Traumatic Brain Injury in Iraq and Afghanistan Veterans:

New Results from a National Random Sample Study

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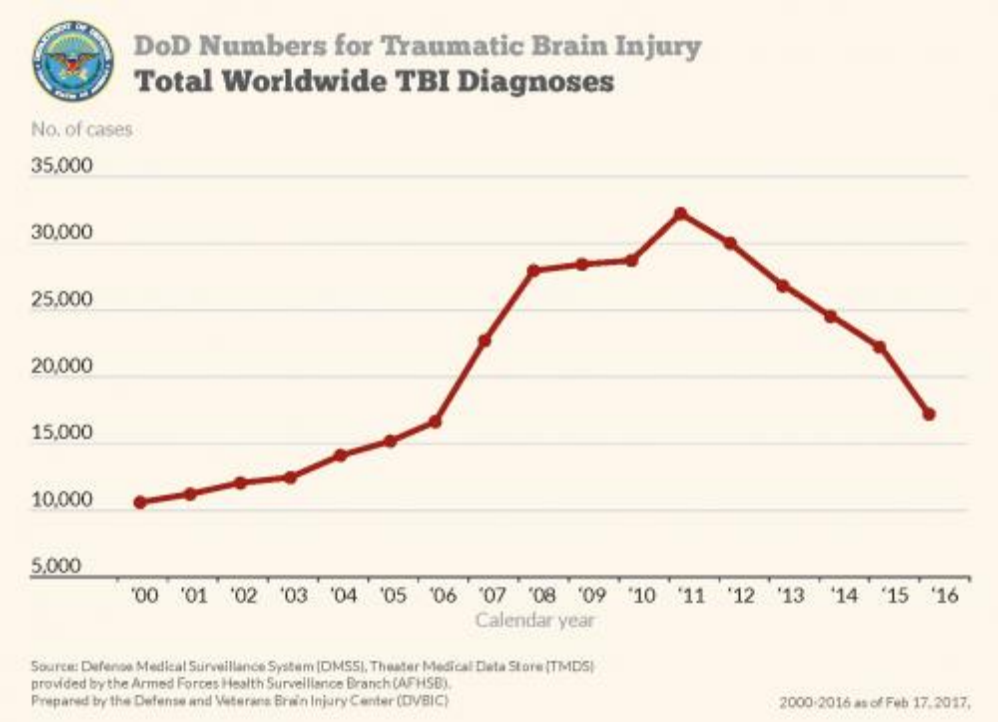
Background

Polling Question

- What is the incidence of TBI among Iraq/Afghanistan Veterans?
  a) Less than 10%
  b) 10-20%
  c) 20-30%
  d) 30-40%
  e) More than 40%

Military TBI

- A ”signature injury” of Iraq & Afghanistan conflicts
- 361,000 TBI diagnoses from 2000 – 2016
- 11 – 23% of deployed military members sustain probable TBI



Characterizing TBI

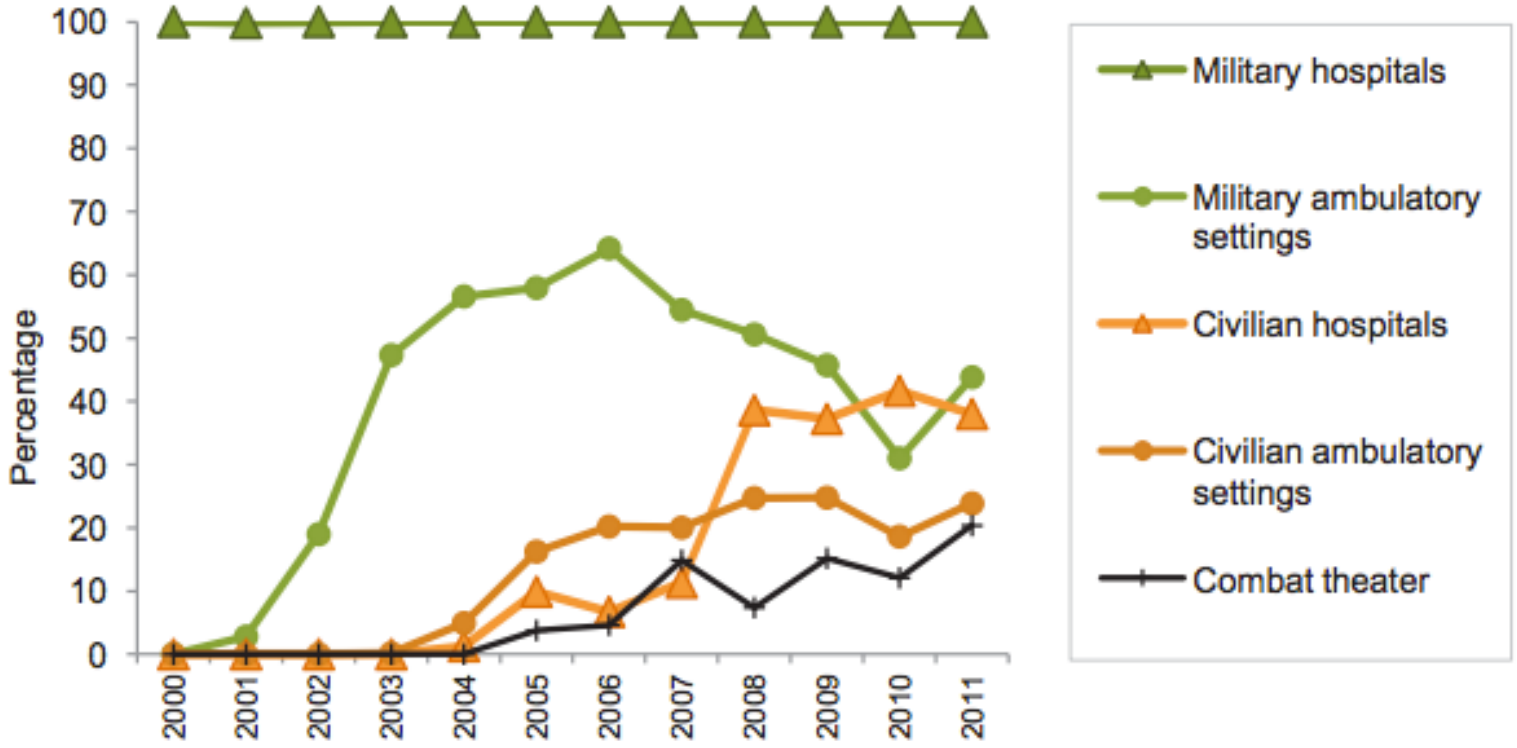
- Hoge et al. (2008)
  - 15% of soldiers returning from Iraq had probable TBI
  - TBI associated with younger age, junior rank, male gender, high combat intensity
  - Blast mechanism of injury most common
- RAND Report (2008)
  - Factors associated with military TBI
    - Male Gender
    - Enlisted Status
    - Younger Age
    - Combat Trauma Exposure: only significant factor after controlling for covariates

Consequences of TBI

- Of veterans with positive TBI screens, 80% with comorbid psychiatric diagnoses (Carlson et al., 2010):
  - PTSD (50%)
  - Depression (33%)
  - Anxiety disorders
  - Alcohol use disorders
- Other sequelae include
  - Cognitive impairment
  - Pain disorders
  - Suicidal ideation, attempt, completion
    - Veterans with TBI are 1.55 times more likely to die from suicide than those without TBI

Characterizing TBI

FIGURE 2. Percentage of TBI case-defining medical encounters with any cause of injury code, by clinical setting, active component, U.S. Armed Forces, 2000-2011



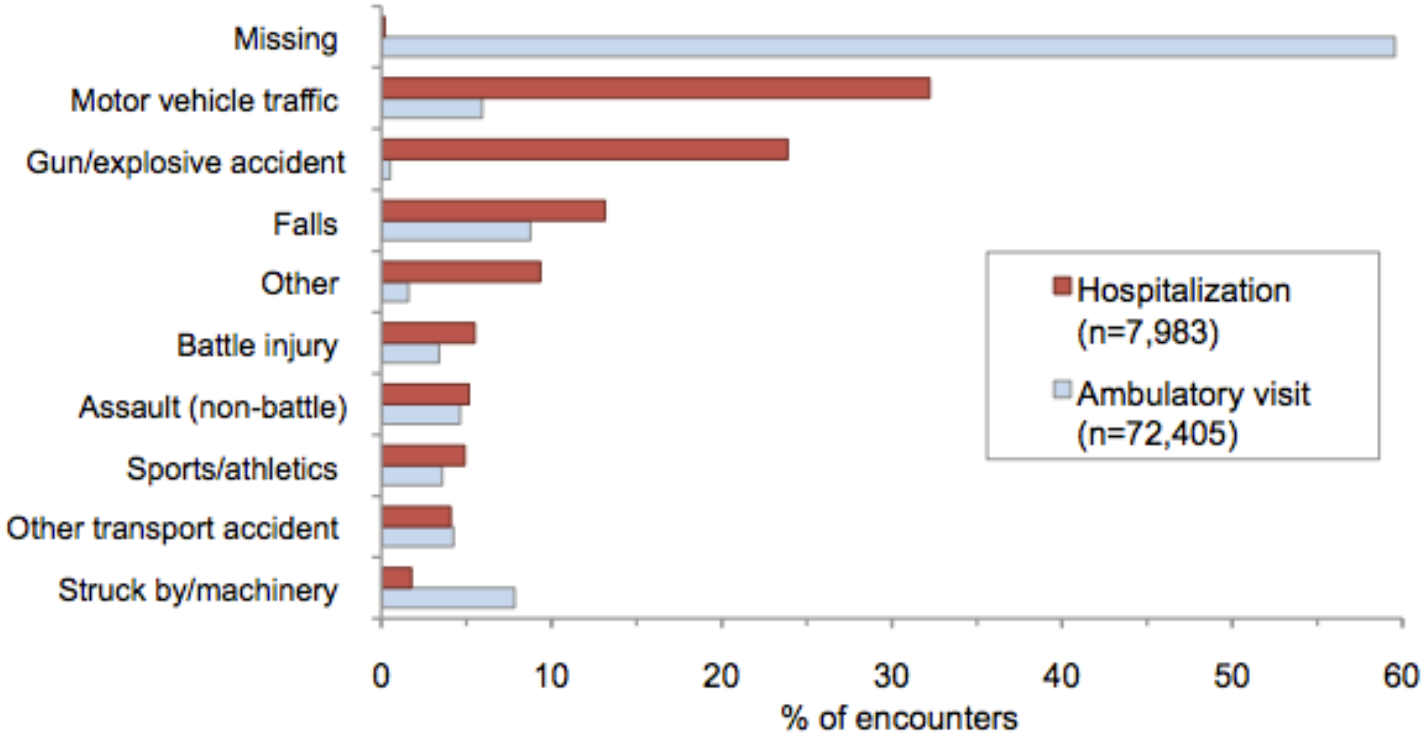
Armed Forces Health Surveillance Center: External causes of traumatic brain injury, 2000 – 2011. Medical Surveillance Monthly Report (MSMR): Armed Forces Health Surveillance Center, March 2013

Polling Question

- Which was reported to be the most common cause of TBI requiring military hospitalization from 2000-2011?
  a) Falls
  b) Gun/explosive accident
  c) Motor vehicle traffic
  d) Sports/athletics
  e) Struck by machinery

Characterizing TBI

FIGURE 3. Percentage of TBI case-defining medical encounters with a specific cause[a] or with no cause recorded, by clinical setting of treatment, military treatment facilities, active component, U.S. Armed Forces, 2000-2011



[a]"Assault (non-combat)" and "combat" are intentional injuries. All others are unintentional (accidental) injuries.

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Questions about TBI

- What are typical characteristics of TBI occurring during military service?
- What percentage had head injuries prior to military service?
- Are veterans with multiple head injuries more likely to report current physical and mental health symptoms?
- Questions addressed with data from a national survey enrolling a random sample of military veterans who served since 9/11.

Methods

National Post-Deployment Adjustment Study

National Institute of Mental Health (R01MH080988)

- May 2009, a random sample of 3000 names / addresses drawn by the VA Environmental Epidemiological Service of the over one million U.S. active duty & military reservists who served in military on or after September 11, 2001.
- Women veterans oversampled (33%)
- In total, N=1388 Iraq and Afghanistan Veterans completed a web-based survey on post-deployment adjustment, representing a 56% corrected response rate.

National Post-Deployment Adjustment Study

National Institute of Mental Health (R01MH080988)

1. Potential participants were sent an introductory letter about the upcoming survey.
2. Four days later, a invitation with $4.40 in commemorative postage stamps was sent containing a password and instructions on to complete a 35-minute web-based survey.
3. Twelve days afterward, postcards were sent thanking Veterans for completion or reminding others to do so.
4. Two weeks later, those who still had not taken the survey received a paper version of the survey.
5. Two months later a final letter alerting Veterans that the survey would close the following week.

National Post-Deployment Adjustment Study

National Institute of Mental Health (R01MH080988)

- The resulting sample included Iraq & Afghanistan military service members & / or Veterans from all branches of the military & the reserves.
- Participants resided in all 50 states, Washington D.C., & four territories.
- Responders were similar to non-responders in age, gender, & geographic region.
- No differences based on survey medium (paper vs. web) or reimbursement

Measures: Assessing TBI

- Probable mild TBI:
  head injury + any of the following:
  - Loss of consciousness less than 30 minutes
  - Post traumatic amnesia less than 24 hours
  - Dazed or “seeing stars” immediately after injury
- Probable moderate-to-severe TBI:
  head injury + any of the following:
  - Skull fracture
  - Brain surgery
  - Loss of consciousness greater than 30 minutes
  - Post traumatic amnesia greater than 24 hours

Measures: Assessing TBI

- Assessed probable TBI before, during and after military service
- For each period, assessed:
  - Head injury
  - Number of head injuries
- For worst head injury during each period, assessed:
  - Age at time of injury
  - Mechanism of injury
  - Loss of consciousness
  - Duration of unconsciousness
  - Memory impairment

Results

Veteran Sample Demographics

Sample Demographics	n=1102 % (n) or median
Age	34 years
Male gender	84.4% (930)
Caucasian race	70.5% (775)
Education beyond high school	81.1% (893)
Branch of Service	
Army	53.6% (584)
Air Force	19.3% (210)
Navy	15.7% (171)
Marine Corps	11.2% (122)
Coast Guard	0.3% (3)
Reserves/National Guard	47.4% (525)
Officer rank	16.7% (184)
Multiple deployments	26.4% (284)
Type of service	
Direct combat	33.7% (370)
Combat or service support	66.3% (731)

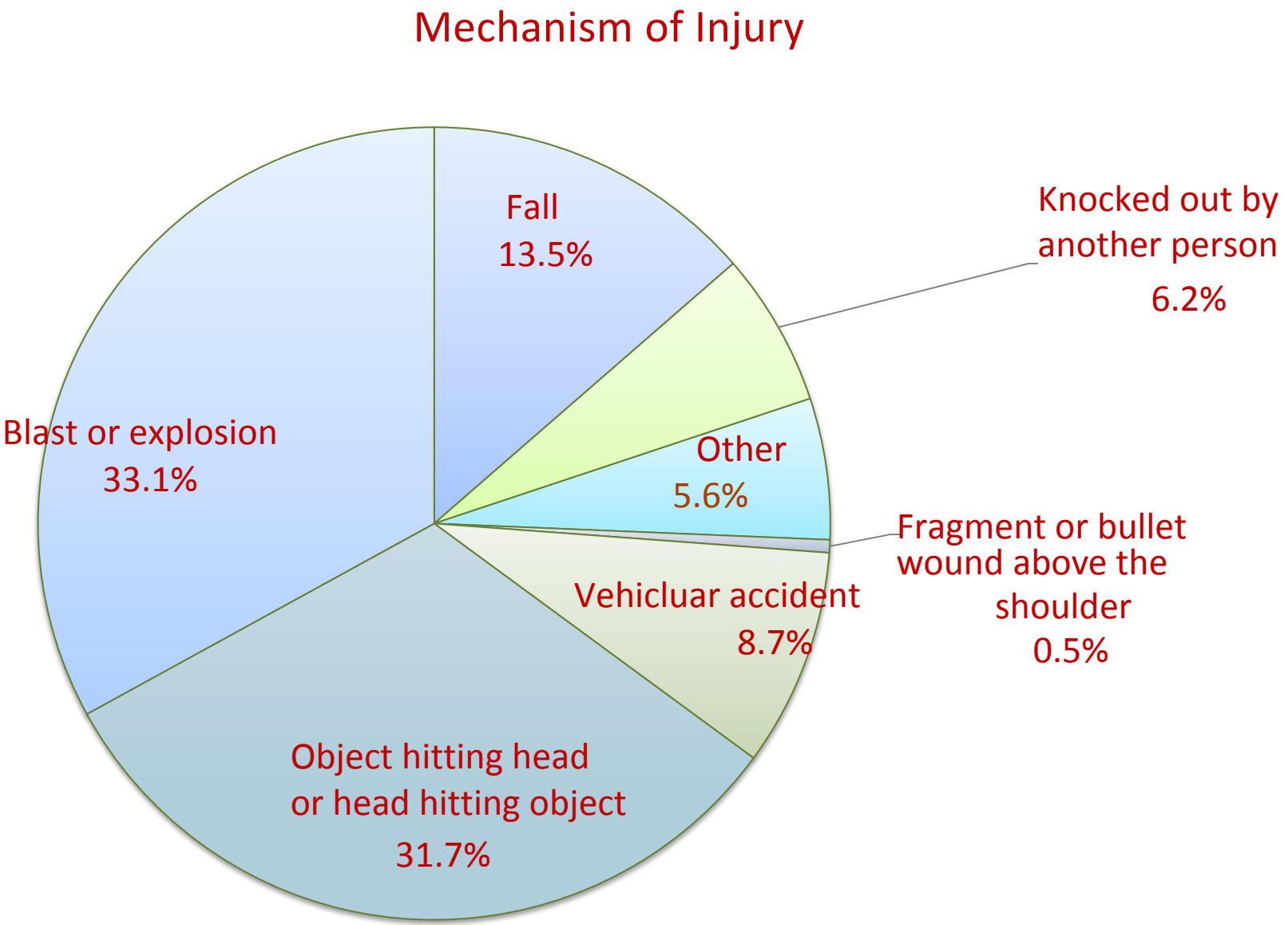
Table 1. Characteristics of Veteran Sample

Veteran Sample: TBI Numbers

Sample Demographics	n=1102 % (n) or median
Reported head injury during military service	223 (20.3)
Met criteria for probable TBI during military service	191 (17.3)
Number of head injuries during military service	
1	112 (50.2)
2	56 (25.0)
3	29 (13.2)
4	11(4.9)
≥5	15 (6.6)
Met criteria for probable TBI before military service	85 (7.8)
Number of head injuries before military service	
1	54 (64.1)
2	16 (19.5)
3	9 (10.5)
4	2 (2.4)
≥5	3 (3.8)
Of veterans with probable TBI during military service, sustained probable TBI before military service	**22 (11.6)**

Table 1. Characteristics of Veteran Sample

Mechanism of Injury during Service



Characteristics of TBI during Service

Characteristic	TBI during service, No. (%) (n = 191)
Lost consciousness	87 (45.6)
Skull fracture	7 (3.8)
Required brain surgery	1 (0.5)
Immediate symptoms following TBI	
Dazed, confused, or "seeing stars"	172 (90.0)
Dizziness	125 (65.5)
Blurred vision	104 (54.5)
Loss of coordination	96 (50.5)
Ruptured eardrums	25 (13.0)

Table 2. Characteristics of Traumatic Brain Injury During Military Service

Characteristics of TBI during Service

Characteristic	TBI during service, No. (%) (n = 191)
Severity of TBI	
Mild	167 (87.3)
Moderate/Severe	24 (12.7)
Post-traumatic amnesia	37 (19.2)
Problems beginning or getting worse after TBI	
Headaches	111 (57.9)
Memory problems/lapses	92 (48.0)
Sleep problems	83 (43.5)
Irritability	76 (39.7)
Balance problems or dizziness	56 (29.4)
Sensitivity to bright light	55 (29.1)

Table 2. Characteristics of Traumatic Brain Injury During Military Service

Risk Factors for TBI during Service

Multivariate analysis	Risk of TBI during military service		
	OR	CI	p
Male gender	1.254	0.731 – 2.149	0.4111
Caucasian race	1.148	0.794 – 1.658	0.4632
Post-high school education	0.921	0.615 – 1.379	0.6893
Multiple deployments	1.464	0.953 – 2.248	0.8160
Deployment > 1 year	1.312	0.846 – 2.036	0.2250
Officer rank	0.502	0.296 – 0.852	0.0107
High combat exposure	2.877	1.971 – 4.200	<0.0001
TBI before military service	2.257	1.288 – 3.956	0.0045

Table 3. Multivariate Analysis: Individuals Who Sustained TBI During Military Service (N=1,102)

Outcomes: Single vs. Multiple Head Injuries

Outcome	Single Head Injury		Multiple head injuries		Analysis	
	%	n	%	n	χ^2	p
PTSD	28.0%	26	62.3%	62	22.57	<0.0001
Depression	44.5%	41	61.7%	61	5.41	0.0200
Suicidal ideation	17.3%	16	31.4%	31	5.14	0.0234
Violence	16.9%	16	19.8%	20	0.27	0.6051
Back pain	54.0%	50	74.8%	74	9.09	0.0026
Headache	59.8%	55	63.8%	63	0.33	0.5884
Any pain	56.5%	52	75.4%	74	7.55	0.0060

Table 4. Outcomes of Single Compared With Multiple Head Injuries During Military Service

Discussion

TBI Mechanisms

- Results consistent with AFHSC 2013 report
- Most common mechanism was blast/explosion (33%), though object hitting head/head hitting object was close second (31%)
  - Blast/Explosion accounts for 1/3rd of injuries
  - Supports allocating resources to preventing other types of TBIs as well
  - Future research should look at differences and commonalities between blast and non-blast TBI

Screening for TBI

- 233 veterans reported head injury during military service
- 191 veterans met criteria for probable TBI during military service
  - 14.3% of those reporting head injury did not meet criteria for probable TBI
  - Clinicians may find false positives if only asking veteran patients about ”head injuries”
  - Supports use of VA/DoD criteria for TBI screening

Risk Factors for Sustaining Military TBI

- Enlisted rank
- High combat exposure
- *Sustaining TBI prior to military service*
  - Veterans had double the odds of sustaining TBI during service if they sustained TBI prior to service
  - Supports comprehensive screening for pre-military TBI in Standards of Medical Fitness

Outcomes

- Nearly half of veterans reported more than one head injury during military service
- Veterans with more than one head injury had statistically significant higher rates of PTSD, depression, suicidal ideation, and pain.
- Implications for policy and practice
  - Clinicians should inquire about number of TBIs as well as type.

Limitations

- Self-reported data may be affected by incomplete or inaccurate recall
- Only collected data on whether the veterans' worst head injury met criteria for TBI
  - Could not compare single vs. multiple TBI
- Likely other variables that may predict military TBI that need to be explored

Questions?

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