cocaine	42	17.1	66.1
T51, 980	Toxic effect of alcohol	24	9.8	75.9
998.0	Postoperative shock	20	8.2	84.1
T45, 964	Poisoning by anticoagulants	13	5.3	89.4
G03 (.8,.9)	Meningitis due to other and unspecified causes	8	3.3	92.7
T81.1	Shock during or resulting from a procedure, not elsewhere classified	4	1.6	94.3
Other	See 'Methods' section for other diagnoses	14	5.7	100.0
Total		245	100.0	100.0

Other Diagnoses include: 968,T41,T56,T65 (3) and 995 (2)

Table 29. Injury-related causes of ABI (based on E-code), 2003

	Fatal			Non-fatal			Total		
Mechanism of Injury	Number	Percent	Rate	Number	Percent	Rate	Number	Percent	Rate
Poisoning	182	19.0	4.4	775	81.0	18.8	957	100.0	23.2
Suffocation	141	90.4	3.4	15	9.6	0.4	156	100.0	3.8
Drowning	51	73.9	1.2	18	26.1	0.4	69	100.0	1.7
Falls	26	25.5	0.6	76	74.5	1.8	102	100.0	2.5
Motor vehicle traffic crash	47	63.5	1.1	27	36.5	0.7	74	100.0	1.8
Fire/burn	30	71.4	0.7	12	28.6	0.3	42	100.0	1.0
Other	47	38.8	1.1	74	61.2	1.8	121	100.0	2.9
Total	524	34.5	12.7	997	65.5	24.2	1,521	100.0	36.9

Table 30. Hospital discharge disposition for nonfatal ABI, 2003

Discharge Disposition	Number	Percent
Routine discharge (home/self care)	1,389	62.3
Inpatient-other short-term hospital	86	3.9
Skilled nursing facility (SNF)	158	7.1
Intermediate care facility (ICF)	17	0.8
Inpatient-other type facility	145	6.5
Home health	179	8.0
Other	257	11.5
Total	2,231	100.0

Table 31. Primary payers for hospitalized ABI, 2003
(Hospital Discharge Dataset only)

Payer	Number of Discharges	Percent of Discharges	Total Hospital Charges
Government	1,232	55.4	$33,646,775
Commercial Insurance	464	20.9	$13,417,175
Self Pay	173	7.8	$1,924,534
Workers Compensation	28	1.3	$644,558
HMO	137	6.2	$3,931,569
Other	191	8.6	$4,924,587
Total	2,225	100.0	$58,489,198

* For 7 observations, the payer and/or charges were not reported

Table 32. SCI by age, 2003

	Fatal			Non-fatal			Total		
Age	Number	Percent	Rate	Number	Percent	Rate	Number	Percent	Rate
0-4	0	0.0	0.0	2	100.0	0.8	2	100.0	0.8
5-14	0	0.0	0.0	4	100.0	0.7	4	100.0	0.7
15-24	9	27.3	1.6	33	78.6	5.7	42	100.0	7.2
25-44	17	28.8	1.4	59	77.6	5.0	76	100.0	6.4
45-64	15	25.0	1.5	60	80.0	5.9	75	100.0	7.4
65+	36	102.9	7.0	35	49.3	6.8	71	100.0	13.8
Total	77	28.5	1.9	193	71.5	4.7	270	100.0	6.6

Table 33. SCI by gender, 2003

	Fatal			Non-fatal			Total		
Age	Number	Percent	Rate	Number	Percent	Rate	Number	Percent	Rate
Male	48	24.1	2.4	151	75.9	7.5	199	100.0	9.9
Female	29	40.8	1.4	42	59.2	2.0	71	100.0	3.4
Total	77	28.5	1.9	193	71.5	4.7	270	100.0	6.6

Table 34. Incidence of SCI by county, 2003

County	Freq	Percent	Age-Adjusted Rate	Crude Rate	County	Freq	Percent	Age-Adjusted Rate	Crude Rate	County	Freq	Percent	Age-Adjusted Rate	Crude Rate
JEFFERSON	38	14.1	5.3	5.4	CARTER	*	-	-	-	WOLFE	*	-	-	-
FAYETTE	17	6.3	6.3	6.4	CHRISTIAN	*	-	-	-	WOODFORD	*	-	-	-
DAVIESS	10	3.7	10.8	10.8	CLARK	*	-	-	-	ANDERSON	0	0.0	0.0	0.0
LAUREL	9	3.3	14.8	16.1	GARRARD	*	-	-	-	BALLARD	0	0.0	0.0	0.0
HOPKINS	8	3.0	15.0	17.1	KNOTT	*	-	-	-	BOURBON	0	0.0	0.0	0.0
WHITLEY	7	2.6	18.9	18.6	LAWRENCE	*	-	-	-	BRACKEN	0	0.0	0.0	0.0
KENTON	6	2.2	4.1	3.9	LEWIS	*	-	-	-	BULLITT	0	0.0	0.0	0.0
NELSON	6	2.2	16.3	14.8	MCLEAN	*	-	-	-	CARLISLE	0	0.0	0.0	0.0
BOYLE	5	1.9	17.8	17.7	MADISON	*	-	-	-	CARROLL	0	0.0	0.0	0.0
CLAY	5	1.9	19.8	20.6	METCALFE	*	-	-	-	CASEY	0	0.0	0.0	0.0
LETCHER	5	1.9	21.3	20.3	PERRY	*	-	-	-	CRITTENDEN	0	0.0	0.0	0.0
MCCRACKEN	5	1.9	7.9	6.6	SCOTT	*	-	-	-	CUMBERLAND	0	0.0	0.0	0.0
SHELBY	5	1.9	13.7	13.4	TAYLOR	*	-	-	-	EDMONSON	0	0.0	0.0	0.0
WARREN	5	1.9	5.7	5.1	WAYNE	*	-	-	-	FLEMING	0	0.0	0.0	0.0
WEBSTER	5	1.9	36.3	35.4	ADAIR	*	-	-	-	GALLATIN	0	0.0	0.0	0.0
BOONE	*	-	-	-	ALLEN	*	-	-	-	GRANT	0	0.0	0.0	0.0
BOYD	*	-	-	-	CALDWELL	*	-	-	-	GREEN	0	0.0	0.0	0.0
CALLOWAY	*	-	-	-	CLINTON	*	-	-	-	HARLAN	0	0.0	0.0	0.0
FLOYD	*	-	-	-	ELLIOTT	*	-	-	-	HENRY	0	0.0	0.0	0.0
GRAVES	*	-	-	-	ESTILL	*	-	-	-	HICKMAN	0	0.0	0.0	0.0
GREENUP	*	-	-	-	FULTON	*	-	-	-	JACKSON	0	0.0	0.0	0.0
LESLIE	*	-	-	-	HART	*	-	-	-	JESSAMINE	0	0.0	0.0	0.0
LINCOLN	*	-	-	-	HENDERSON	*	-	-	-	JOHNSON	0	0.0	0.0	0.0
SPENCER	*	-	-	-	KNOX	*	-	-	-	LARUE	0	0.0	0.0	0.0
BREATHITT	*	-	-	-	LIVINGSTON	*	-	-	-	LEE	0	0.0	0.0	0.0
FRANKLIN	*	-	-	-	MCCREARY	*	-	-	-	LOGAN	0	0.0	0.0	0.0
GRAYSON	*	-	-	-	MAGOFFIN	*	-	-	-	LYON	0	0.0	0.0	0.0
HANCOCK	*	-	-	-	MARION	*	-	-	-	MARTIN	0	0.0	0.0	0.0
HARDIN	*	-	-	-	MARSHALL	*	-	-	-	MORGAN	0	0.0	0.0	0.0
HARRISON	*	-	-	-	MASON	*	-	-	-	NICHOLAS	0	0.0	0.0	0.0
MERCER	*	-	-	-	MEADE	*	-	-	-	OWEN	0	0.0	0.0	0.0
MONROE	*	-	-	-	MENIFEE	*	-	-	-	OWSLEY	0	0.0	0.0	0.0
MUHLENBERG	*	-	-	-	MONTGOMERY	*	-	-	-	PENDLETON	0	0.0	0.0	0.0
PIKE	*	-	-	-	OHIO	*	-	-	-	ROBERTSON	0	0.0	0.0	0.0
BARREN	*	-	-	-	OLDHAM	*	-	-	-	ROWAN	0	0.0	0.0	0.0
BATH	*	-	-	-	POWELL	*	-	-	-	SIMPSON	0	0.0	0.0	0.0
BELL	*	-	-	-	PULASKI	*	-	-	-	TODD	0	0.0	0.0	0.0
BRECKINRIDGE	*	-	-	-	ROCKCASTLE	*	-	-	-	TRIGG	0	0.0	0.0	0.0
BUTLER	*	-	-	-	RUSSELL	*	-	-	-	TRIMBLE	0	0.0	0.0	0.0
CAMPBELL	*	-	-	-	WASHINGTON	*	-	-	-	UNION	0	0.0	0.0	0.0

* At least one but fewer than five

- Percentage or rate suppressed to prevent disclosure of the value on which it was based

Table 35. Leading causes of SCI, all ages, 2003

	Fatal			Non-fatal			Total		
Mechanism of Injury	Number	Percent	Rate	Number	Percent	Rate	Number	Percent	Rate
Motor vehicle traffic crash	31	37.3	0.8	52	62.7	1.3	83	100.0	2.0
Fall	12	19.4	0.3	50	80.6	1.2	62	100.0	1.5
Non-traffic land transportation	3	25.0	0.1	9	75.0	0.2	12	100.0	0.3
Struck by or against object or person	1	16.7	0.0	5	83.3	0.1	6	100.0	0.1
Firearm	3	30.0	0.1	7	70.0	0.2	10	100.0	0.2
Other	16	48.5	0.4	17	51.5	0.4	33	100.0	0.8
Unknown (missing E-code)	11	17.2	0.3	53	82.8	1.3	64	100.0	1.6
Total	77	28.5	1.9	193	71.5	4.7	270	100.0	6.6

Table 36. Hospital discharge disposition for non-fatal SCI, 2003

Discharge Disposition	Number	Percent
Routine discharge (home/self care)	80	41.5
Inpatient-other short-term hospital	15	7.8
Skilled nursing facility (SNF)	7	3.6
Inpatient-other type facility	41	21.2
Home health	15	7.8
Rehab (from trauma registry data)	6	3.1
Other	29	15.0
Total	193	100.0

Table 37. Injury Severity Score by mechanism for non-fatal SCI, 2003

	Injury Severity Score										
	Mild		Moderate		Severe		Critical		Unknown		
Injury Mechanism	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Total
Motor vehicle traffic crash	1	50.0	14	16.5	20	37.0	13	41.9	4	19.0	52
Falls	1	50.0	17	20.0	19	35.2	9	29.0	4	19.0	50
Non-traffic land transportation	0	0.0	5	5.9	1	1.9	1	3.2	2	9.5	9
Struck by or against object or person	0	0.0	1	1.2	1	1.9	1	3.2	2	9.5	5
Firearm	0	0.0	2	2.4	0	0.0	4	12.9	1	4.8	7
Other	0	0.0	9	10.6	2	3.7	1	3.2	3	14.3	15
Unknown	0	0.0	37	43.5	11	20.4	2	6.5	5	23.8	55
Total	2	100.0	85	100.0	54	100.0	31	100.0	21	100.0	193

Table 38. Primary payers for hospitalized SCI, 2003
(Hospital Discharge Dataset only)

Payer	Number of Discharges	Percent of Discharges	Total Hospital Discharges
Commercial Ins	78	42.9	$6,710,004
Government	70	38.5	$3,095,401
Workers Compensation	8	4.4	$335,791
HMO	4	2.2	$199,258
Self Pay	3	1.6	$117,788
Other	19	10.4	$814,230
Total	182	100.0	$11,272,472

* For 11 observations, payer and/or charges was missing

Table 39. Number of injury-related cases reported on hospital discharge file, 1999-2003

Year	Number	Percent Increase
1999	56,972	-
2000	73,808	29.6
2001	85,588	16.0
2002	91,100	6.4
2003	93,700	2.9

Table 40. Estimates of overall incidence rates per 100,000 Kentucky residents for TBI, SCI, and ABI, 1998-2003

	Incidence Rate Estimate					
Year	All TBI	Percent Increase	All SCI	Percent Increase	All ABI	Percent Increase
1998	62.5	-	4.1	-	40.0	-
1999	76.7	22.7	3.2	-22.0	55.9	39.8
2000	96.0	25.2	3.6	12.5	78.6	40.6
2001	124.7	29.9	8.3	130.6	79.7	1.4
2002	117.3	-5.9	6.5	-21.7	84.5	6.0
2003	123.4	5.2	6.6	1.5	84.1	-0.5

Table 41. Estimates of fatal and non-fatal incidence rates per 100,000 Kentucky residents for TBI, SCI, and ABI, 1998-2003

	Incidence Rate Estimate					
	TBI		SCI		ABI	
Year	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal
1998	21.4	40.8	1.1	3.0	12.6	26.4
1999	24.2	52.5	1.8	1.4	26.0	29.9
2000	24.5	71.5	0.4	3.2	30.5	48.1
2001	26.9	97.8	1.6	6.7	29.0	50.7
2002	26.6	90.7	1.6	5.0	31.0	63.4
2003	22.4	95.7	1.9	4.7	29.9	54.2