HHS Public Access

Author manuscript

J Interpers Violence. Author manuscript; available in PMC 2025 February 01.

Published in final edited form as:

J Interpers Violence. 2024 March ; 39(5-6): 1351–1367. doi:10.1177/08862605231203962.

Association Between Lifetime Sexual Violence and Recent Traumatic Brain Injury Among Adults: 2017 Connecticut Behavioral Risk Factor Surveillance System

Dana Waltzman[1], **Jill Daugherty**[1], **Juliet Haarbauer-Krupa**[1], **Xi Zheng**[2], **Celeste Jorge**[2], **Kathleen C. Basile**[1]

[1]National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, Atlanta, GA, USA

[2]Connecticut Department of Public Health, Hartford, CT, USA

Abstract

Sexual violence (SV) is a critical public health problem that is associated with numerous negative health consequences, including immediate- and long-term physical and mental health conditions and health-risk behaviors. Some of these health-risk behaviors (e.g., substance use, unsafe driving practices, poor mental health, lower impulse control, and abnormal brain circuitry) might increase the risk for sustaining a traumatic brain injury (TBI). A TBI causes neurological or neuropsychological changes and may also lead to various symptoms that affect a person's cognition, mobility, behavior, and mental health. Determining if those who have experienced SV are at increased risk of sustaining a TBI in their lifetime is critical given the high prevalence and health impacts of SV, the potential vulnerability to TBI after SV, and the known detrimental effects of TBI. This exploratory study examined data from the 2017 Connecticut behavioral risk factor surveillance system and found that lifetime SV victimization (controlling for age and sex) was associated with increased odds of reporting a recent TBI in the past 12 months (adjusted odds ratio [AOR] = 2.1; 95% confidence interval [CI] [1.03, 4.21]). Further research is needed to better understand how SV history is related to the risk of sustaining a TBI. Healthcare professionals can support patients who experience SV by providing resources to help reduce associated physical and mental health conditions and health-risk behaviors.

Keywords

traumatic brain injury; sexual violence; prevalence; health; behavior

Corresponding Author: Dana Waltzman, Division of Injury Prevention, National Center for Injury Prevention & Control, Centers for Disease Control & Prevention, 4770 Buford Highway, Mail Stop. F62, Atlanta, GA 30341, USA. dwaltzman@cdc.gov.

Disclaimer

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

Supplemental Material

Supplemental material for this article is available online.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

Sexual violence (SV) is a critical public health problem, can reoccur across the lifespan, and can have lifelong impacts on health (Basile et al., 2022). It comprises any sexual act (e.g., rape, unwanted sexual touch) perpetrated against someone without their consent (Basile et al., 2014). SV can be perpetrated by anyone, including intimate partners (Bagwell-Gray, 2021; Bagwell-Gray et al., 2015). During 2016 and 2017, half of women (54.3%) and nearly a third of men (30.7%) in the United States experienced some form of SV involving physical contact (Basile et al., 2022). Additionally, 19.6% of women and 7.6% of men have had a lifetime prevalence of contact SV by an intimate partner (Leemis et al., 2022).

SV victimization is associated with numerous negative health consequences (e.g., immediate- and long-term physical and mental health conditions and altered brain architecture) and risk behaviors (e.g., substance use and higher-risk driving behaviors) (Basile et al., 2020; Marusak et al., 2015; Santaularia et al., 2014; Thomason et al., 2015), some of which may increase risk for traumatic brain injury (TBI). TBI can affect a person's short- or long-term cognition, mobility, behavior, and mental health (Centers for Disease Control and Prevention, 2015). While unintentional falls (49.1%) and motor vehicle crashes (24.5%) are the most common mechanisms of injury contributing to a TBI-related hospitalization in the United States, assaults account for 6.5% (Centers for Disease Control and Prevention, 2021). Sequelae due to SV may contribute to a higher susceptibility to certain causes of TBI (i.e., motor vehicle crashes, intentional self-harm) through deficits in impulse control (Arnsten et al., 2015), difficulties with emotional regulation (Jacques-Tiura et al., 2021; Weiss et al., 2015), and other cognitive challenges (Basile et al., 2020) that may result from experiencing SV.

For example, experiencing SV, especially during childhood, can dramatically hinder the development of adaptive emotion regulation skills (Mandavia et al., 2016). Research supports the idea that persons with difficulties employing adaptive emotional regulation strategies to tolerate negative emotions and distress may use alcohol and/or other substances to cope with these stressors, especially after experiencing SV (Fossos et al., 2011; Garland et al., 2013; Ullman, Lorenz, et al., 2018; Ullman, Relyea, et al., 2013). In turn, alcohol misuse and substance abuse is associated with risky behavior and impaired driving (Basile et al., 2020; Marusak et al., 2015; Santaularia et al., 2014; Thomason et al., 2015) that contributes to many traffic injuries and fatalities (including TBI) (Centers for Disease Control and Prevention, 2022). Thus, one theoretical pathway that may link SV and TBI is that the same maladaptive emotion regulation skills and coping strategies used to manage the negative sequalae following SV also increase the risk for TBI.

The violent situation encountered by those who have experienced SV may increase the risk of TBI which is another pathway linking the two. However, data are scant about the percentage of victims who have sustained a TBI while experiencing SV. Prior studies have also shown a link between intimate partner violence (IPV), of which SV is a subset, and sustaining an acquired brain injury or TBI (Gabbe et al., 2022; Saleem et al., 2022). Obtaining reliable prevalence estimates for TBIs sustained due to IPV is also difficult (due to a lack of appropriate screening tools, unreliable administrative healthcare data, persons not seeking healthcare, or underreporting, etc.). Despite this, some older studies (Jackson et al., 2002; Smith et al., 2001) have estimated a TBI prevalence of 60% to

92% among women IPV survivors (St Ivany & Schminkey, 2016), while a recent scoping review (Ayton et al., 2021) estimated a prevalence between 1.6% and 94% depending on the specific populations studied. Nevertheless, while most IPV-related TBIs result from physical violence, SV victimization may be co-occurring (Costello & Greenwald, 2022).

An increased risk of sustaining a TBI may be plausible for those who have experienced SV, given the health consequences and risk behaviors linked to both SV and TBI (Basile et al., 2020; Corrigan, 1995). However, this link has not been systematically investigated. To determine the possibility, this exploratory study examined whether a history of SV victimization was associated with having a recently diagnosed TBI.

Methods

Study Population

The Centers for Disease Control and Prevention's (CDC) Behavioral Risk Factor Surveillance System (BRFSS) (National Center for Chronic Disease Prevention and Health Promotion: Division of Population Health, 2023) is an annual, nationally representative telephone survey of noninstitutionalized U.S. adults of ages 18 and older that collects state-specific data about health-related conditions and behaviors. States administer the same set of core questions with additional selected optional modules or state-added questions. The BRFSS uses a complex, disproportionate stratified sample design for respondents who complete the survey by landline, and a random sample design for those who complete it by cellphone. It also uses iterative proportional fitting to weight the data. The CDC's Institutional Review Board evaluates BRFSS data which are de-identified and considered exempt from human subject review. Data from 2017 Connecticut (CT) BRFSS respondents were also used for this study (Connecticut Department of Public Health, 2017) as CT is the only state that incorporated both TBI-related and lifetime SV victimization-related questions. More than 10,000 (10,558) adults in CT completed the core sections of the BRFSS using a landline or cellphone for an overall response rate of 88.7% (n = 9,389).

TBI Module

The TBI module was administered as an optional post-survey group of state-added questions after the BRFSS survey was completed. Once a survey respondent completed the CT BRFSS survey, a $5 Amazon gift card was offered to the respondent if they were willing to continue for an additional 5-minute survey, which included the TBI and the SV questions. Of the original 10,558 adults, 63% (63.7% or n = 6,746) consented to answering the post-survey questions. Respondents were asked, "In the last 12 months, has a doctor or other health professional told you that you have suffered a TBI or concussion?" Responses to this question were dichotomized as yes/no and this was the only question in the TBI module.

Lifetime SV Victimization Questions

The adverse childhood experiences (ACEs) module was added to the CT BRFSS as an optional module. The ACE module included three questions that assessed childhood sexual abuse before the age of 18, which asked: (1) "How often did anyone at least 5 years older than you or an adult, ever touch you sexually?"; (2) "How often did anyone at least 5

years older than you or an adult, try to make you touch them sexually?"; and (3) "How often did anyone at least 5 years older than you or an adult, force you to have sex?" These questions were combined to form a binary (yes/no) childhood sexual abuse indicator, where responding "yes" to one or more of these questions was a yes for the indicator.

A module focused on SV in adulthood was also administered as an optional group of post-survey state-added questions. If the respondent chose to continue, they were asked, "Since you were 18 years old, has anyone EVER made you take part in any sexual activity (including touch that made you uncomfortable) when you really did not want to, or without your consent? For example, you were drunk or asleep, or you thought you would be hurt or punished if you refused?" If they answered affirmatively, they were asked, "Has this happened in the past 12 months?" Responses to these questions were dichotomized as yes/no.

The childhood sexual abuse indicator and the first adulthood SV question were combined to form a binary (yes/no) lifetime SV indicator, where responding "yes" to any of these questions was coded as "yes" for the indicator.

Statistical Analysis

Descriptive statistics were calculated for demographic characteristics (sex, age, race/ethnicity, educational attainment), recent TBI diagnosis, and life-time SV (Table 1). Only respondents who answered "yes" or "no" to the TBI question (N = 6,710) were included in the analysis. Statistical modeling was conducted using a multivariable binomial logistic regression model that examined the association between lifetime SV (main predictor of interest) and recent TBI (outcome) while controlling for sex and age, as these are associated with both SV (Smith et al., 2018) and TBI (Centers for Disease Control and Prevention & National Center for Health Statistics, 2022). Additionally, a sensitivity analysis was run where respondents who answered "yes" to the recent SV question (past 12 months) were removed (two respondents were omitted from the "yes" recent TBI and lifetime SV cell) to eliminate potential temporal issues in associating lifetime SV with TBI in the last 12 months. All analyses were performed in SAS 9.4 (SAS Institute, Cary, NC) accounting for the complex survey design and incorporating the design weight, strata, and the primary sampling unit specific to the post-survey state-added questions.

Results

Of those who completed the survey, 51% (51.7%) were female, about half (50.5%) were between the ages of 35 and 64 years, and 69.6% were non-Hispanic white (Table 1). Approximately, 1.7% of individuals reported a TBI or concussion diagnosis in the preceding 12 months and 14.6% reported experiencing SV in their lifetime. One in 10 (10.2%) reported experiencing at least one incident of childhood sexual abuse, 6.5% reported experiencing SV in adulthood, and 2.7% reported experiencing both (data not shown). Of those who indicated they had experienced SV in adulthood, 16% reported they had the encounter in the past 12 months.

The prevalence of self-reported recent TBI diagnosis among those who experienced lifetime SV was 2.8% (95% confidence interval [CI] [1.3, 4.3]) and among those who have not experienced SV, the prevalence was 1.5% (95% CI [1.0, 2.1]) (Table 2). Lifetime SV was associated with increased self-report of recent TBI (adjusted odds ratio [AOR] = 2.1; 95% CI [1.03, 4.21]) after adjusting for sex and age. Additionally, while not significant, the sensitivity analysis (Supplemental Table 1) demonstrated similar results (AOR = 2.0, 95% CI [0.97, 4.13]).

Discussion

Findings from this exploratory study demonstrate that having a lifetime history of SV is associated with reporting a TBI in the past 12 months. Research indicates that both TBI and SV can profoundly affect one's personal well-being (Andelic, Sigurdardottir, et al., 2010; Martin et al., 2008). SV victimization is associated with adverse behaviors such as substance use and unsafe driving practices that increase TBI risk (Basile et al., 2020; Parry-Jones et al., 2006). In addition, strong evidence exists for the link between both alcohol use and TBI (Corrigan, 1995; Weil et al., 2018) and alcohol use and SV (Basile et al., 2020; Walsh et al., 2014). Previous research has shown that trauma (such as violence and other ACEs) experienced in childhood can alter brain response due to toxic stress (Shonkoff et al., 2009; Shonkoff & Garner, 2012). This altered brain response and architecture (e.g., in brain activity and connectivity) (Marusak et al., 2015; Thomason et al., 2015) is associated with deficits in impulse control which likely increases the risk for injuries, including TBI.

Studies have also shown a link between SV victimization and subsequent poor mental health such as the misuse of alcohol and other substances, depression, and suicide attempts (Easton & Kong, 2017; Merrick et al., 2017). Some of these same mental health conditions also enhance the likelihood of sustaining a TBI (Andelic, Jerstad, et al., 2010; Higgins et al., 2020; Matei et al., 2022) via risk behaviors such as driving without a seatbelt while intoxicated or being the passenger of someone who is under the influence of alcohol or other drugs (Basile et al., 2020; Seesen et al., 2019). Additionally, TBI might also occur during exposure to SV or as part of the exposure to other violence in a relationship where such violence also occurs (in IPV but also in childhood), which is another possible reason for an association between SV and TBI. The nature of this association warrants further investigation.

No studies examined the direct association between SV victimization and TBI. However, TBIs do occur with IPV victimization and IPV victims may likely experience SV victimization as well (Costello & Greenwald, 2022). The prevalence of TBIs with sexual IPV is difficult to fully understand because many situations in which these injuries occur may not be perceived or identified. Most IPV victims (66%) do not seek medical care for their injuries (Truman & Morgan, 2014). While a systematic review did show that sexual IPV victims may be more likely to seek medical or social services help than physical or psychological IPV victims (Wright et al., 2021), such victims along with healthcare providers, may not immediately recognize a TBI at the time of the event if other more visible injuries are present. This limits the potential to examine the associations between IPV and/or SV and TBI.

Those experiencing SV may have deficits in impulse control (Arnsten et al., 2015), difficulties with emotional regulation (Jacques-Tiura et al., 2021; Weiss et al., 2015), and other cognitive challenges (Basile et al., 2020) which may increase the risk of certain causes of TBI (e.g., motor vehicle crashes, intentional self-harm) and may partly explain the association between SV and TBI. Research suggests that experiencing SV can compromise crucial regions within the brain that are responsible for regulating emotions such as failing to dampen the dorsolateral prefrontal cortex and engaging amygdala-pregenual cingulate inhibitory circuitry (Marusak et al., 2015) or abnormalities in the connectivity between the prefrontal cortex and amygdala (Thomason et al., 2015). Such damage could predispose a vulnerability of SV victims to risk behaviors such as driving under the influence of alcohol or other substances (Merrick et al., 2017), thus also increasing the likelihood of sustaining a TBI (e.g., a motor vehicle crash that injures the head). While the current study could not directly examine a mediating effect of factors such as health-risk behaviors, mental health, and/or altered brain architecture, a future study may be warranted to better understand the mechanisms through which SV may increase the susceptibility for a TBI.

Considering the relationship between SV and health-risk behaviors and injuries such as TBI can allow healthcare providers to better support patients holistically. Integrated treatment approaches (Galovski et al., 2021) which incorporate considerations for TBI would be beneficial in mitigating health problems and helping to prevent future injuries by connecting patients to victim-centered services (e.g., Rape Crisis Centers, Sexual Assault Response Teams) and therapeutic approaches (e.g., Trauma-focused Cognitive Behavioral Therapy, Cognitive Processing Therapy) (Basile et al., 2016). An upstream approach is to implement comprehensive violence prevention strategies based on the best available evidence such as promoting social norms that protect against violence and create protective environments (Basile et al., 2016).

Limitations

Several limitations exist in this study. First, BRFSS data are retrospective and cross-sectional. As such, determining temporality or causality was not possible. However, because only 16% of those who reported SV in adulthood did so in the last 12 months (Table 1), most respondents likely sustained their TBI after their reported SV. A sensitivity analysis (Supplemental Table 1) that removed respondents who had experienced SV in the past 12 months demonstrated similar results. A future study with a larger sample size that examines these associations may be warranted. Second, BRFSS data are based on self-reports and subject to recall bias. Third, these findings are not generalizable to the national BRFSS sample of noninstitutionalized adults in the United States. Fourth, the TBI question only asked if a doctor or other health professional diagnosed the respondent with a TBI or concussion in the last 12 months. Not every person with a TBI will seek medical care, resulting in significant underestimates of TBI prevalence which happens when using data based on healthcare encounters (Centers for Disease Control and Prevention, 2021). Similarly, administrative healthcare data such as electronic health records are not a reliable way to study IPV and SV-related IPV (Adhia et al., 2023; Alvarez et al., 2017). International Classification of Diseases, Tenth revision, Clinical Modification (ICD-10-CM) codes are not consistently used across states, hospitals, and healthcare settings, or even among staff within

healthcare settings, despite the fact that injuries seen in Emergency Departments (EDs) and urgent care are probably due to IPV/SV(Adhia et al., 2023; Rebbe et al., 2022). Among the documented cases, the IPV/SV that presents in these settings is a small subset of all of such cases, as even IPV/SV that results in severe injury does not always end up in a medical care setting (Adhia et al., 2023; Robinson et al., 2021). An alternative to looking at healthcare data is to rely on self-report data in surveys. Unfortunately, underreporting is still common in confidential surveys especially for sensitive topics like SV and for conditions that are not as well understood by the public such as TBI. Thus, reporting studies that can examine these questions even if the sample size is smaller than ideal and that support more work in this area is important. Fifth, due to the small sample size of adults who self-reported a recent TBI in CT ($N = 109$), additional analyses of differences by demographic factors (e.g., race/ethnicity, sex), or of possible confounders or mediators (e.g., alcohol use or other health-risk behaviors or conditions that contribute to the risk of sustaining a TBI) could not be completed. Additionally, a mediation analysis could not be conducted due to how other variables were asked about in the survey (temporal precedence could not be established).

However, Supplemental Table 2 includes descriptive information and bivariate associations about some of the BRFSS survey questions on health-risk behaviors may show the link between SV and TBI. Future studies with a larger sample size to understand potential differences across groups would be beneficial. Sixth, the BRFSS telephone survey might underestimate the prevalence of recent TBI; this survey sample's noninstitutionalized adults, and those with more severe TBIs may not have been able to participate in the survey because they live in institutional settings or group homes and were thus excluded. Seventh, the state-added post-survey module incentive could have led to selection bias. Eighth, Ns for the TBI variable ($N = 103$ for yes TBI, $N = 6,348$ for yes TBI) were unequal for the multivariate logistic regression. The statistical software procedure used for the stratified sampling and iterative weighting in the BRFSS data has limited options for estimating the variability in rare events. However, the estimation method used provides a conservative 95% confidence interval (Curtin et al., 2006) but is still a limitation of the software.

Conclusions

Findings from this exploratory study demonstrate an association between SV history and recent TBI. More research is needed to better understand how SV history is related to the risk for sustaining a TBI. Increasing awareness among healthcare providers of the relationship between SV and TBI may help support patient care and appropriate referrals to supportive services.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Funding

The author(s) received no financial support for the research and/or authorship of this article.

Biographies

Dana Waltzman, PhD, is a behavioral scientist on the Traumatic Brain Injury (TBI) Team in the Division of Injury Prevention at CDC's Injury Center. Her work focuses on understanding the public health burden, etiology, long-term effects, and prevention of TBI among children and adults.

Jill Daugherty, PhD, is an epidemiologist on the TBI Team in the Division of Injury Prevention at the CDC's Injury Center. Her work focuses on understanding the public health burden and sociodemographic disparities in TBI.

Juliet Haarbauer-Krupa, PhD, FACRM, is a senior health scientist on the TBI Team in the Division of Injury Prevention at CDC's Injury Center. She has over 30 years of experience and has authored 100+ publications and presentations in the area of TBI. She is an adjunct professor in the Department of Pediatrics at Emory University School of Medicine.

Xi Zheng, MPH, MS, is a BRFSS & YRBS epidemiologist at Connecticut Department of Public Health. She earned her Master of Nutritional Sciences from the University of Connecticut and her Master of Public Health from the University of Pittsburgh. She studied traditional Chinese Medicine in China. Xi has been with the Connecticut Department of Public Health for 6 years.

Celeste Jorge, MPH, is a supervising epidemiologist at the Connecticut Department of Public Health and serves as the state coordinator for the Behavioral Risk Factor Surveillance System and the Youth Risk Behavior Surveillance System. Celeste earned her Master of Public Health from the University of Connecticut and has been with the CT Department of Public Health for 19 years.

Kathleen C. Basile, PhD, is deputy associate director for Science in the Division of Violence Prevention at CDC, where she has been since 2000. Her research interests are measurement, prevalence, etiology, impacts, and prevention of sexual violence and intimate partner violence of adults and adolescents. She received her PhD in Sociology from Georgia State University.

References

Adhia A, Rebbe R, Lane Eastman A, Foust R, & Putnam-Hornstein E (2023). Intimate partner violence-related emergency department and hospital visits in California following the ICD-10-CM transition, 2016–2018. Journal of Interpersonal Violence, 38(7–8), 6230–6241. 10.1177/08862605221127220 [PubMed: 36196989]

Alvarez C, Fedock G, Grace KT, & Campbell J (2017). Provider screening and counseling for intimate partner violence: A systematic review of practices and influencing factors. Trauma Violence Abuse, 18(5), 479–495. 10.1177/1524838016637080 [PubMed: 27036407]

Andelic N, Jerstad T, Sigurdardottir S, Schanke AK, Sandvik L, & Roe C (2010). Effects of acute substance use and pre-injury substance abuse on traumatic brain injury severity in adults admitted to a trauma centre. Journal of Trauma Management & Outcomes, 4, 6. 10.1186/1752-2897-4-6 [PubMed: 20504353]

Andelic N, Sigurdardottir S, Schanke AK, Sandvik L, Sveen U, & Roe C (2010). Disability, physical health and mental health 1 year after traumatic brain injury. Disability and Rehabilitation, 32(13), 1122–1131. 10.3109/09638280903410722 [PubMed: 20113311]

Arnsten AFT, Raskind MA, Taylor FB, & Connor DF (2015). The effects of stress exposure on prefrontal cortex: Translating basic research into successful treatments for post-traumatic stress disorder. Neurobiology of Stress, 1, 89–99. 10.1016/j.ynstr.2014.10.002 [PubMed: 25436222]

Ayton D, Pritchard E, & Tsindos T (2021). Acquired brain injury in the context of family violence: A systematc scoping review of incidence, prevalence, and contributing factors. Trauma, Violence, & Abuse, 22(1), 3–17. 10.1177/1524838018821951

Bagwell-Gray ME (2021). Women's experiences of sexual violence in intimate relationships: Applying a new taxonomy. Journal of Interpersonal Violence, 36(13–14), NP7813–NP7839. [PubMed: 30791809]

Bagwell-Gray ME, Messing JT, & Baldwin-White A (2015). Intimate partner sexual violence: A review of terms, definitions, and prevalence. Trauma, Violence, & Abuse, 16(3), 316–335.

Basile KC, Clayton HB, Rostad WL, & Leemis RW (2020). Sexual violence victimization of youth and health risk behaviors. American Journal of Preventive Medicine, 58(4), 570–579. 10.1016/j.amepre.2019.11.020 [PubMed: 32033854]

Basile KC, DeGue S, Jones K, Freire K, Dills J, Smith SG, & Raiford JL (2016). Stop sv: A technical package to prevent sexual violence. https://stacks.cdc.gov/view/cdc/39126

Basile KC, Smith SG, Breiding MJ, Black MC, & Mahendra RR (2014). Sexual violence surveillance: Uniform definitions and recommended data elements, version 2.0. https://stacks.cdc.gov/view/cdc/26326

Basile KC, Smith SG, Kresnow M, Khatiwada S, & Leemis RW (2022). The national intimate partner and sexual violence survey: 2016/2017 report on sexual violence. https://www.cdc.gov/violenceprevention/datasources/nisvs/summaryreports.html

Centers for Disease Control and Prevention. (2015). Report to congress on traumatic brain injury in the United States: Epidemiology and rehabilitation. National Center for Injury Prevention and Control; Division of Unintentional Injury Prevention. Retrieved June 15, 2022 from https://www.cdc.gov/traumaticbrain-injury/pdf/tbi_report_to_congress_epi_and_rehab-a.pdf

Centers for Disease Control and Prevention. (2021). Surveillance report of traumatic brain injury-related hospitalizations and deaths by age group, sex, and mechanism of injury—United States, 2016 and 2017. https://www.cdc.gov/traumatic-braininjury/pdf/TBI-surveillance-report-2016-2017-508.pdf

Centers for Disease Control and Prevention. (2022). Impaired driving: Get the facts. Retrieved April 28, from https://www.cdc.gov/transportationsafety/impaired_driving/impaired-drv_factsheet.html

Centers for Disease Control and Prevention & National Center for Health Statistics. (2022). Mortality data on CDC wonder. Retrieved August 21, 2021 from https://wonder.cdc.gov/mcd.html

Connecticut Department of Public Health. (2017). Connecticut behavioral risk factor surveillance system survey data. https://portal.ct.gov/-/media/Departments-and-Agencies/DPH/BRFSS/BRFSSCT2017pdf.pdf

Corrigan JD (1995). Substance abuse as a mediating factor in outcome from traumatic brain injury. Archives of Physical Medicine and Rehabilitation, 76(4), 302–309. 10.1016/S0003-9993(95)80654-7 [PubMed: 7717829]

Costello K, & Greenwald BD (2022). Update on domestic violence and traumatic brain injury: A narrative review. Brain Sciences, 12(1), 122. [PubMed: 35053865]

Curtin LR, Kruszon-Moran D, Carroll M, & Li X (2006). Estimation and analytic issues for rare events in NHANES. Proceedings of the survey research methods section, American Statistical Association.

Easton SD, & Kong J (2017). Mental health indicators fifty years later: A population-based study of men with histories of child sexual abuse. Child Abuse & Neglect, 63, 273–283. 10.1016/j.chiabu.2016.09.011 [PubMed: 27720219]

Fossos N, Kaysen D, Neighbors C, Lindgren KP, & Hove MC (2011). Coping motives as a mediator of the relationship between sexual coercion and problem drinking in college students. Addictive Behaviors, 36(10), 1001–1007. 10.1016/j.addbeh.2011.06.001 [PubMed: 21719202]

Gabbe BJ, Braaf S, Cameron PA, & Berecki-Gisolf J (2022). Epidemiology and 6- and 12-month outcomes of intimate partner violence and other violence-related traumatic brain injury in major trauma: A population-based trauma registry study. The Journal of Head Trauma Rehabilitation, 37(1), E1–E9. 10.1097/htr.0000000000000741 [PubMed: 34985035]

Galovski TE, Werner KB, Iverson KM, Kaplan S, Fortier CB, Fonda JR, Currao A, Salat D, & McGlinchey RE (2021). A multi-method approach to a comprehensive examination of the psychiatric and neurological consequences of intimate partner violence in women: A methodology protocol. Front Psychiatry, 12, 569335. 10.3389/fpsyt.2021.569335 [PubMed: 33679466]

Garland EL, Pettus-Davis C, & Howard MO (2013). Self-medication among traumatized youth: Structural equation modeling of pathways between trauma history, substance misuse, and psychological distress. Journal of Behavioral Medicine, 36(2), 175–185. 10.1007/s10865-012-9413-5 [PubMed: 22454227]

Higgins C, Rooney K, O'Connell B, Waldron B, & Linehan C (2020). Attempted suicide leading to acquired brain injury: A scoping review. Brain Injury, 34(2), 160–170. 10.1080/02699052.2019.1686771 [PubMed: 31674208]

Jackson H, Philp E, Nuttall RL, & Diller L (2002). Traumatic brain injury: A hidden consequence for battered women. Professional Psychology: Research and Practice, 33, 39–45. 10.1037/0735-7028.33.139

Jacques-Tiura AJ, Lanni DJ, Anderson LA, & Naar S (2021). Victimization and food addiction symptoms: Direct and indirect effects through emotion dysregulation, impulsivity, and loss-of-control eating. Psychology of Women Quarterly, 45(2), 243–254. [PubMed: 34588739]

Leemis RW, Friar N, Khatiwada S, Chen MS, Kresnow M, Smith SG, Caslin S, & Basile KC (2022). The national intimate partner and sexual violence survey: 2016/2017 report on intimate partner violence. https://www.cdc.gov/violenceprevention/pdf/nisvs/NISVSReportonIPV_2022.pdf

Mandavia A, Robinson GG, Bradley B, Ressler KJ, & Powers A (2016). Exposure to childhood abuse and later substance use: Indirect effects of emotion dysregulation and exposure to trauma. Journal of Traumatic Stress, 29(5), 422–429. 10.1002/jts.22131 [PubMed: 27622844]

Martin SL, Rentz ED, Chan RL, Givens J, Sanford CP, Kupper LL, Garrettson M, & Macy RJ (2008). Physical and sexual violence among North Carolina women: Associations with physical health, mental health, and functional impairment. Women's Health Issues, 18(2), 130–140. [PubMed: 18319149]

Marusak HA, Martin KR, Etkin A, & Thomason ME (2015). Childhood trauma exposure disrupts the automatic regulation of emotional processing. Neuropsychopharmacology, 40(5), 1250–1258. [PubMed: 25413183]

Matei VP, Rosca AE, Pavel AN, Paun RM, Gmel G, Daeppen JB, & Studer J (2022). Risk factors and consequences of traumatic brain injury in a Swiss male population cohort. BMJ Open, 12(7), e055986. 10.1136/bmjopen-2021-055986

Merrick MT, Ports KA, Ford DC, Afifi TO, Gershoff ET, & Grogan-Kaylor A (2017). Unpacking the impact of adverse childhood experiences on adult mental health. Child Abuse & Neglect, 69, 10–19. 10.1016/j.chiabu.2017.03.016 [PubMed: 28419887]

National Center for Chronic Disease Prevention and Health Promotion: Division of Population Health. (2023). Behavioral risk factor surveillance system. U.S. Department of Health & Human Services. Retrieved February 2, 2023 from https://www.cdc.gov/brfss/index.html

Parry-Jones BL, Vaughan FL, & Miles Cox W (2006). Traumatic brain injury and substance misuse: A systematic review of prevalence and outcomes research (1994–2004). Neuropsychological Rehabilitation, 16(5), 537–560. [PubMed: 16952892]

Rebbe R, Adhia A, Eastman AL, Chen M, & Winn J (2022). The measurement of intimate partner violence using international classification of diseases diagnostic codes: A systematic review. Trauma Violence Abuse, 24(4), 2165–2180. 10.1177/15248380221090977 [PubMed: 35506696]

Robinson SR, Ravi K, & Voth Schrag RJ (2021). A systematic review of barriers to formal help seeking for adult survivors of IPV in the United States, 2005–2019. Trauma Violence Abuse, 22(5), 1279–1295. 10.1177/1524838020916254 [PubMed: 32266870]

Saleem GT, Champagne M, Haider MN, Leddy JJ, Willer B, Asante I, Kent A, Joseph T, & Fitzpatrick JM (2022). Prevalence and risk factors for intimate partner physical violence–related

acquired brain injury among visitors to justice center in New York. The Journal of Head Trauma Rehabilitation, 37(1), E10–E19. 10.1097/htr.0000000000000750 [PubMed: 34985036]

Santaularia J, Johnson M, Hart L, Haskett L, Welsh E, & Faseru B (2014). Relationships between sexual violence and chronic disease: A cross-sectional study. BMC Public Health, 14, 1286. 10.1186/1471-2458-14-1286 [PubMed: 25516229]

Seesen M, Siviroj P, Sapbamrer R, & Morarit S (2019). High blood alcohol concentration associated with traumatic brain injury among traffic injury patients during new year festivals in Thailand. Traffic Injury Prevention, 20(2), 115–121. 10.1080/15389588.2018.1547379 [PubMed: 30892946]

Shonkoff JP, Boyce WT, & McEwen BS (2009). Neuroscience, molecular biology, and the childhood roots of health disparities: Building a new framework for health promotion and disease prevention. JAMA, 301(21), 2252–2259. 10.1001/jama.2009.754 [PubMed: 19491187]

Shonkoff JP, & Garner AS (2012). The lifelong effects of early childhood adversity and toxic stress. Pediatrics, 129(1), e232–246. 10.1542/peds.2011-2663 [PubMed: 22201156]

Smith DJ Jr., Mills T, & Taliaferro EH (2001). Frequency and relationship of reported symptomology in victims of intimate partner violence: The effect of multiple strangulation attacks. The Journal of Emergency Medicine, 21(3), 323–329. 10.1016/s0736-4679(01)00402-4 [PubMed: 11604297]

Smith S, Zhang X, Basile K, Merrick M, Wang J, Kresnow M, & Chen J (2018). The national intimate partner and sexual violence survey (NISVS): 2015 data brief—updated release. https://www.cdc.gov/violenceprevention/data-sources/nisvs/2015NISVSdatabrief.html

St Ivany A, & Schminkey D (2016). Intimate partner violence and traumatic brain injury: State of the science and next steps. Family & Community Health, 39(2), 129–137. 10.1097/fch.0000000000000094 [PubMed: 26882416]

Thomason ME, Marusak HA, Tocco MA, Vila AM, McGarragle O, & Rosenberg DR (2015). Altered amygdala connectivity in urban youth exposed to trauma. Social Cognitive and Affective Neuroscience, 10(11), 1460–1468. 10.1093/scan/nsv030 [PubMed: 25836993]

Truman JL, & Morgan RE (2014). Nonfatal domestic violence. US Department of Justice, Bureau of Justice Statistics.

Ullman SE, Lorenz K, Kirkner A, & O'Callaghan E (2018). Postassault substance use and coping: A qualitative study of sexual assault survivors and informal support providers. Alcoholism Treatment Quarterly, 36(3), 330–353. 10.1080/07347324.2018.1465807 [PubMed: 30555208]

Ullman SE, Relyea M, Peter-Hagene L, & Vasquez AL (2013). Trauma histories, substance use coping, PTSD, and problem substance use among sexual assault victims. Addictive Behaviors, 38(6), 2219–2223. 10.1016/j.addbeh.2013.01.027 [PubMed: 23501138]

Walsh K, Resnick HS, Danielson CK, McCauley JL, Saunders BE, & Kilpatrick DG (2014). Patterns of drug and alcohol use associated with life-time sexual revictimization and current posttraumatic stress disorder among three national samples of adolescent, college, and household-residing women. Addictive Behaviors, 39(3), 684–689. 10.1016/j.addbeh.2013.12.006 [PubMed: 24370205]

Weil ZM, Corrigan JD, & Karelina K (2018). Alcohol use disorder and traumatic brain injury. Alcohol Research: Current Reviews, 39(2), 171. [PubMed: 31198656]

Weiss NH, Sullivan TP, & Tull MT (2015). Explicating the role of emotion dysregulation in risky behaviors: A review and synthesis of the literature with directions for future research and clinical practice. Current Opinion in Psychology, 3, 22–29. 10.1016/j.copsyc.2015.01.013 [PubMed: 25705711]

Wright EN, Anderson J, Phillips K, & Miyamoto S (2021). Help-seeking and barriers to care in intimate partner sexual violence: A systematic review. Trauma, Violence, & Abuse, 23(5), 1510–1528. 10.1177/1524838021998305

Table 1.

Characteristics of Adult Respondents in the Connecticut Behavioral Risk Factor Surveillance System, 2017.[a]

Characteristic	*N*	Weighted Percentage	95% CI
Sex			
Males	2,747	48.3	46.5–50.2
Females	3,954	51.7	49.8–53.5
Age (years)			
18–34	665	28.0	26.1–29.9
35–64	3,453	50.5	48.6–52.3
65+	2,479	21.6	20.3–22.8
Race/ethnicity			
Non-Hispanic White	5,582	69.6	67.7–71.4
Non-Hispanic Black	368	9.6	8.3–10.8
Non-Hispanic Other[b]	298	6.6	5.6–7.7
Hispanic	357	14.2	12.7–15.8
Educational attainment			
Completed high school or less	1,584	38.4	36.5–40.3
Some college	1,592	27.3	25.7–28.9
Bachelor's degree or higher	3,518	34.3	32.7–35.8
Recent TBI. In the last 12 months, has a doctor or other health professional told you that you have suffered a traumatic brain injury or concussion?			
Yes	109	1.7	I.2–2.2
No	6601	98.3	97.8–98.8
Lifetime sexual violence[c]			
Yes	1016	14.6	13.3–15.9
No	5540	85.4	84.1–86.7
Childhood sexual abuse[d]			
One or more times	692	10.2	9.1–11.4
Never	5903	89.8	88.6–90.9
Adulthood sexual violence[e]			
Yes	509	6.5	5.7–7.4
No	6119	93.5	92.6–94.3
Adulthood recent sexual violence (past 12 months)[f]			
Yes	33	16.0	9.5–22.4
No	475	84.0	77.6–90.5

TBI = traumatic brain injury; CI = confidence interval.

[a]The sample only includes individuals who responded "yes" or "no" to the recent TBI question ($N = 6,710$).

[b]Includes those who answered that they were "non-Hispanic, Asian, AI/AN, or other."

[c]This indicator combines answers to three questions from the adverse childhood experiences (ACEs) module about childhood sexual abuse and one question about adult lifetime sexual violence. Please see questions in superscripts 4 and 5.

[d]This indicator combines answers to three questions from the ACEs: How often did anyone at least 5 years older than you or an adult, ever touch you sexually? How often did anyone at least 5 years older than you or an adult, try to make you touch them sexually? and how often did anyone at least 5 years older than you or an adult, force you to have sex? Yes to one or more is a yes for the indicator.

[e]Adulthood sexual violence was defined as answering "Yes" to the question, "Since you were 18 years old, has anyone EVER made you take part in any sexual activity (including touch that made you uncomfortable) when you really did not want to, or without your consent? For example, you were drunk or asleep, or you thought you would be hurt or punished if you refused."

[f]Recent sexual violence was defined as answering "Yes" to the question, "Has this happened in the past 12 months?." This was only asked of respondents who answered "Yes" to the adulthood sexual violence question.

Table 2.

Association for the Relationship Between Recent Traumatic Brain Injury (TBI) and Lifetime Sexual Violence Adjusted by Select Characteristics—Connecticut Behavioral Risk Factor Surveillance System, 2017.

	Recent TBI		
	Adjusted Odds Ratio (AOR)		
Characteristic	**AOR**	**95% CI**	***p*-Value**
Lifetime sexual violence			
Yes	2.08	1.03-4.21	0.04
No	REF	REF	
Sex			
Female	0.61	0.32–1.15	0.12
Male	REF	REF	
Age (years)			
Mean	0.99	0.97-1.01	0.18

CI = confidence interval.