HHS Public Access
Author manuscript
J Head Trauma Rehabil. Author manuscript; available in PMC 2021 November 01.

Published in final edited form as:
J Head Trauma Rehabil. 2020 ; 35(6): E461–E468. doi:10.1097/HTR.0000000000000593.

State-Level Numbers and Rates of Traumatic Brain Injury-Related Emergency Department Visits, Hospitalizations, and Deaths in 2014

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Abstract

Objective: To provide state-level traumatic brain injury (TBI)- related emergency department (ED) visit, hospitalization, and death estimates for 2014.

Setting and Participants: The Centers for Disease Control and Prevention's Core Violence and Injury Prevention Program and State Injury Indicators participating states.

Design: Cross-sectional.

Main Measures: Number and incidence rates of TBI-related ED visits, hospitalizations, and deaths in more than 30 states.

Results: The rates of TBI-related ED visits in 2014 ranged from 381.1 per 100 000 (South Dakota) to 998.4 per 100 000 (Massachusetts). In 2014, Pennsylvania had the highest TBI-related hospitalization rate (98.9) and Ohio had the lowest (55.1). In 2014, the TBI-related death rate ranged from 9.1 per 100 000 (New Jersey) to 23.0 per 100 000 (Oklahoma).

Conclusion: The variations in TBI burden among states support the need for tailoring prevention efforts to state needs. Results of this analysis can serve as a baseline for these efforts.

Keywords

injury; prevention; public health; state; TBI; traumatic brain injury

THE SEVERITY OF A TRAUMATIC BRAIN INJURY (TBI) may range from "mild," that is, a brief change in mental status or consciousness, to "severe," that is, an extended period of unconsciousness or amnesia after the injury. TBIs treated in an emergency department (ED) are generally classified as mild (often referred to as a concussion),[1] and individuals with a mild TBI are often asymptomatic within a couple of months.[2,3] In contrast, individuals with TBI who are hospitalized or die as a result of their injuries are generally

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Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's website (www.headtraumarehab.com).

The authors declare no conflicts of interest.

classified by healthcare providers as having had a moderate or severe TBI.[4] Individuals with a moderate or severe TBI can experience long-term symptoms, including an extended period of unconsciousness or amnesia after the injury and may require specialized care.[5] A severe TBI may also be associated with brain hemorrhage and can be fatal.[5]

Previous assessments of regionality indicate differences in injury incidence and outcomes, including those related to TBI, based on where an individual lives.[6–9] For example, a study examining differences in mild TBI incidence by Bazarian and colleagues[6] analyzed data on ED visits captured in the National Hospital Ambulatory Medical Care Survey and found that mild TBI incidence was higher in the Midwestern region of the United States and in nonurban areas. In addition, data from the Agency for Healthcare Research and Quality's Healthcare Cost and Utilization Project found that the relative risk of inpatient mortality among pediatric patients admitted for a TBI varied by as much as nearly 2-fold depending on the state.[10] Despite the potential variation of TBI incidence between states and regions, reporting of TBI data with this level of detail is challenging due to limitations in current national databases. As state health departments and others can use state-level health data to inform prevention strategies, identify resource gaps and needs, and make policy and funding decisions to support their population, this is a critical information gap.

Thus, the objective of this article is to provide data on state-level TBI-related ED visits, hospitalizations, and deaths obtained in conjunction with the Centers for Disease Control and Prevention's (CDC's) Core Violence and Injury Prevention Program (Core VIPP) and the State Injury Indicators for 2014. These data create a benchmark for states so they can see where they rank and what is achievable in terms of their TBI rates. Two other articles in this issue (Sarmiento et al, 2020, and Waltzman et al, 2020) present TBI state-level data stratified by age and sex, respectively, using the same data source.

METHODS

On an annual basis using a standardized approach,[11] states funded through the Core VIPP analyze and submit state-level data on TBI-related ED visits, hospitalizations, and deaths to the CDC. The term "TBI-related" is meant to signify any ED visit, hospitalization, or death in which the patient or decedent has sustained a TBI. It is possible that the patient or decedent may have sustained other injuries or had other complicating health factors as well. States that are not funded through the Core VIPP are also encouraged to submit data to the CDC (see Supplementary Digital Content Table 1, available at: http://links.lww.com/JHTR/A350, for detailed information on states). Information obtained from participating states are reviewed and assembled for inclusion in CDC reports that describe state-level injury burden.[11] This process provides state injury programs with a standardized method for evaluating injury data that are comparable across states.[12] Some states did not submit data for all 3 TBI indicators (ED visits, hospitalizations, and deaths): in 2014, 25 states submitted data on TBI-related ED visits 32 states submitted data on TBI-related hospitalizations, and 36 states submitted data on TBI-related deaths.

Statewide, centralized electronic vital statistics, hospital discharge, and ED data are used to calculate the indicators prepared and submitted by states. The vital statistics data are a complete enumeration of deaths that occur in the state. The physician who certifies the cause of death, medical examiner or coroner, and/or the funeral director are generally responsible for the personal and medical information on the death certificate. The death certificates are then reviewed and registered locally and submitted to the state registrar who files them. All states send death certificate data to the National Vital Statistics System, which is managed by the CDC's National Center for Health Statistics.[13] The death data are coded according to the *International Classification of Diseases*, *Tenth Edition* (*ICD-10*), structure.[14] The hospitalization and ED data are administrative billing files that are derived from the patient's medical records. Coders, often employed by the hospitals, abstract information from the medical records and convert it to *International Classification of Diseases, Ninth Edition, Clinical Modification* (*ICD-9-CM*),[15] and related coding rubrics to submit for billing. These billing files are compiled into centralized files within the state, typically maintained either by the state health department or the state's hospital association. Hospitalizations and ED visits are generally maintained in separate files, and each contain data on all hospital discharges and ED visits that occur in the state. If a patient is seen in the ED and then admitted to the hospital, in most states, the record is only included in the hospitalization file.

The states gain access to these data sources and either analyze the data directly or request another party to carry out the analyses. They then complete spreadsheets with case counts, as well as their state's population numbers, obtained from the US Census Bureau or a suitable alternative (eg, state demographic center).[12] Specific instructions (https://www.cdc.gov/injury/stateprograms/indicators.html) for each indicator (ED visits, hospitalizations, and deaths) are provided to the states, as well as preformatted spreadsheets that automatically calculate age-adjusted rates.

For the TBI indicators, electronic data sources are first limited to an injury subset and then all fields are searched for a TBI code. For deaths, cases are selected if (*a*) the underlying cause of death is an injury (*ICD-10* codes of V01-Y36, Y85-Y87, Y89, *U01-*U03) and (*b*) one of the following *ICD-10* TBI codes is listed in a contributing cause of death field (S01.0–S01.9, S02.0, S02.1, S02.3, S02.7–S02.9, S04.0, S06.0–S06.9, S07.0, S07.1, S07.8, S07.9, S09.7–S09.9, T90.1, T90.2, T90.4, T90.5, T90.8, or T90.9). For hospitalizations and ED visits, a case is selected if it has a primary diagnosis of injury (800–909.2, 909.4, 909.9, 910–994.9, 995.5–995.59, or 995.80–995.85) and one of the following *ICD-9-CM* TBI codes is on any field: 800–801, 803–804, 850–854, 950.1–950.3, 959.01, or 995.55. See Supplementary Digital Content Table 2 (available at: http://links.lww.com/JHTR/A351) for a description of the *ICD-10* and *ICD-9-CM* codes used. Once submitted, the CDC conducts a quality check of each state's data.

One of the purposes of this article was to display the most recent TBI rates available. Because of the coding transition from *ICD-9-CM* to *ICD-10-CM* in the hospital discharge and ED data that occurred on October 1, 2015, 2014 was the most recent full year available for analysis. As the states are using their administrative and vital statistics data, it is a complete census of TBI-related ED visits, hospitalizations, and deaths that occur in that state. Because of the census nature of the data (ie, they are complete counts of all TBIs that occurred in the state) and the fact that states are using similar methodology, numbers and rates are comparable across states.

Compilation and analysis

All analyses were secondary in nature, and no personally identifiable information was collected. A health statistician and coauthor (K.T.) compiled the rates that these states calculated. Age-adjusted rates were calculated by the states based on National Center for Health Statistics guidance.[16] Numbers and age-adjusted rates are presented for each reporting state for the 3 indicators. Although the data are complete counts for the states, 95% confidence intervals (CIs) for rates are presented to account for random variation.[17] These results are also presented in choropleth maps. The choropleth maps use differences in coloring to indicate the state's TBI rate in comparison with other states.

RESULTS

TBI-related ED visits

The rates of TBI-related ED visits in 2014 ranged from a low of 381.1 (95% CI, 367.8–394.4) per 100 000 in South Dakota to a high of 998.4 (95% CI, 990.6–1006.1) per 100 000 in Massachusetts (see Table 1; and Figure 1).

TBI-related hospitalizations

In 2014, the rates of TBI-related hospitalizations ranged from a low of 55.1 (95% CI, 53.7–56.4) per 100 000 in Ohio to a high of 98.9 (95% CI, 97.2–100.6) per 100 000 in Pennsylvania (see Table 2; and Figure 2).

TBI-related deaths

In 2014, the rates of TBI-related death ranged from a low of 9.1 (95% CI, 8.5–9.7) per 100 000 in New Jersey to a high of 23.0 (95% CI, 21.5–24.5) per 100 000 in Oklahoma (see Table 3; and Figure 3).

DISCUSSION

TBI-related ED visits, hospitalizations, and deaths varied by state in 2014. There were few strong discernible patterns by state or region, when using the US Census Bureau's regional definitions.[18] States with higher rates of TBI-related deaths were generally more likely to be located in the West. For example, Utah, Oklahoma, and Washington all appeared at the top of the list. The states with the highest rates of TBI-related hospitalizations were spread out across the country (eg, Pennsylvania, Arizona). The states with the lowest rates of TBI-related hospitalizations were evenly distributed across the country. Lower TBI-related death rates were more likely in the East: Rhode Island, New York, and New Jersey reported the lowest rates overall.

It is interesting to note that the same states do not appear in the same positions for each indicator. For example, while Pennsylvania had the highest rate of TBI-related hospitalizations, it does not appear at the top of the list for TBI-related ED visits or deaths. Similarly, New Jersey had the lowest rate of TBI-related deaths in 2014 but is not at the bottom of the list for the other 2 indicators. It is possible that the factors that contribute to TBI-related hospitalizations are different from the factors that contribute to TBI-related ED visits and TBI-related deaths, and vice versa. However, these data do not allow us to draw these conclusions and thus present an area that is ripe for study in future research.

Previous research has suggested that residents of rural areas have both higher incidence and higher mortality rates from TBI than do residents of urban areas.[6,19–21] Some studies have also found that there are urban-rural differences related to patient age, severity of injury, and the most frequent mechanisms of injury.[22] While we did not examine TBI rates by degree of rurality, it is possible that state-level urban-rural differences in the TBI experience help explain some of the state-level differences we see in TBI rates in this article, particularly in terms of the TBI-related death rates. The states with the highest TBI-related death rates are found in the West and are generally more rural than states in the East, which have the lowest rates of TBI-related deaths.

Recent research has also been conducted that explores the causes of TBI-related deaths over time.[23] Prior to 2009, unintentional motor vehicle crashes were the most common cause of TBI-related deaths in the United States, but in the last decade, suicide has become the most common cause of TBI-related deaths.[23] Suicide rates are known to vary by state.[24] When comparing our tables with those of suicide-related deaths, in general, states that have the highest rates of TBI-related death also have higher suicide rates.[25] Conversely, those states with lower suicide rates are found in the eastern half of the United States; this may have an association with lower TBI-related death rates seen in our data.

In terms of TBI-related hospitalizations and ED visits, research suggests that persons with a suspected illness or injury are more likely to visit an ED, hospital, or other healthcare provider if they have access to transportation and/or if the providers are easily accessible.[26,27] It is possible that those states with higher TBI-related ED visits and hospitalization rates have more easily accessible hospitals. Researchers from the Pew Research Center found that residents of rural areas were more likely to report that access to hospitals was a problem than urban residents and that they had to travel farther to receive care.[28] This could also play a role in some of the state differences we found. Furthermore, differences in ED visits and hospitalizations by state are likely affected by healthcare utilization patterns generally and insurance coverage specifically. In 2017 the US Census Bureau reported that the uninsured rate nationally was 8.7% but ranged from a low of 2.8% in Massachusetts to a high of 17.3% in Texas.[29] Our data do show that Massachusetts, for example, has a relatively high rate of TBI-related ED visits, which may correspond with its high insurance coverage rate. Conversely, Florida had a relatively low rate of TBI-related ED visits and a higher uninsured rate (12.9% in 2017) than the national average 8.7%).[29] Future research might examine the extent of unmet healthcare needs among those with a suspected or diagnosed TBI.

Dissemination of state-level TBI data can provide an impetus for further investigation and research efforts aimed at identifying and targeting state needs and resource gaps. Data-driven interventions tailored to specific states and problems are essential for developing and sustaining TBI prevention efforts and reducing the burden of this injury among the American population.

Limitations

While these data allowed us to produce state-level numbers and rates of TBI-related ED visits, hospitalizations, and deaths for the first time, there are a number of limitations to their use. First, not all states report TBI data to the CDC, so there was not a full accounting of all 50 states. Second, there are data elements missing from certain states that do report (eg, not all states report ED visits, hospitalizations, and deaths; some might only report 1 or 2 of those indicators based on data availability). Third, observation stays in which a patient is observed longer than a regular ED visit may not be reported consistently across states. While many states include these stays in their ED data, other states include them in the hospitalization data or even a separate data set. This may explain some variation in the numbers provided and may contribute to undercounting in states that do not report these stays in their ED numbers. On the contrary, the hospitalization data do not take into account patient transfers or readmissions and may therefore present some duplication of cases. Fourth, these data provide an incomplete picture of persons who experience a TBI because they do not include information regarding those treated in urgent cares, those treated in outpatient physicians' offices, or those who lack access or do not seek medical care. Therefore, the overall burden of TBI in these states is underestimated. Fifth, mechanism of injury or injury intent (unintentional or intentional) for the TBIs was not available in the data provided to the CDC from all the states. Differences in mechanism of injury likely underlie many of the state-level differences presented, and this information may help the states in any prevention efforts that they undertake. Sixth, there is the issue of whether healthcare providers properly diagnose TBIs. This likely creates an undercount of the true burden of TBI in each state and might differentially impact states depending on the number of available providers, access to care, health insurance programs, and other factors. Seventh, there are limitations with relying on *ICD* codes to determine the incidence of TBI. For example, there may be coding errors in the medical record and inconsistent implementation of TBI diagnostic criteria. A TBI may also be missed and therefore not coded if another more acute injury is present, all of which may contribute to an undercount on this injury. Finally, the ED and hospitalization numbers and rates are based on state residents seeking care in in-state medical facilities. For smaller states, in particular, or those living adjacent to larger metropolitan areas across state lines, it is possible that a meaningful proportion of patients could seek care across state lines. This may be even more relevant for TBIs of greater severity that require hospitalizations in which a higher-level trauma center is sought. This likely contributes to an undercount of TBI in these smaller or more rural states.

CONCLUSION

This article presents the first CDC analysis of state-level TBI data. TBI-related ED visits, hospitalizations, and deaths varied by state in 2014. While it is difficult to make state- or region-level conclusions related to TBI risk, this analysis can be used to inform prevention and education efforts using state-related contextual information. For example, states with particularly high rates of TBI-related ED visits, hospitalizations, and deaths may need to consider engaging in more rigorous prevention efforts for the mechanisms of injury that likely contribute to their higher rates. The CDC's Injury Center works with states and other key stakeholders to advance research and programs to improve the prevention, recognition, and management of TBI. Information and resources are available for states and local public health professionals at https://www.cdc.gov/traumaticbraininjury/index.html.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The findings and conclusions in this manuscript are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Abbreviation:

CI	confidence interval

REFERENCES

1. Cassidy JD, Carroll L, Peloso P, et al. Incidence, risk factors and prevention of mild traumatic brain injury: results of the WHO Collaborating Centre Task Force on Mild Traumatic Brain Injury. J Rehabil Med. 2004;36:28–60. [PubMed: 15074435]
2. Lumba-Brown A, Yeates KO, Sarmiento K, et al. Centers for Disease Control and Prevention guideline on the diagnosis and management of mild traumatic brain injury among children. JAMA Pediatr. 2018;172(11):e182853. [PubMed: 30193284]
3. Barlow KM, Crawford S, Stevenson A, Sandhu SS, Belanger F, Dewey D. Epidemiology of postconcussion syndrome in pediatric mild traumatic brain injury. Pediatrics. 2010;126(2):e374–e381. [PubMed: 20660554]
4. Centers for Disease Control and Prevention. Report to Congress on traumatic brain injury in the United States: epidemiology and rehabilitation. https://www.cdc.gov/traumaticbraininjury/pdf/tbi_report_to_congress_epi_and_rehab-a.pdf. Published 2015 Accessed September 21, 2019.
5. National Institute of Neurological Disorders and Stroke. Traumatic Brain Injury: Hope Through Research. Bethesda, MD: National Institutes of Health; 2002.
6. Bazarian JJ, McClung J, Shah MN, Ting Cheng Y, Flesher W, Kraus J. Mild traumatic brain injury in the United States, 1998–2000. Brain Inj. 2005;19(2):85–91. [PubMed: 15841752]
7. Gabella B, Hoffman RE, Marine WW, Stallones L. Urban and rural traumatic brain injuries in Colorado. Ann Epidemiol. 1997;7(3):207–212. [PubMed: 9141644]
8. Tiesman H, Zwerling C, Peek-Asa C, Sprince N, Cavanaugh JE. Non-fatal injuries among urban and rural residents: the National Health Interview Survey, 1997–2001. Inj Prev. 2007;13(2):115–119. [PubMed: 17446252]
9. Jarman MP, Castillo RC, Carlini AR, Kodadek LM, Haider AH. Rural risk: geographic disparities in trauma mortality. Surgery. 2016;160(6):1551–1559. [PubMed: 27506860]
10. Greene NH, Kernic MA, Vavilala MS, Rivara FP. Variation in pediatric traumatic brain injury outcomes in the United States. Arch Phys Med Rehabil. 2014;95(6):1148–1155. [PubMed: 24631594]
11. Centers for Disease Control and Prevention. State Injury Indicators reports. https://www.cdc.gov/injury/stateprograms/indicators.html. Published 2018 Accessed April 19, 2019.
12. Thomas KE, Johnson RL. State Injury Indicators Report: Instructions for Preparing 2014 Data. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2016.
13. Centers for Disease Control and Prevention. Mortality data from the National Vital Statistics System. http://www.cdc.gov/nchs/deaths.htm. Published 2019 Accessed November 1, 2019.
14. Centers for Disease Control and Prevention. External Cause of In- jury Mortality Matrix for ICD-10. Atlanta, GA: Centers for Disease Control and Prevention; 2010.

15. Centers for Disease Control and Prevention. ICD-9-CM Official GuidelinesforCodingandReporting. Atlanta, GA: Centers for Disease Control and Prevention; 2011.
16. Klein RJ SC. Age Adjustment Using the 2000 Projected U.S. Population. Hyattsville, MD: National Center for Health Statistics; 2001.
17. National Center for Health Statistics. Technical Appendix From Vital Statistics of the United States: 1999 Mortality. Hyattsville, MD: National Center for Health Statistics; 2004.
18. US Census Bureau. Census regions and divisions in the United States. https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf Published 2017 Accessed October 13, 2017.
19. Chapital AD. Traumatic Brain Injury: Outcomes of a Rural Versus Urban Population Over a 5-Year Period. Manoa, HI: University of Hawaii Biomedical Sciences, University of Hawaii; 2005.
20. Johnstone B, Nossaman LD, Schopp LH, Holmquist L, Rupright SJ. Distribution of services and supports for people with traumatic brain injury in rural and urban Missouri. J Rural Health. 2002;18(1):109–117. [PubMed: 12043749]
21. Leonhard MJ, Wright DA, Fu R, Lehrfeld DP, Carlson KF. Urban/rural disparities in Oregon pediatric traumatic brain injury. Inj Epidemiol. 2015;2(1):32. [PubMed: 26697290]
22. Stewart TC, Gilliland J, Fraser DD. An epidemiologic profile of pediatric concussions: identifying urban and rural differences. J Trauma Acute Care Surg. 2014;76(3):736–742. [PubMed: 24553542]
23. Daugherty J, Waltzman D, Sarmiento K, Xu L. Traumatic brain injury–related deaths by race/ethnicity, sex, intent, and mechanism of injury—United States, 2000–2017. MMWR Morb Mortal Wkly Rep. 2019;68(46):1050–1056. [PubMed: 31751321]
24. Centers for Disease Control and Prevention. Suicide mortality by state: 2017. https://www.cdc.gov/nchs/pressroom/sosmap/suicide-mortality/suicide.htm. Published 2019 Accessed April 24, 2019.
25. Garnett MF, Hedegaard H. QuickStats: age-adjusted rates of suicide, by state—National Vital Statistics System, United States, 2017. MMWR Morb Mortal Wkly Rep. 2019;68:198.
26. Syed ST, Gerber BS, Sharp LK. Traveling towards disease: transportation barriers to health care access. J Community Health. 2013;38(5):976–993. [PubMed: 23543372]
27. Arcury TA, Preisser JS, Gesler WM, Powers JM. Access to transportation and health care utilization in a rural region. J Rural Health. 2005;21(1):31–38. [PubMed: 15667007]
28. Lam O, Broderick B, Toor S. How Far Americans Live From the Closest Hospital Differs by Community Type. Washington, DC: Pew Research Center; 2018.
29. Berchick ER, Hood E, Barnett JC. Health Insurance Coverage in the United States: 2017. Washington, DC: US Government Printing Office; 2018.

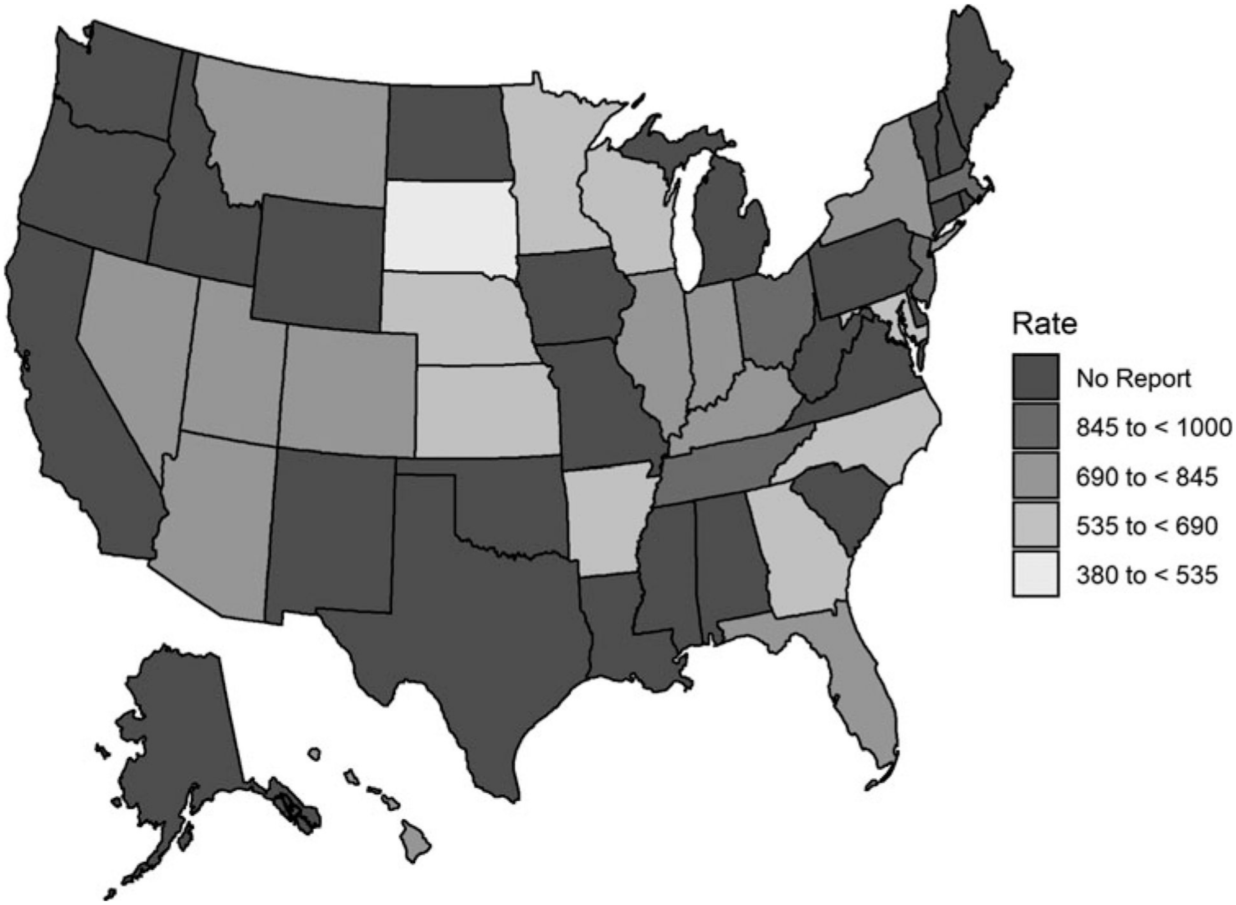

Figure 1.
Rate of traumatic brain injury–related emergency department visits by state, United States—2014, Centers for Disease Control and Prevention Core Violence and Injury Prevention Program data.

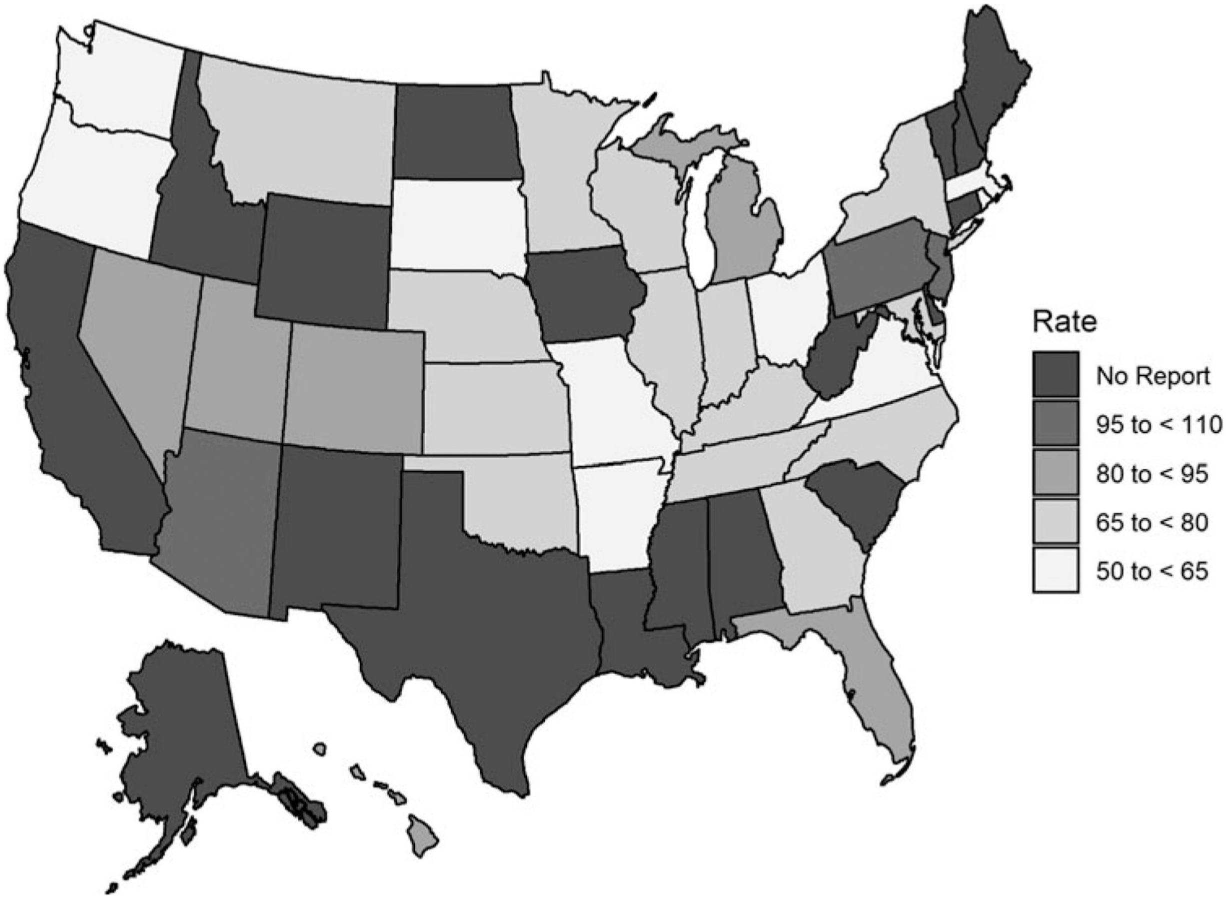

Figure 2.

Rate of traumatic brain injury–related hospitalizations by state, United States—2014, Centers for Disease Control and Prevention Core Violence and Injury Prevention Program data.

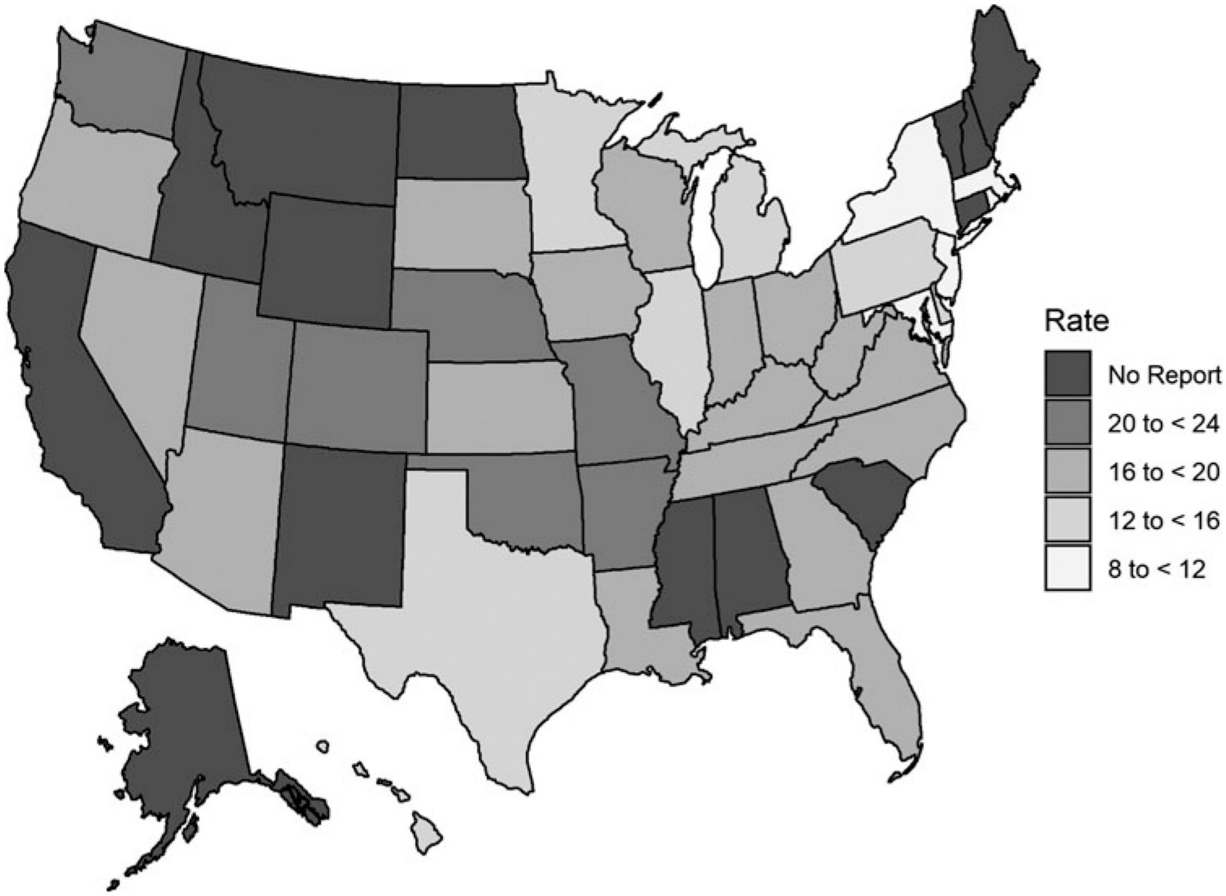

Figure 3.
Rate of traumatic brain injury–related deaths by state, United States—2014, Centers for Disease Control and Prevention Core Violence and Injury Prevention Program data.

TABLE 1

State-level numbers and age-adjusted rates of traumatic brain injury–related emergency department visits, United States—2014, Centers for Disease Control and Prevention Core Violence and Injury Prevention Program data

State	No.	Rate	95% Cl
Arizona	54 287	813.3	806.4–820.2
Arkansas	18 607	633.5	624.3–642.8
Colorado	39 134	750.9	743.4–758.4
Florida	151 058	775.5	771.4–779.5
Georgia	64 714	657.3	652.1–662.4
Hawaii	11 293	786.4	771.6–801.2
Illinois	94 018	733.2	728.5–737.9
Indiana	46 266	708.5	701.9–715.0
Kansas	18 659	635.3	626.1–644.5
Kentucky	32 302	747.4	739.1–755.6
Maryland	39 177	671.1	664.4–677.9
Massachusetts	66 952	998.4	990.6–1006.1
Minnesota	37 206	688.3	681.2–695.4
Montana	6 872	690.6	673.9–707.3
Nebraska	10 656	557.2	546.5–567.9
Nevada	20 206	727.0	716.9–737.1
New Jersey	83 991	951.7	945.2–958.2
New York	145 671	742.2	738.3–746.1
North Carolina	67 292	683.7	678.5–688.9
Ohio	111 757	978.4	972.5–984.2
South Dakota	3 249	381.1	367.8–394.4
Tennessee	54 676	850.0	842.7–857.2
Utah	22 024	737.6	727.6–747.6
Wisconsin	36 651	648.5	641.7–655.2

TABLE 2

State-level numbers and age-adjusted rates of traumatic brain injury–related hospitalizations, United States—2014, Centers for Disease Control and Prevention Core Violence and Injury Prevention Program data

State	No.	Rate	95% CI
Arizona	6 922	98.8	96.4–101.1
Arkansas	2 025	64.2	61.3–67.0
Colorado	4 663	86.5	84.0–89.0
Florida	21 081	92.6	91.3–93.9
Georgia	6 616	67.7	66.1–69.4
Hawaii	1 384	85.3	80.7–89.9
Illinois	9 567	69.7	68.3–71.1
Indiana	4 642	66.8	64.9–68.8
Kansas	2 470	79.7	76.5–83.0
Kentucky	3 062	66.0	63.6–68.4
Maryland	4 279	68.4	66.3–70.5
Massachusetts	4 917	64.6	62.8–66.5
Michigan	10 323	94.6	92.7–96.5
Minnesota	4 623	79.1	76.7–81.4
Missouri	4 251	64.1	62.2–66.1
Montana	802	71.3	66.2–76.5
Nebraska	1 563	76.8	72.9–80.7
Nevada	2 328	82.1	78.8–85.5
New Jersey	9 479	96.6	94.6–98.6
New York	16 385	76.4	75.2–77.6
North Carolina	6 796	65.6	64.0–67.2
Ohio	6 768	55.1	53.7–56.4
Oklahoma	3 147	77.5	74.7–80.2
Oregon	2 778	64.1	61.7–66.6
Pennsylvania	14 524	98.9	97.2–100.6
Rhode Island	732	59.1	54.7–63.6
South Dakota	557	60.5	55.4–65.7
Tennessee	5302	76.9	74.8–79.0
Utah	2 269	84.2	80.7–87.8
Virginia	5 172	60.1	58.5–61.8
Washington	4 453	61.2	59.4–63.1
Wisconsin	4 424	70.1	68.0–72.2

TABLE 3

State-level numbers and age-adjusted rates of traumatic brain injury–related deaths, United States—2014, Centers for Disease Control and Prevention Core Violence and Injury Prevention Program data

State	No.	Rate	95% CI
Arizona	1233	17.4	16.4–18.4
Arkansas	625	20.5	18.8–22.1
Colorado	1103	20.5	19.2–21.7
Delaware	141	14.0	11.6–16.3
Florida	3852	17.1	16.6–17.7
Georgia	1721	17.4	16.6–18.2
Hawaii	229	14.2	12.3–16.1
Illinois	1644	12.1	11.5–12.7
Indiana	1106	16.2	15.3–17.2
Iowa	603	17.0	15.6–18.5
Kansas	567	18.7	17.1–20.3
Kentucky	861	18.8	17.5–20.1
Louisiana	863	18.2	16.9–19.4
Maryland	649	10.3	9.5–11.1
Massachusetts	797	10.5	9.7–11.2
Michigan	1580	14.7	14.0–15.4
Minnesota	873	14.4	13.4–15.3
Missouri	1318	20.4	19.3–21.5
Nebraska	417	20.8	18.8–22.9
Nevada	571	19.9	18.3–21.6
New Jersey	892	9.1	8.5–9.7
New York	2170	10.0	9.6–10.4
North Carolina	1825	17.5	16.7–18.3
Ohio	2327	18.5	17.8–19.3
Oklahoma	922	23.0	21.5–24.5
Oregon	848	19.5	18.1–20.8
Pennsylvania	2330	15.7	15.1–16.4
Rhode Island	139	10.6	8.8–12.4
South Dakota	182	19.3	16.4–22.2
Tennessee	1294	18.8	17.7–19.8
Texas	4041	15.6	15.1–16.1
Utah	569	21.6	19.8–23.4
Virginia	1565	18.2	17.2–19.1
Washington	1558	21.3	20.2–22.4
West Virginia	374	18.4	16.4–20.3
Wisconsin	1071	16.9	15.9–18.0