

The Relationship between TBI and Rates of Chronic Symptomatic Illness in Gulf War Veterans

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Veterans Health Administration
**Research
Development**
Improving Veterans' Lives → www.research.va.gov



OPERATIONS DESERT SHIELD/DESERT STORM

7 August 1990 – 28 February 1991



The Army's response to the Iraqi invasion of Kuwait was to deploy rapidly to defend Saudi Arabia and deter Iraq from further aggression. Within days of President Bush's deployment order, thousands of soldiers and tons of equipment began arriving in the Middle East in Operation Desert Shield. A base of aerial support and combat service support operations under the control of the 3rd Support Command took and operated the logistical base required for this very large force. At the start of the ground offensive, the men and women of the support command were supplying 800,000 soldiers in 12,000 tactical combat vehicles and over 10,000 tactical vehicles. Their efforts were critical to the overwhelming success of Operation Desert Storm.



- OPERATION DESERT STORM**
24-28 February 1991
- 1st Air Force, Phase 1
 - 1st Air Force, Phase 2
 - 1st Air Force, Phase 3
 - 1st Air Force, Phase 4

CHRONOLOGY

- 2 Aug 90 Iraq invades Kuwait. U.S. Secretary of Defense announces the invasion. President Bush has made his decision.
- 6 Aug 90 U.S. authorizes economic sanctions against Iraq.
- 7 Aug 90 Operation Desert Shield begins.
- 8 Nov 90 President Bush announces additional deployment to the region. The total number of U.S. troops sent to serve in the Gulf area totals more than 500,000.
- 20 Nov 90 U.S. Secretary of Defense Powell authorizes the use of "all necessary means" to get Iraq's troops out of Kuwait if they don't leave by 21 Jan 91.
- 12 Jan 91 The Congress grants President Bush the authority to use military force.
- 16 Jan 91 U.S. deadline for Iraq withdrawal from Kuwait passes.
- 18 Jan 91 U.S. and coalition forces launch an attack on Iraq and Kuwait.
- 24 Feb 91 U.S. and coalition forces launch an all-out ground attack designed to drive Iraq forces from Kuwait.
- 28 Feb 91 After 28 hours the ground war is ended. Iraq agrees to a temporary ceasefire.
- 3 Mar 91 Iraq accepts conditions for permanent ceasefire.



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The Army's response to the Iraqi invasion of Kuwait was to deploy rapidly to defend Saudi Arabia and deter Iraq from further aggression. Within days of President Bush's deployment order, thousands of soldiers and tons of equipment began arriving in the Middle East to Operation Desert Shield. A base of aerial support and combat service support operations under the control of the 3rd Support Command built and operated the logistical base required for this very large force. At the start of the ground offensive, the men and women of the support command were supplying 300,000 soldiers in 12,000 combat vehicles and over 10,000 aircraft vehicles. Their efforts were critical to the overwhelming success of Operation Desert Storm.



Timeline:

Aug. 2, 1990 – Iraq invaded Kuwait

Jan. 16, 1991 – Air strikes began

Feb. 24, 1991 – Ground combat began

Feb. 28, 1991 – Cease fire declared



CHRONOLOGY

- 2 Aug 90 Iraq invades Kuwait. U.N. Security Council condemns the invasion. President Bush has made his first speech.
- 6 Aug 90 U.N. authorizes economic sanctions against Iraq.
- 7 Aug 90 Operation Desert Shield begins.
- 8 Nov 90 President Bush announces additional deployment to the region. The total number of U.S. troops slated to arrive in the Gulf over totals more than 500,000.
- 20 Nov 90 U.N. Security Council Resolution 678 authorizes the use of "all necessary means" to get Iraq back out of Kuwait if Iraq doesn't leave by 21 Jan 91.
- 12 Jan 91 The Congress grants President Bush the authority to use military force.
- 16 Jan 91 U.S. deadline for Iraq withdrawal from Kuwait passes.
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- 3 Mar 91 Iraq accepts conditions for permanent ceasefire.

- **Gulf War initially declared a decisive victory**



Gulf War Syndrome

- Fatigue
- Headaches
- Widespread pain
- Memory and concentration problems
- Sleep disturbance
- Respiratory problems
- Gastrointestinal problems
- Unusual skin rashes



~~Gulf War Syndrome~~

Gulf War Illness

Chronic
Multisymptom
Illness



Poll Question #1

What is your primary role at the VA?

- student, trainee, or fellow
 - clinician
 - researcher
 - administrator, manager or policy-maker
 - other
-

Poll Question #2

What is your research experience?

- none
 - collaborate on research
 - conduct research myself
-

Poll Question #3

Do you have contact with GW Veterans through your work at the VA?

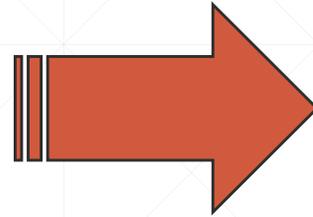
- Yes
 - No
-

25 to 44%

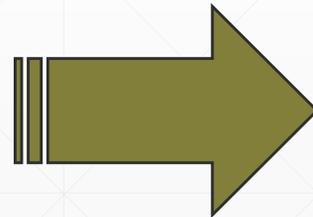
Gulf War Illness

Chronic
Multisymptom
Illness





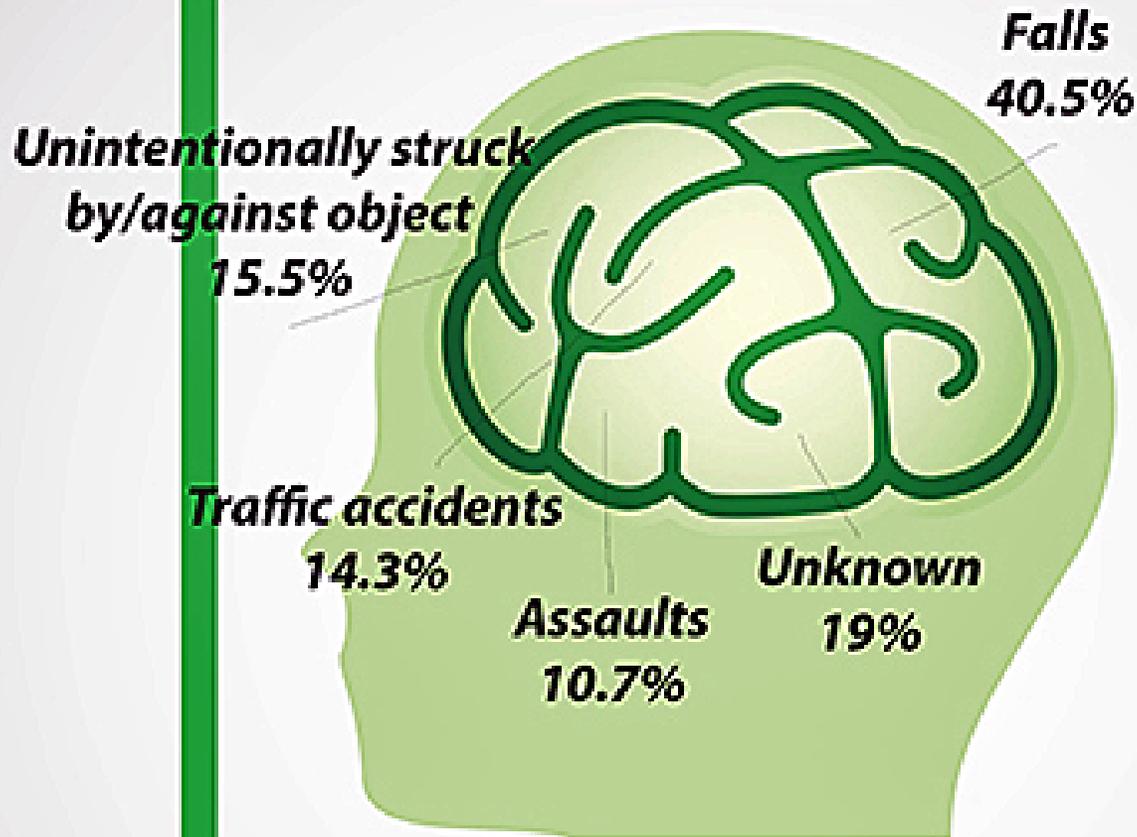
Gulf War Illness (GWI)
Chronic Multisymptom Illness (CMI)



Traumatic Brain Injury (TBI)

**More common
than we think!**

Traumatic Brain Injury Causes



**BRAIN INJURY
AWARENESS MONTH**

MARCH

GW I / C M I



T B I

GW/CMI

mTBI

- Fatigue
- Headaches
- Widespread pain
- Memory and concentration problems
- Sleep disturbance
- Respiratory problems
- Gastrointestinal problems
- Unusual skin rashes



***Oil Fires: Over 600 burning wells
Feb-Nov 1991***



Exposure to chemical weapons



***PB: Pyridostigmine Bromide
(anti-nerve gas pills)***

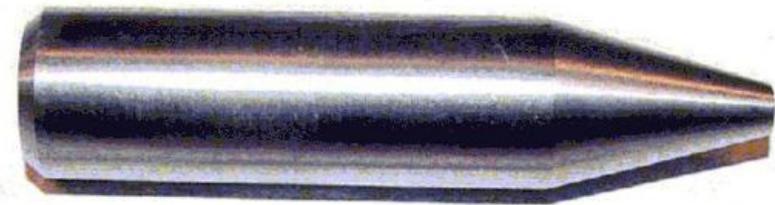


21 TABLETS
PYRIDOSTIGMINE BROMIDE USP 30 MG
(Nerve Agent Pre-Treatment Tablets)
NSN 6505-01-178-7903

Directions for use:
COMMENCE TAKING ONLY WHEN ORDERED BY YOUR COMMANDER
TAKE ONE EVERY 8 HOURS
IT IS DANGEROUS TO EXCEED THE STATED DOSE

LOT NO.:

Munitions containing depleted uranium



Multiple vaccinations



28 years after Desert Storm, what have we learned about Gulf War Illness?

- Etiology is complex
- Multiple studies have implicated anti-nerve gas pills (PB) and excess use of pesticides.

PB and many of the pesticides used in the GW are acetylcholinesterase inhibitors, which is toxic to the central nervous system (i.e., brain).



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(anti-nerve gas pills)

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PERMETHRIN TREATED UNIFORM



DEET APPLIED TO SKIN

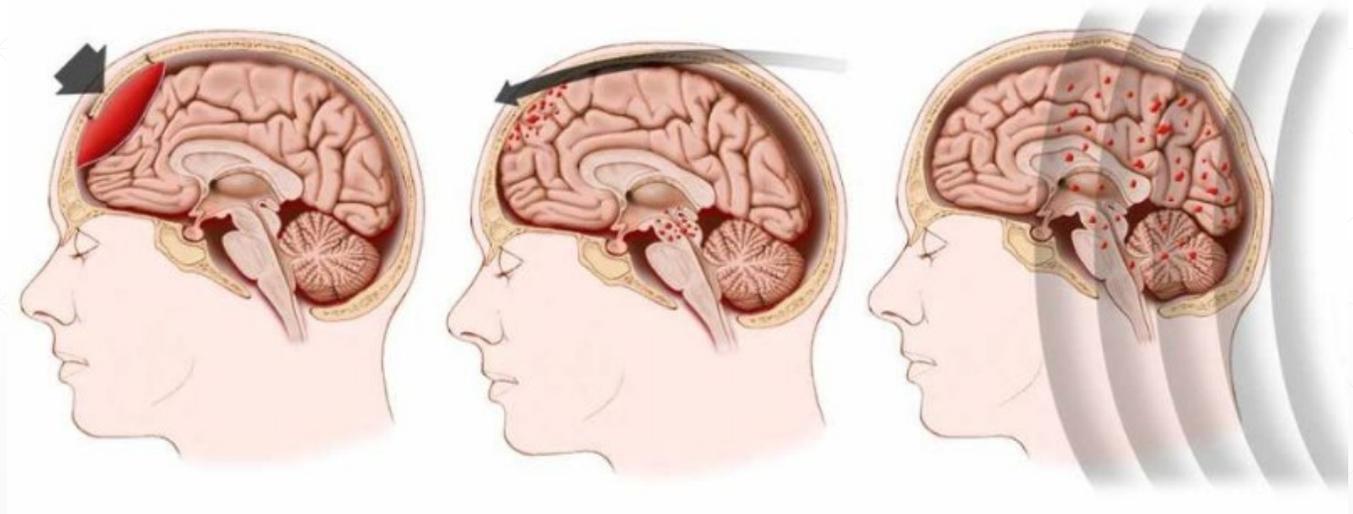


PERMETHRIN-TREATED BED NET

PB and many of the pesticides used in the GW are acetylcholinesterase inhibitors, which is toxic to the central nervous system (i.e., brain).



In TBI, there is physical injury to the brain.

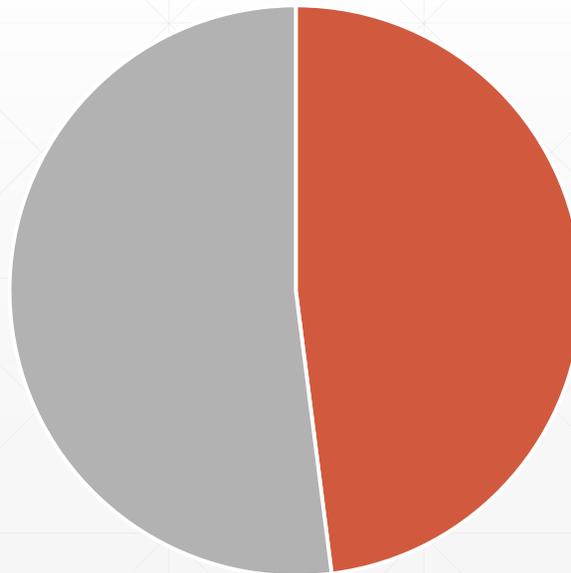


How common is TBI among GW Veterans?

MILITARY MEDICINE, 183, 11/12:e571, 2018

The Relationship Between Traumatic Brain Injury and Rates of Chronic Symptomatic Illness in 202 Gulf War Veterans

Linda L. Chao, PhD†‡*



Ohio State University TBI Identification Method — Interview Form

Step 1

Ask questions 1-5 below. Record the cause of each reported injury and any details provided spontaneously in the chart at the bottom of this page. You do not need to ask further about loss of consciousness or other injury details during this step.

Step 2

Interviewer instruction: If the answer is “yes” to any of the questions in Step 1 ask the following additional questions about each reported injury and add details to the chart below.

Step 3

Interviewer instruction: Ask the following questions to help identify a history that may include multiple mild TBIs and complete the chart below.

- John Corrigan & Jennifer Bogner (2007)
 - Standardized procedure for eliciting lifetime history of TBI
 - 3-5 minute structured interview
 - Asks about injury to head or neck
 - Asks when injury occurred, whether there was loss of or altered (e.g., feeling dizzy or dazed, memory gaps) consciousness

Experience

No head/neck injury OR
Never hospitalized or treated for head/neck injury
OR
Never been near blast or explosion

TBI

Improbable

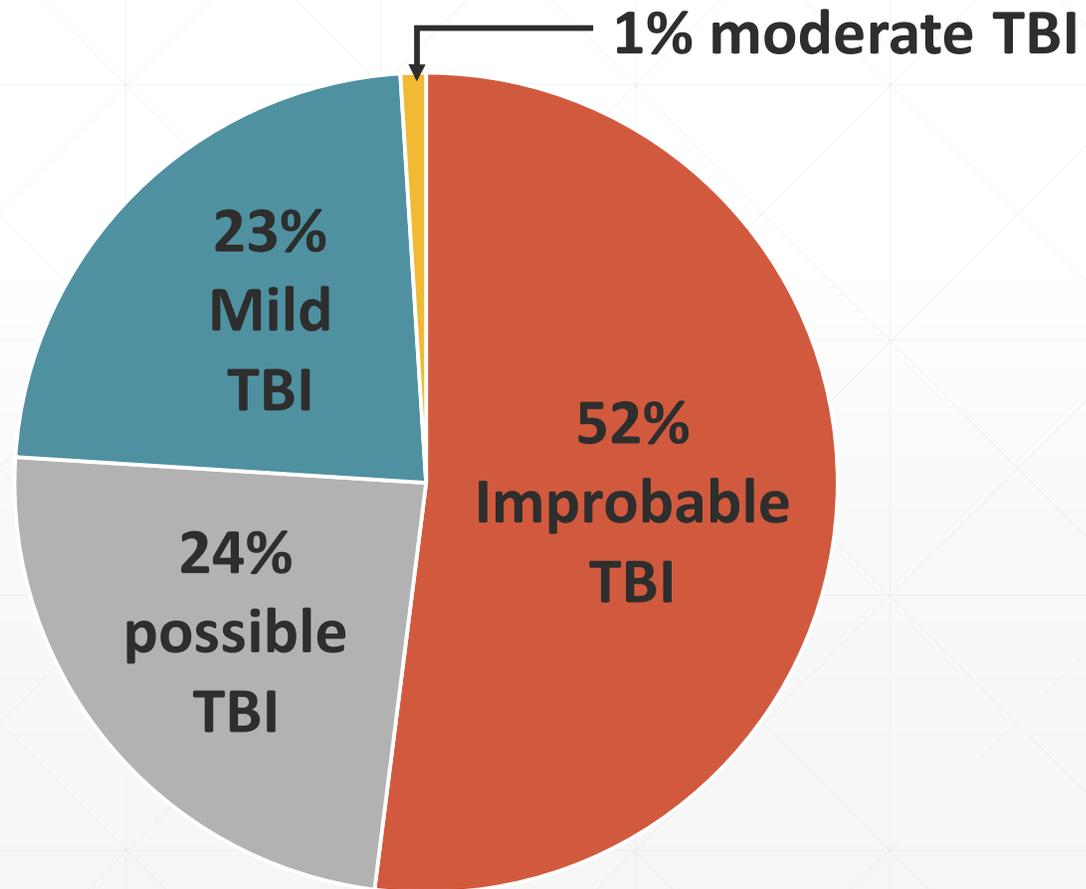
Experience	TBI
No head/neck injury OR Never hospitalized or treated for head/neck injury OR Never been near blast or explosion	Improbable
Had head/neck injury OR was near blast or explosion AND experienced altered consciousness (e.g., dizzy, dazed, memory lapse)	Possible

Experience	TBI
No head/neck injury OR Never hospitalized or treated for head/neck injury OR Never been near blast or explosion	Improbable
Had head/neck injury OR was near blast or explosion AND experienced altered consciousness (e.g., dizzy, dazed, memory lapse)	Possible
Had head/neck injury OR was near blast or explosion AND experienced loss of consciousness (LOC) < 30 minutes	Mild

Experience	TBI
No head/neck injury OR Never hospitalized or treated for head/neck injury OR Never been near blast or explosion	Improbable
Had head/neck injury OR was near blast or explosion AND experienced altered consciousness (e.g., dizzy, dazed, memory lapse)	Possible
Had head/neck injury OR was near blast or explosion AND experienced loss of consciousness (LOC) < 30 minutes	Mild
Had head/neck injury OR was near blast or explosion AND experienced LOC between 30 minutes to 24 hours	Moderate

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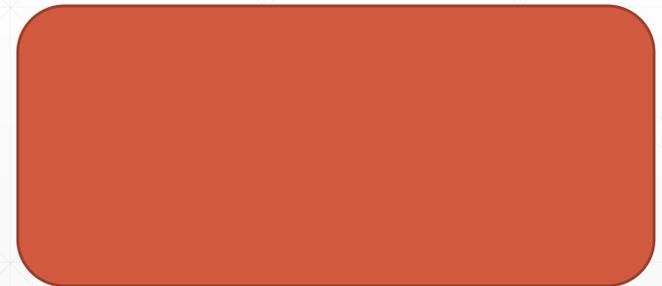
GW / CMI



TBI

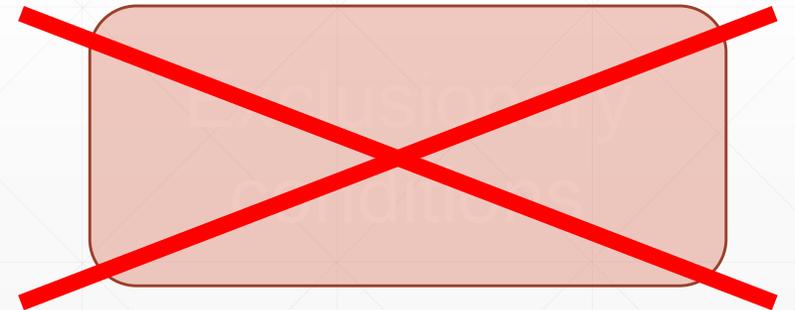
Kansas Gulf War Illness (GWI)

- Fatigue
- Widespread pain
- Cognitive/Mood disturbances
- Neurological symptoms
- Skin rashes
- Gastrointestinal problems
- Intestinal problems

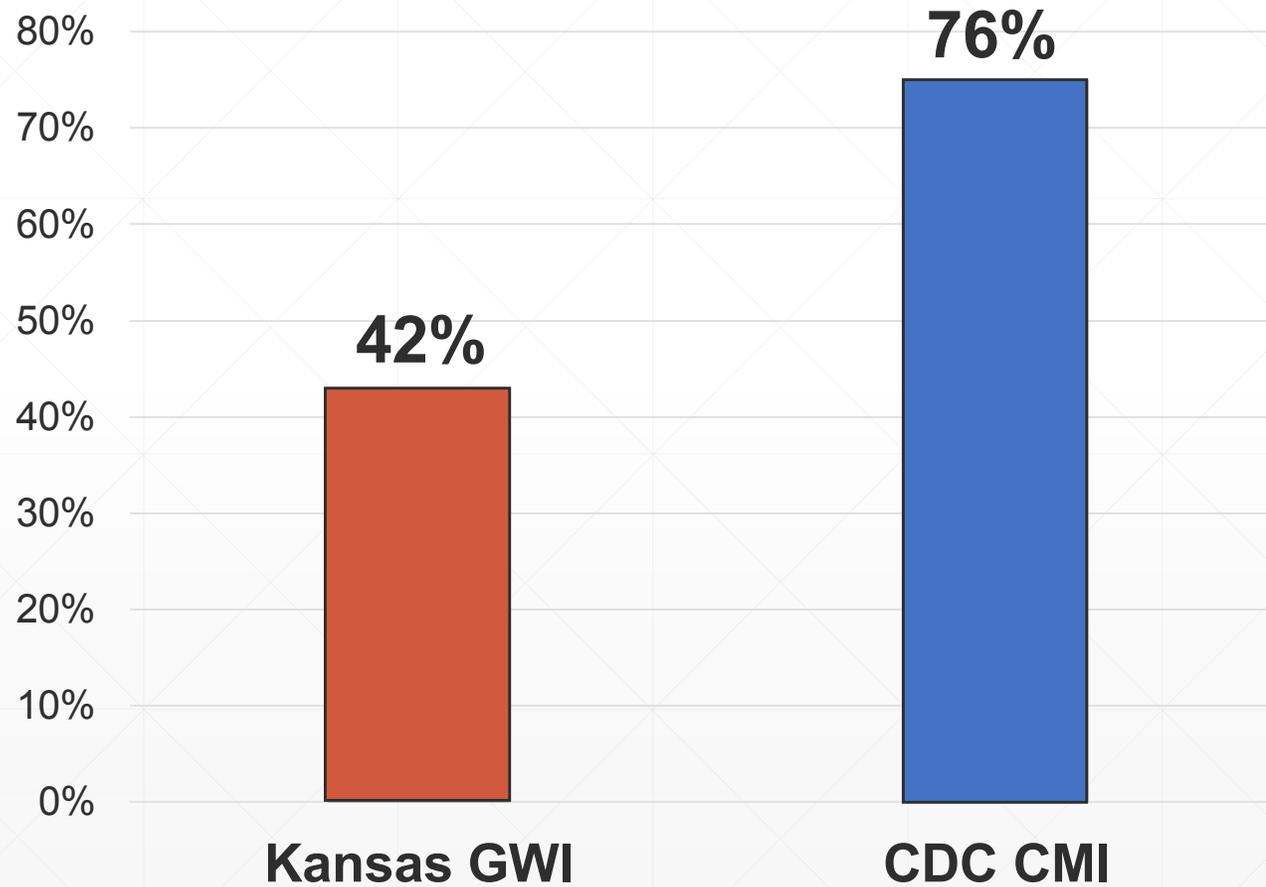


CDC Chronic Multisymptom Illness (CMI)

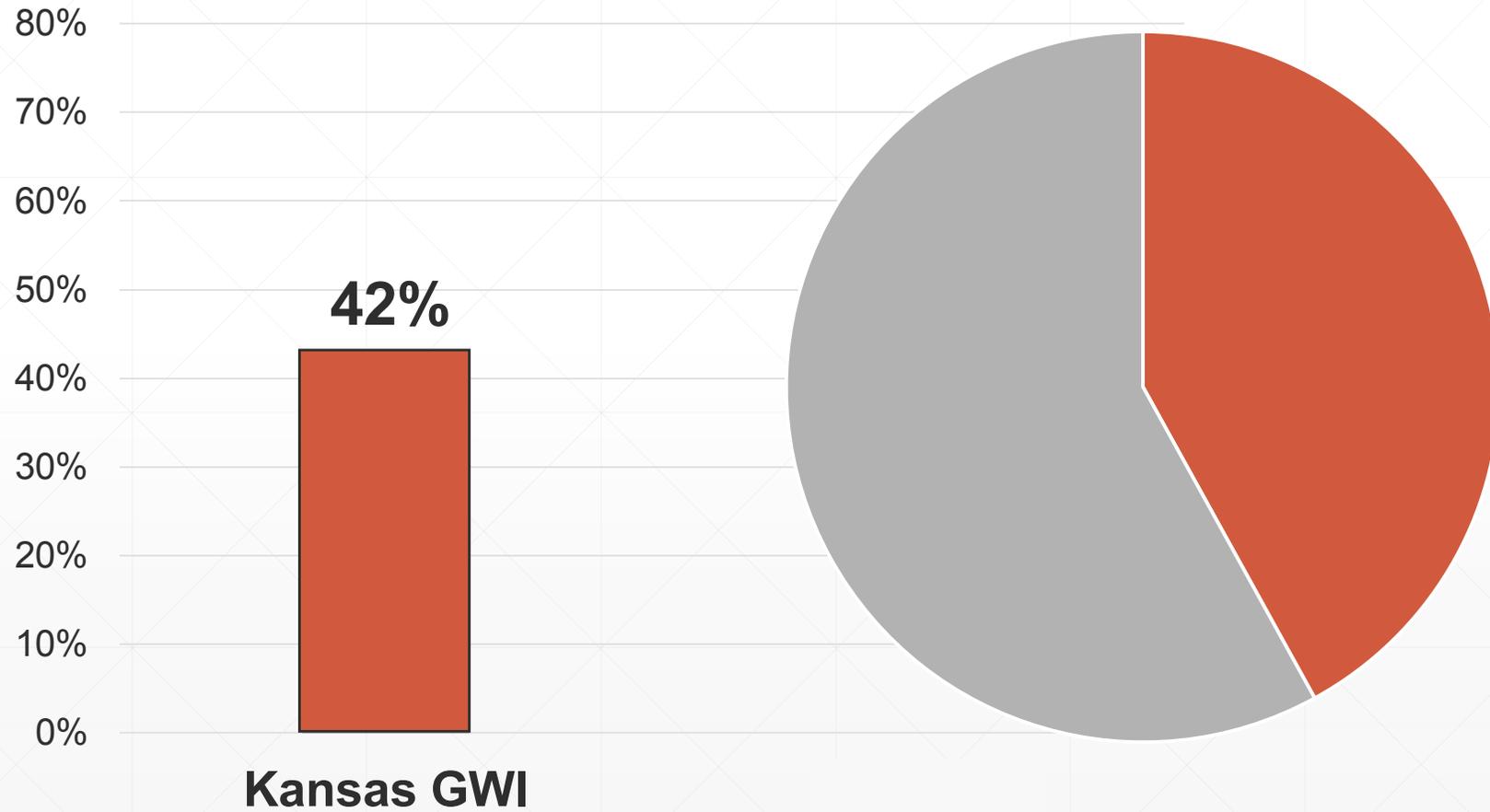
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- Gastrointestinal problems
- Intestinal problems



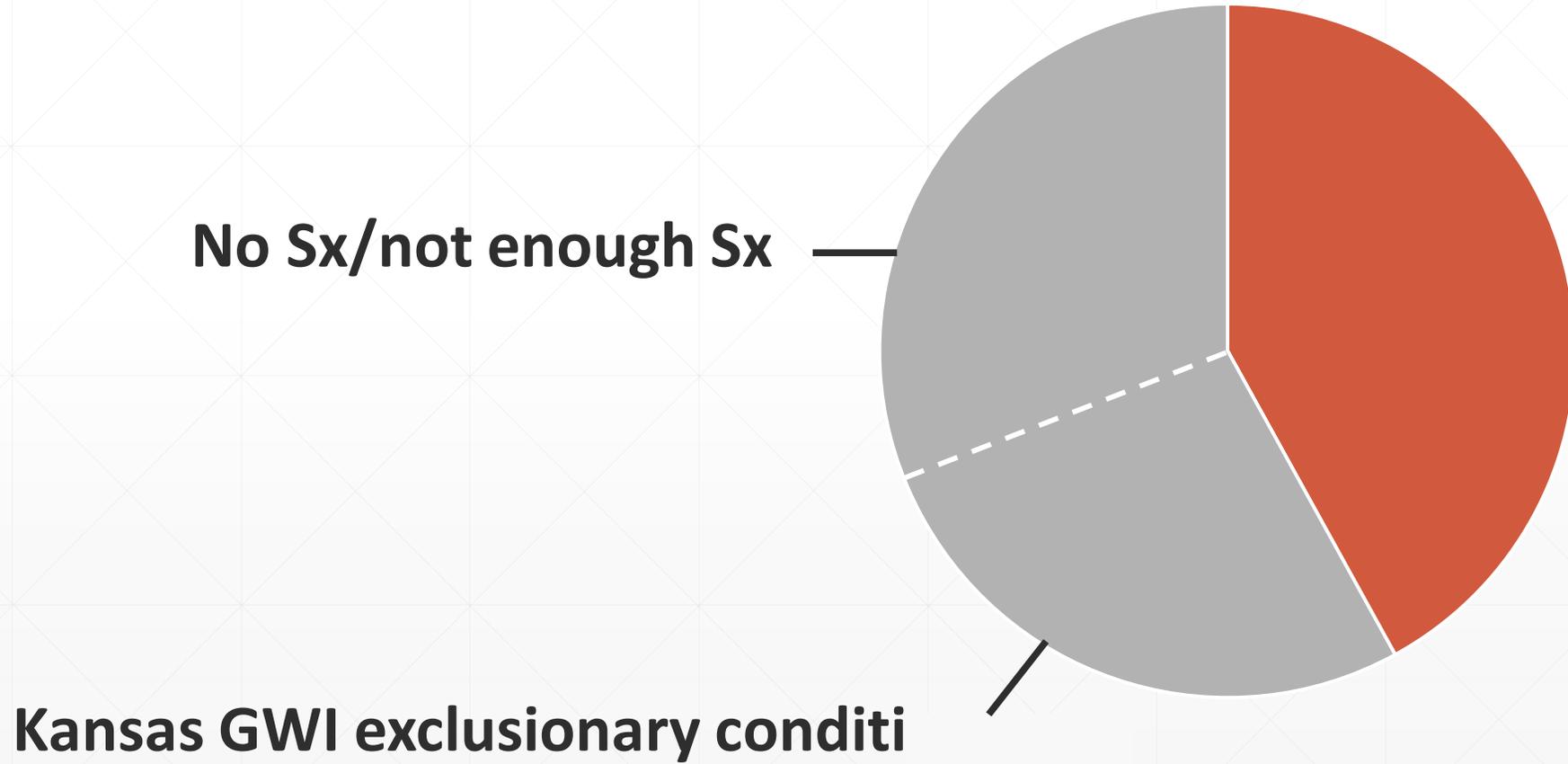
Kansas GWI versus CDC CMI



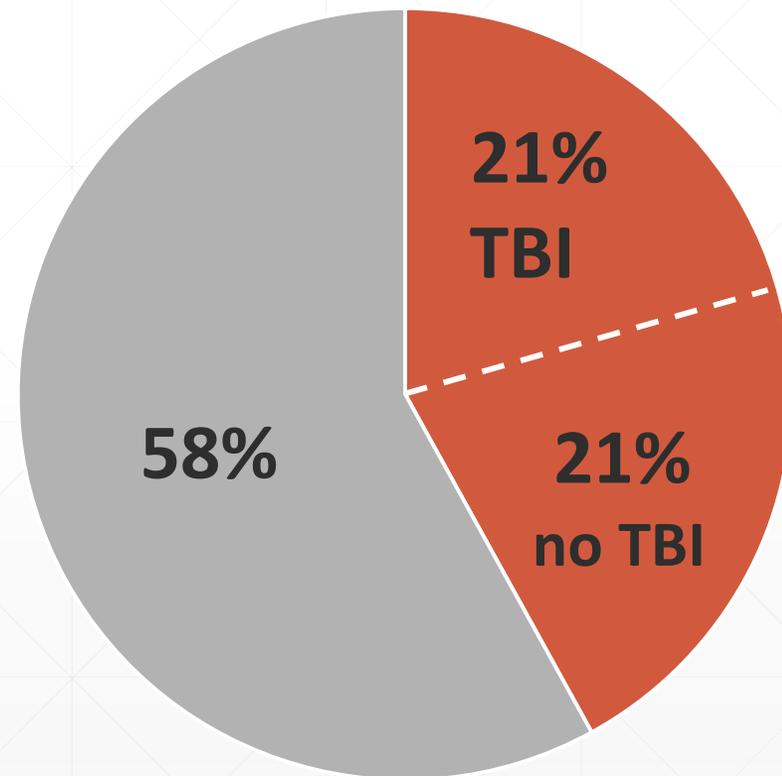
Kansas GWI



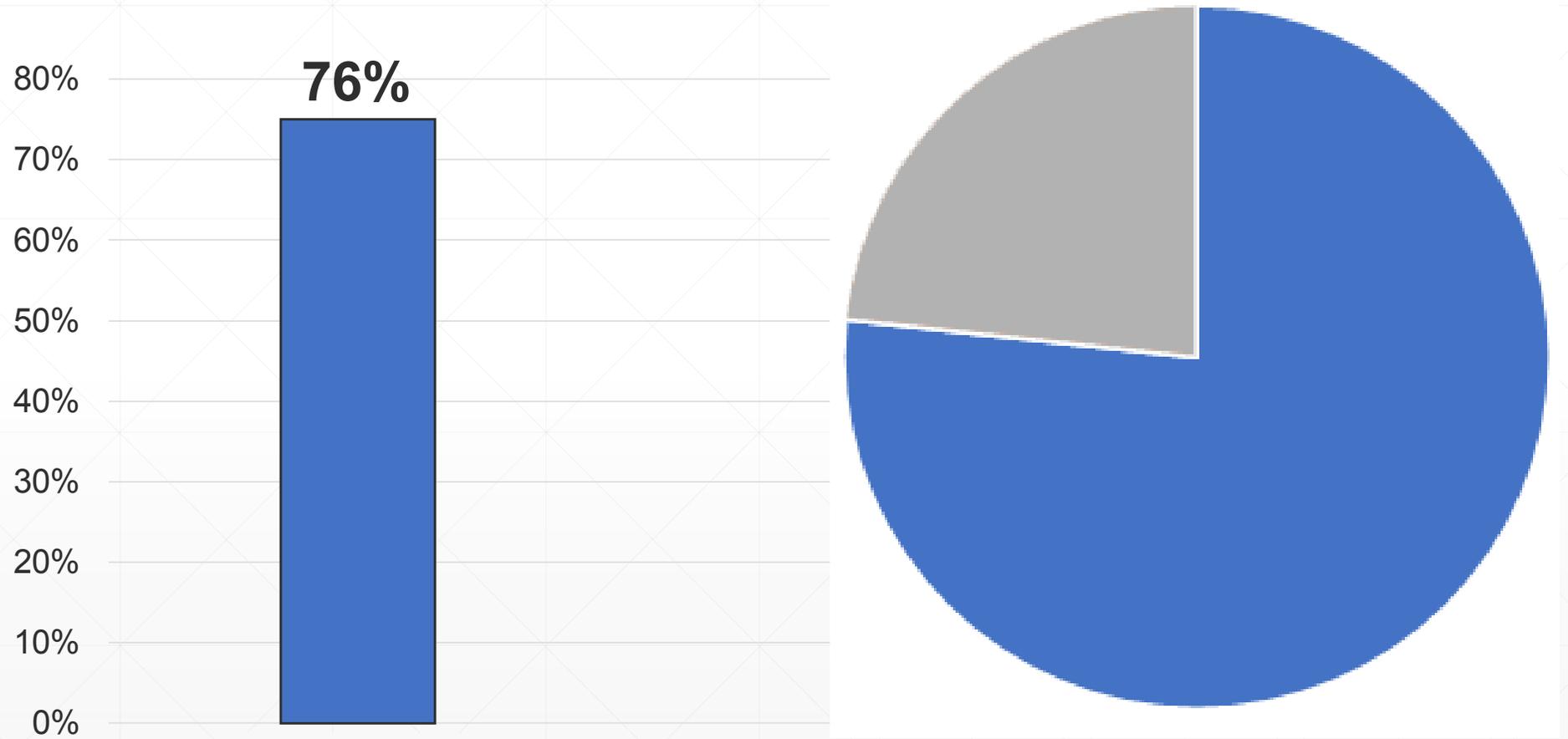
Kansas GWI



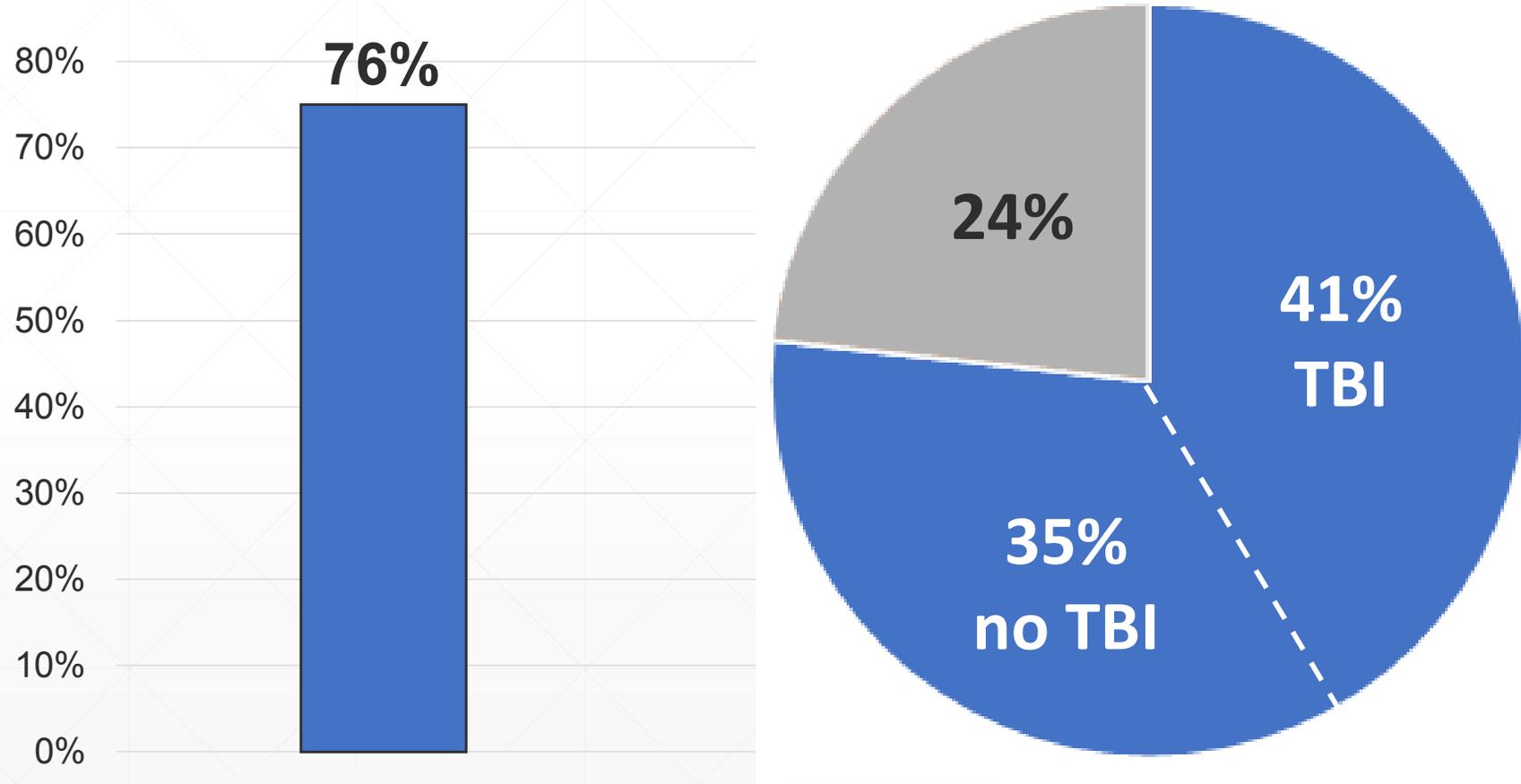
Kansas Gulf War Illness



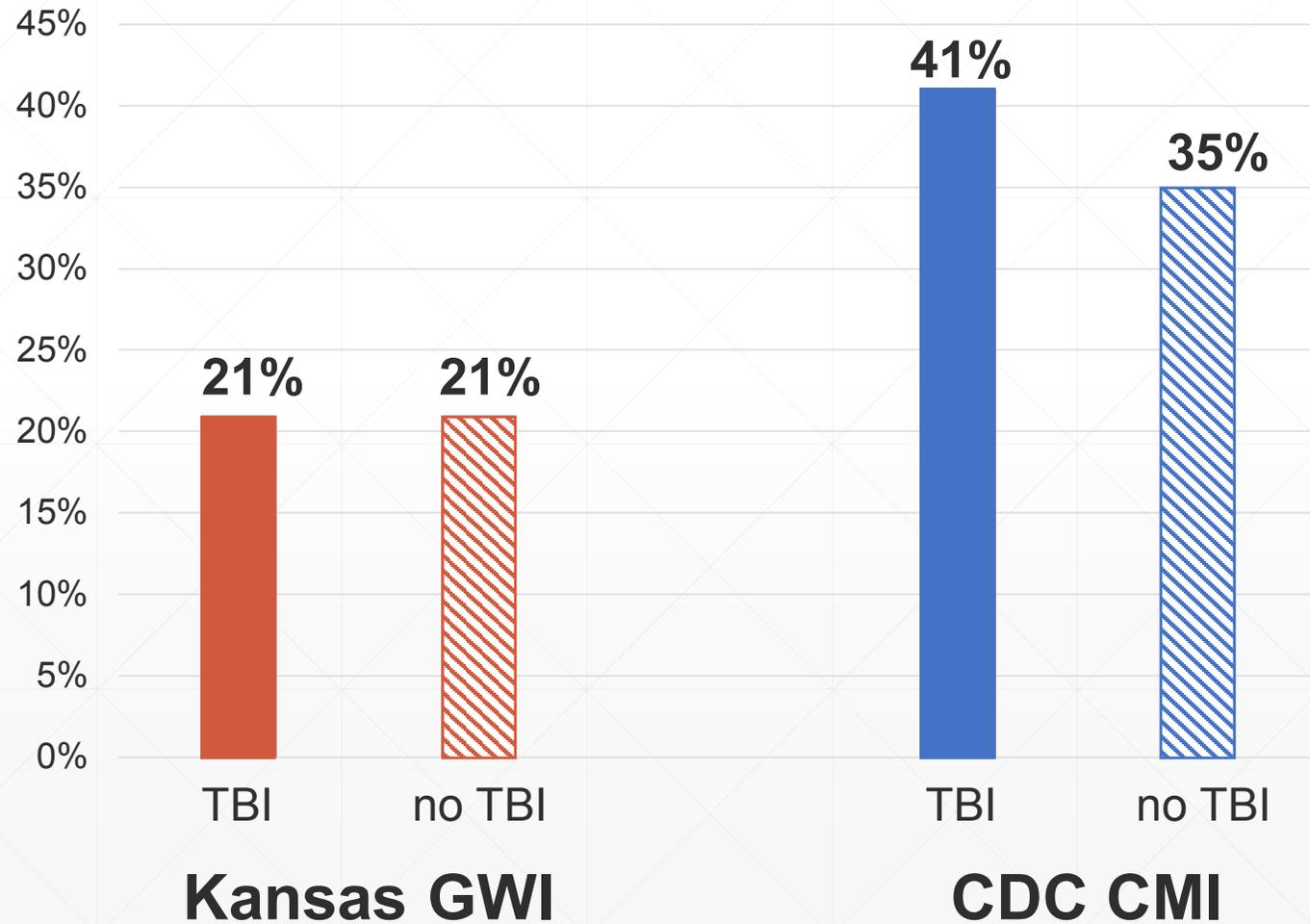
CDC CMI



CDC CMI



Kansas GWI versus CDC CMI



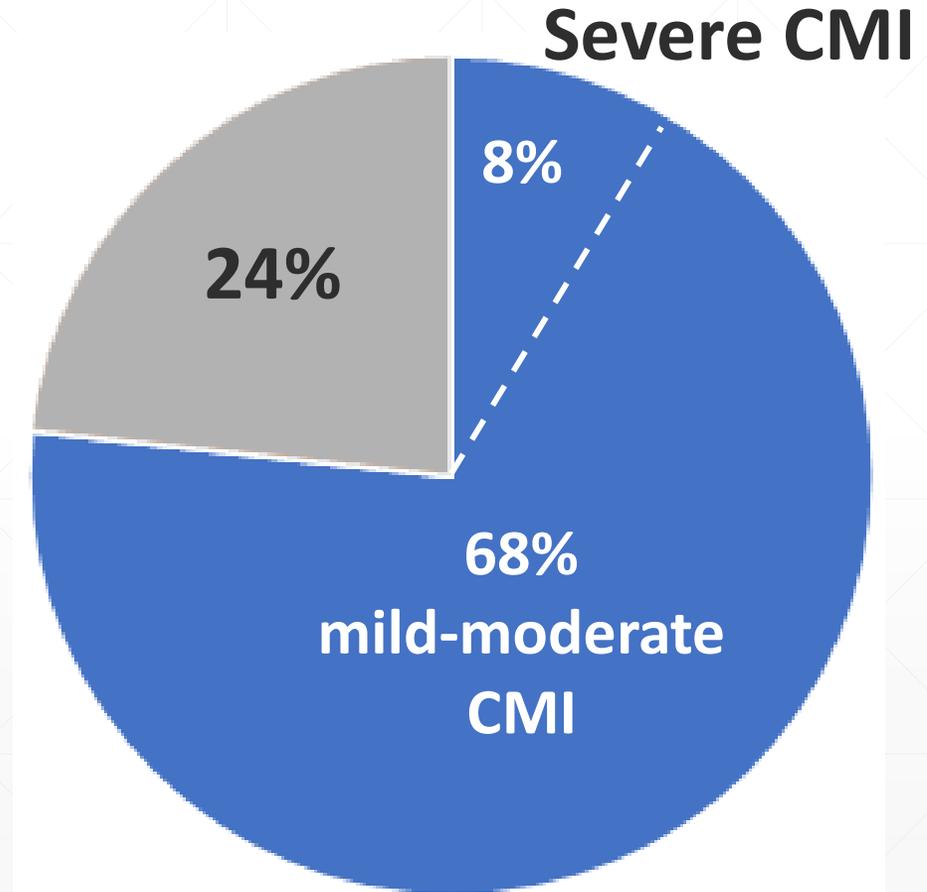
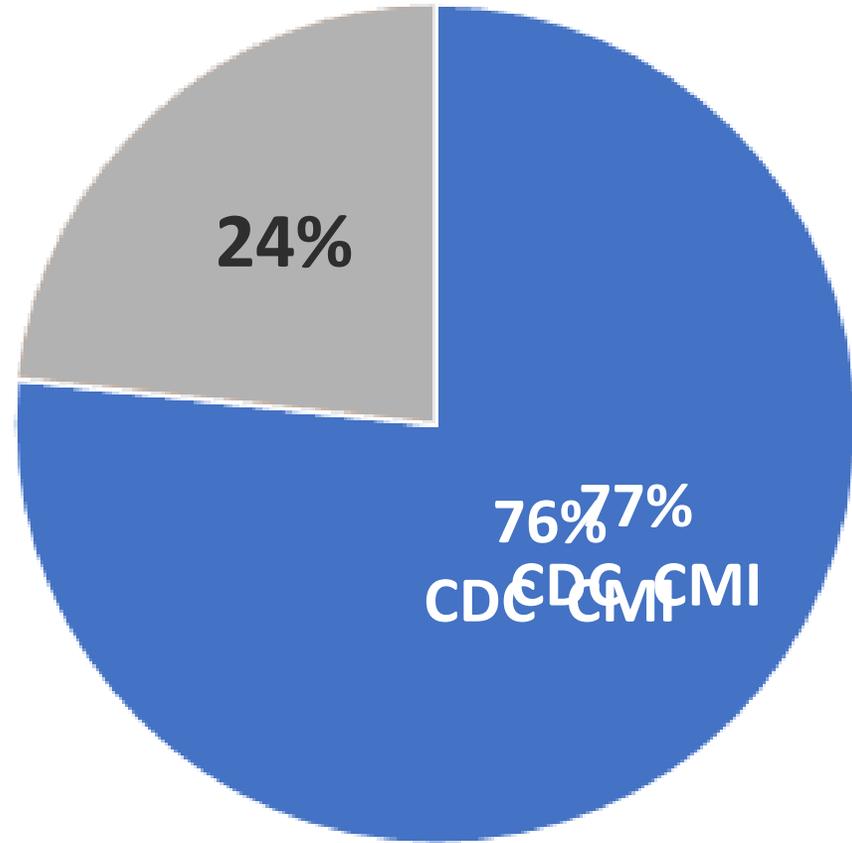
CDC Chronic Multisymptom Illness (CMI)

- Fatigue
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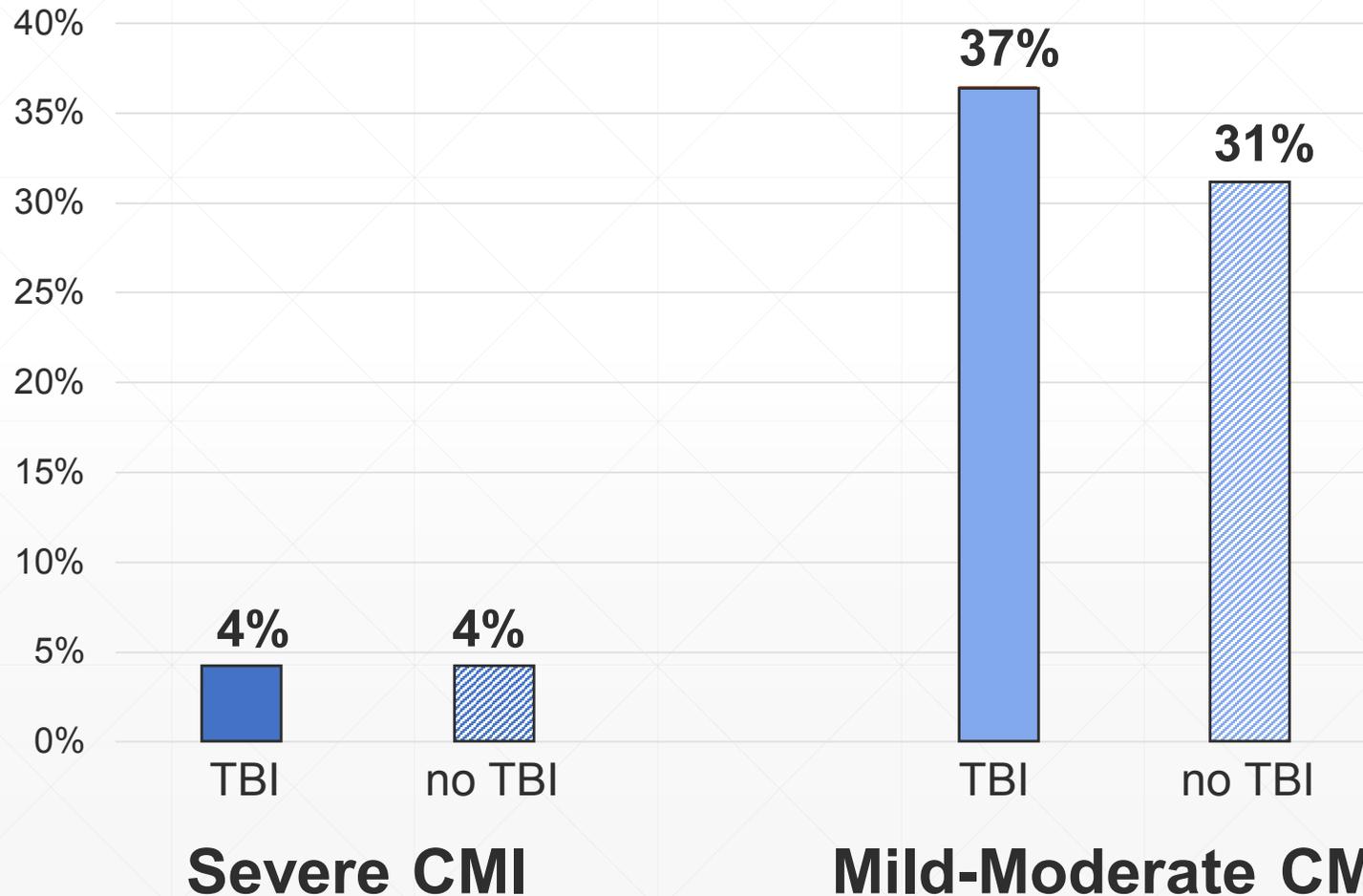
Symptoms in at least
2 of 3 domains

Further categorized
by symptom severity

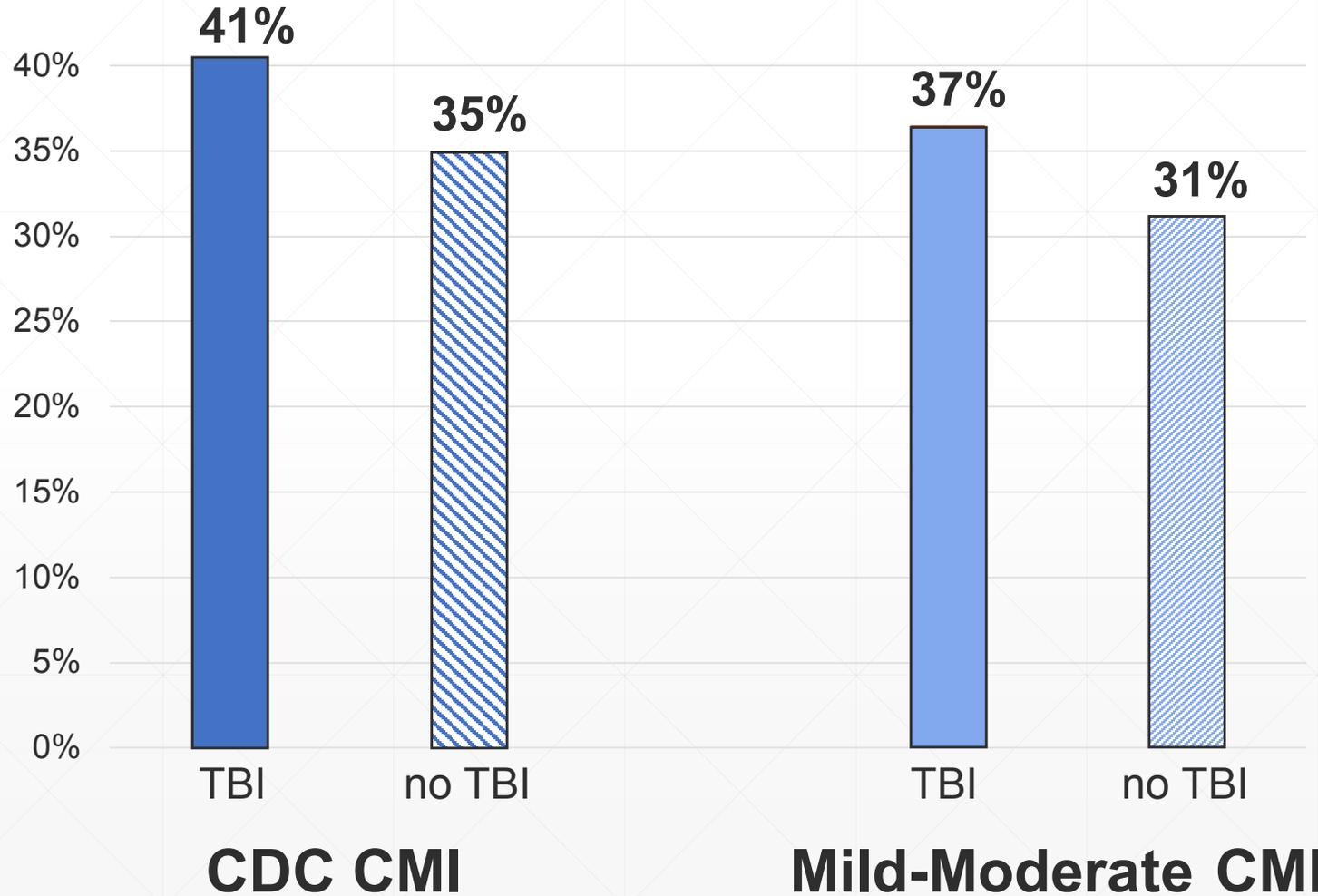
CDC CMI



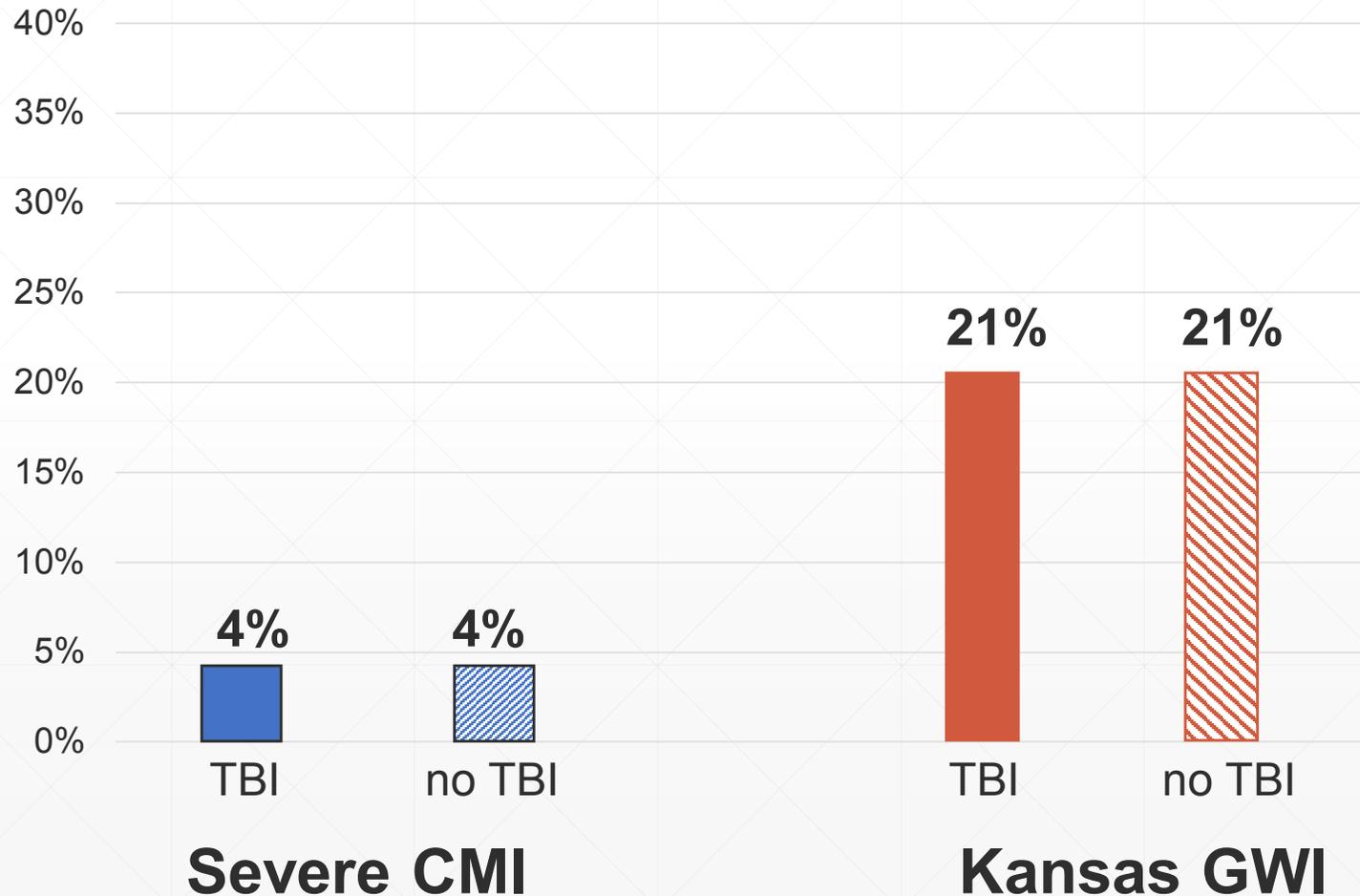
Relationship between CDC CMI and TBI



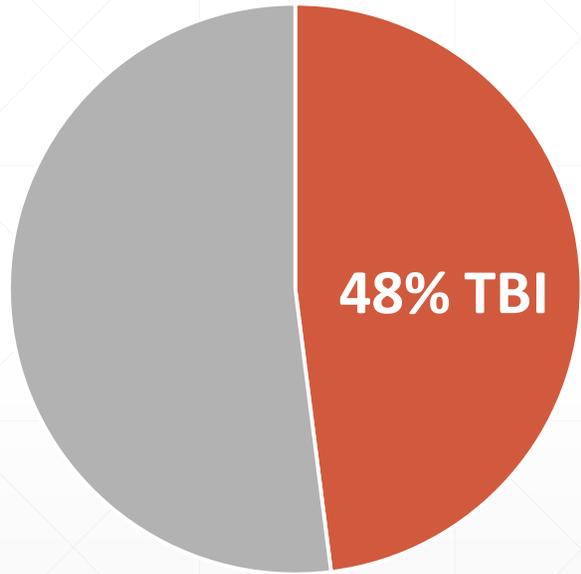
Relationship between symptomatic illness and TBI



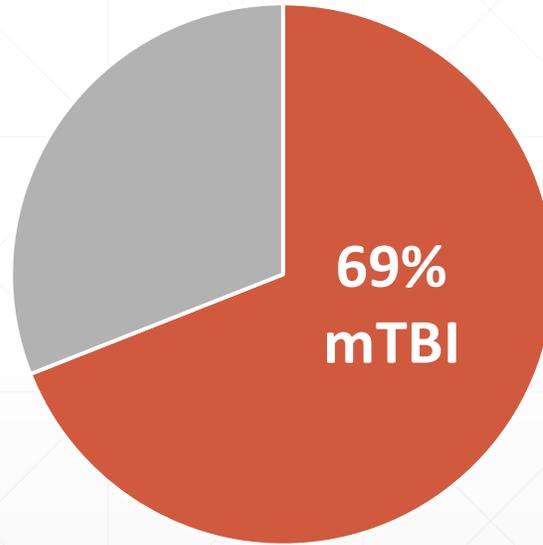
Relationship between symptomatic illness and TBI



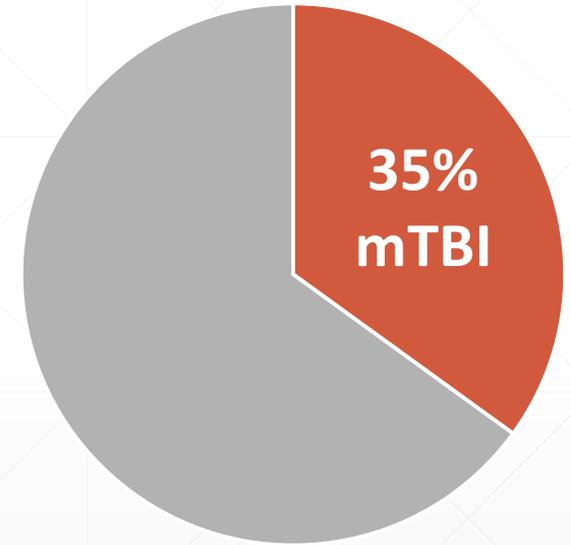
How common in TBI among GW Veterans?



Chao, 2018



Yee et al, 2017



Janulewicz et al, 2018

Different GW Veteran samples:

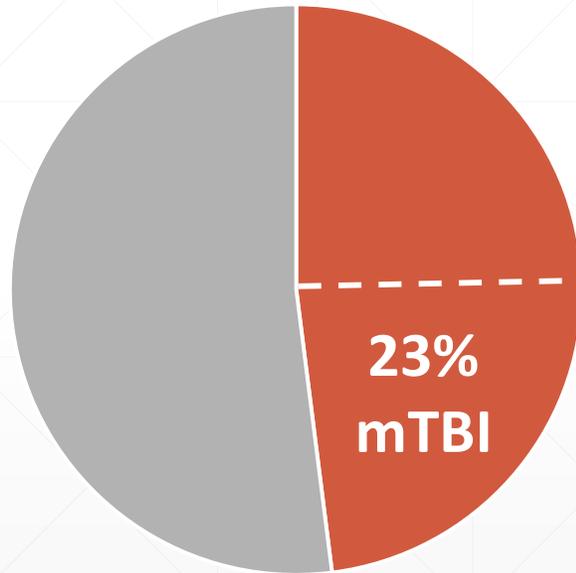
Study	Sample
Chao, 2018	<ul style="list-style-type: none">• GWVs recruited for brain imaging study• moderate-severe TBI exclusionary• 18% female
Yee et al., 2017	<ul style="list-style-type: none">• GWVs from Fort Devens Cohort• All male
Janulewicz et al., 2018	<ul style="list-style-type: none">• GWVs from GWI Consortium• 15% female

Different method of assessing TBI:

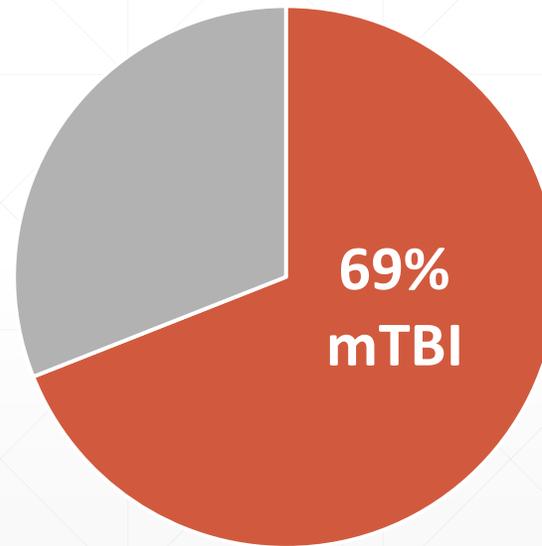
Some people have the misconception that mild TBI (also known as ‘concussion’) only happens when you lose consciousness after being hit on the head or when the symptoms last for a long time. However, a mild TBI occurs anytime you have an impact to the head that causes symptoms for any amount of time (e.g., seconds or longer). These symptoms include: sensitivity to light or noise, headache, dizziness, balance problems, nausea, vomiting, trouble sleeping, fatigue, confusion, difficulty remembering, difficulty concentrating, or loss of consciousness.

How common is TBI among GW Veterans?

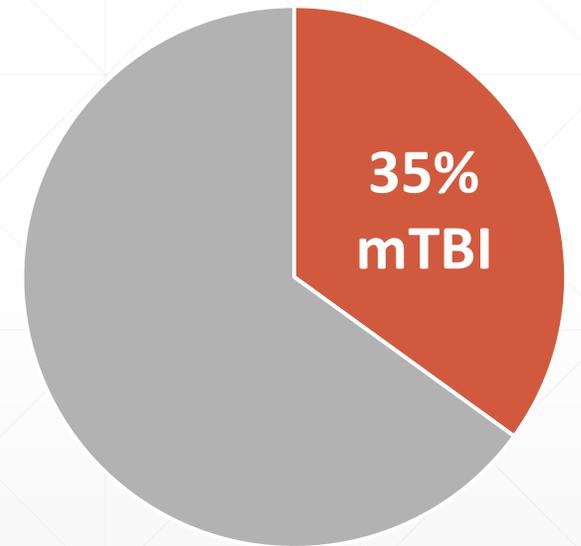
Chao, 2018



Yee et al, 2017



Janulewicz et al, 2018



How many TBIs GW Veterans had?

Study	none	1 mTBI	2 mTBI	3 mTBI
Yee et al., 2017	31%	11%	11%	46%

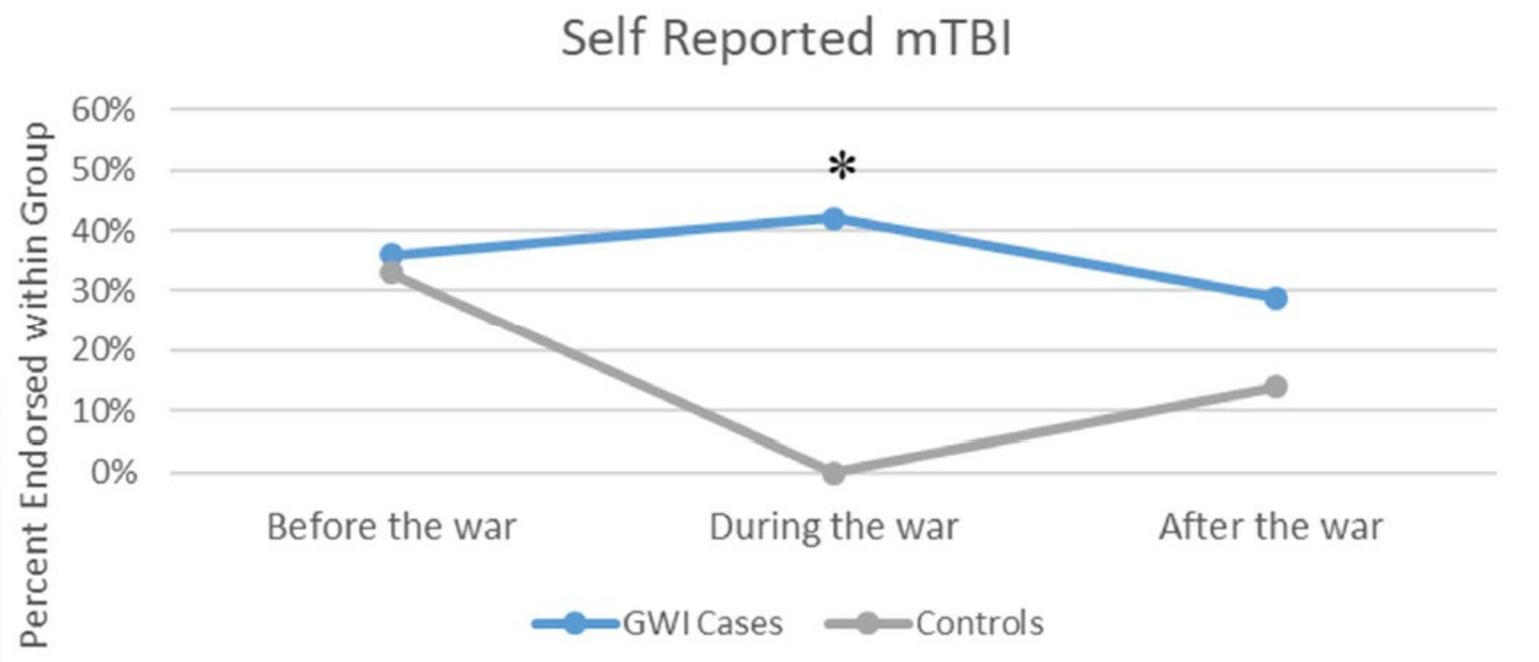
Yee et al. found that more mTBIs were associated with higher rates of chronic multisymptom illness

	none	1 mTBI	2 mTBI	3 mTBI
% of sample	31%	11%	11%	46%
Kansas GWI	29%	27%	28%	49%
CDC CMI	77%	79%	79%	91%

When did the TBIs occur?

Study	Before GW	During GW	After GW
Janulewicz et al., 2018	11%	31%	46%

Janulewicz et al. found higher rates of Kansas GWI among veterans who sustained mTBIs during the Gulf War



When did the TBIs occur?

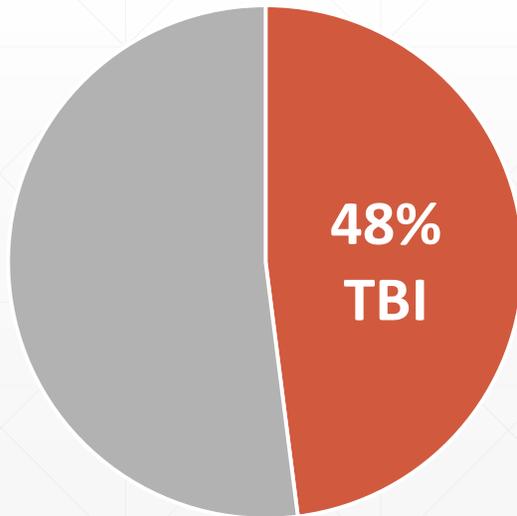
Study	Before GW	During GW	After GW
Chao, 2018	72%	7%	34%

- All 7 were CDC CMI cases
- 4 were Kansas GWI cases
 - 3 others would have been, but had exclusionary condition(s)
- 1 mild TBI; 6 possible TBIs
- 1 had > 1 TBI (during and after GW)

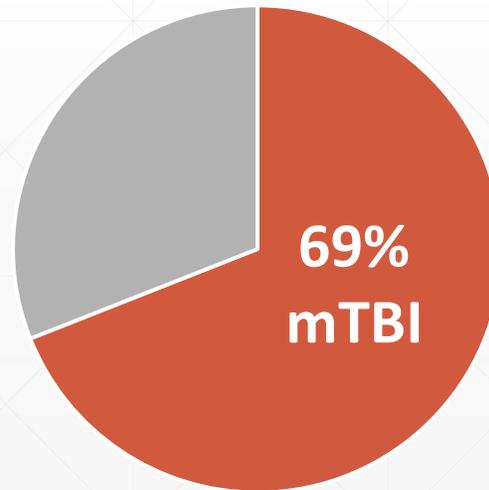
CONCLUSIONS:

Even though TBI was not common in the 1990-91 Gulf War, some GW veterans have a history of TBI.

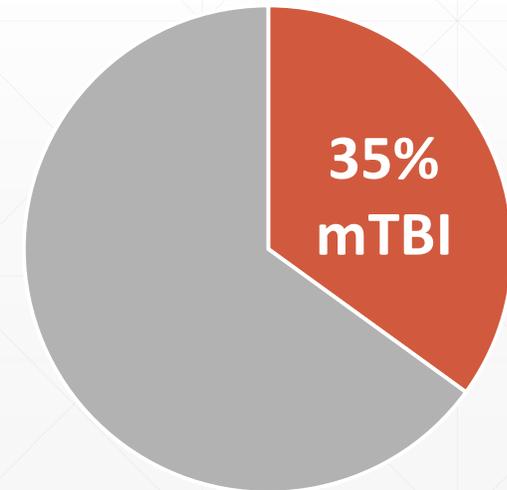
Chao, 2018



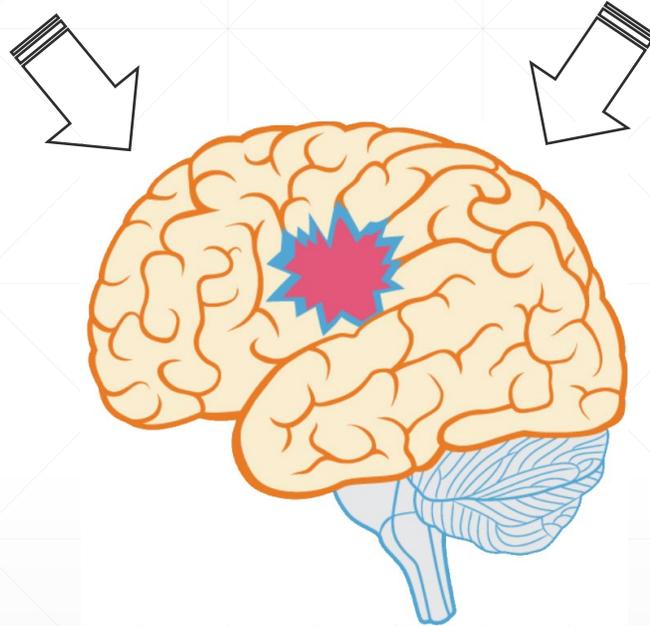
Yee et al, 2017



Janulewicz et al, 2018



GW / CMI



TBI

GW/CMI

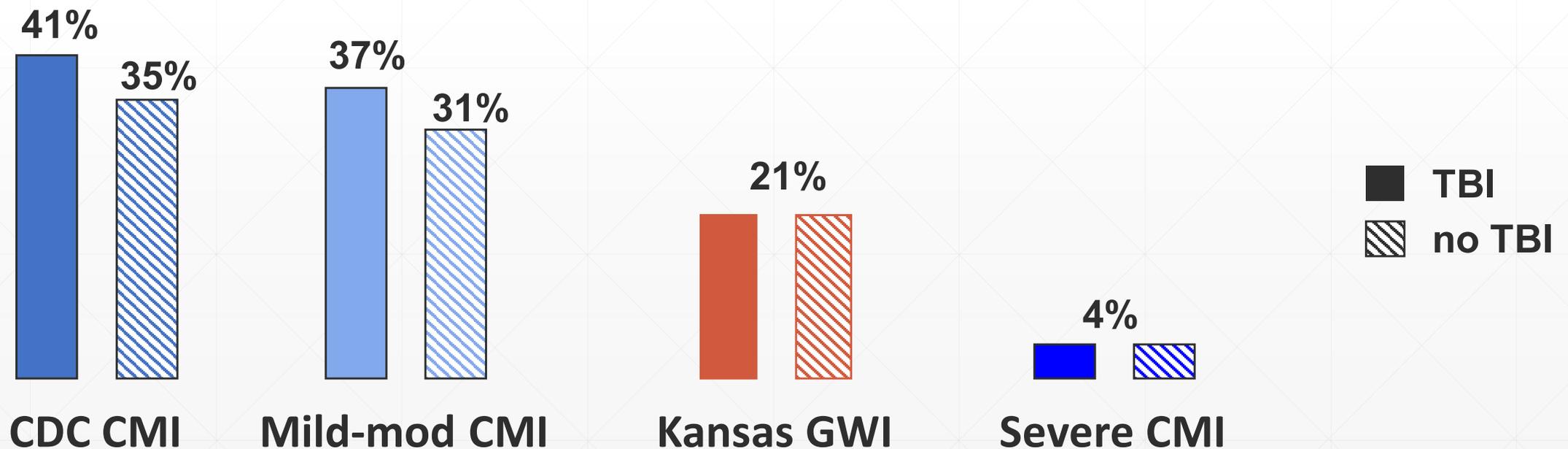
- ✓ Respiratory problems
- ✓ GI problems
- ✓ Skin rashes

mTBI

- ✓ Fatigue
- ✓ Headaches
- ✓ Widespread pain
- ✓ Memory and concentration problems
- ✓ Sleep disturbance

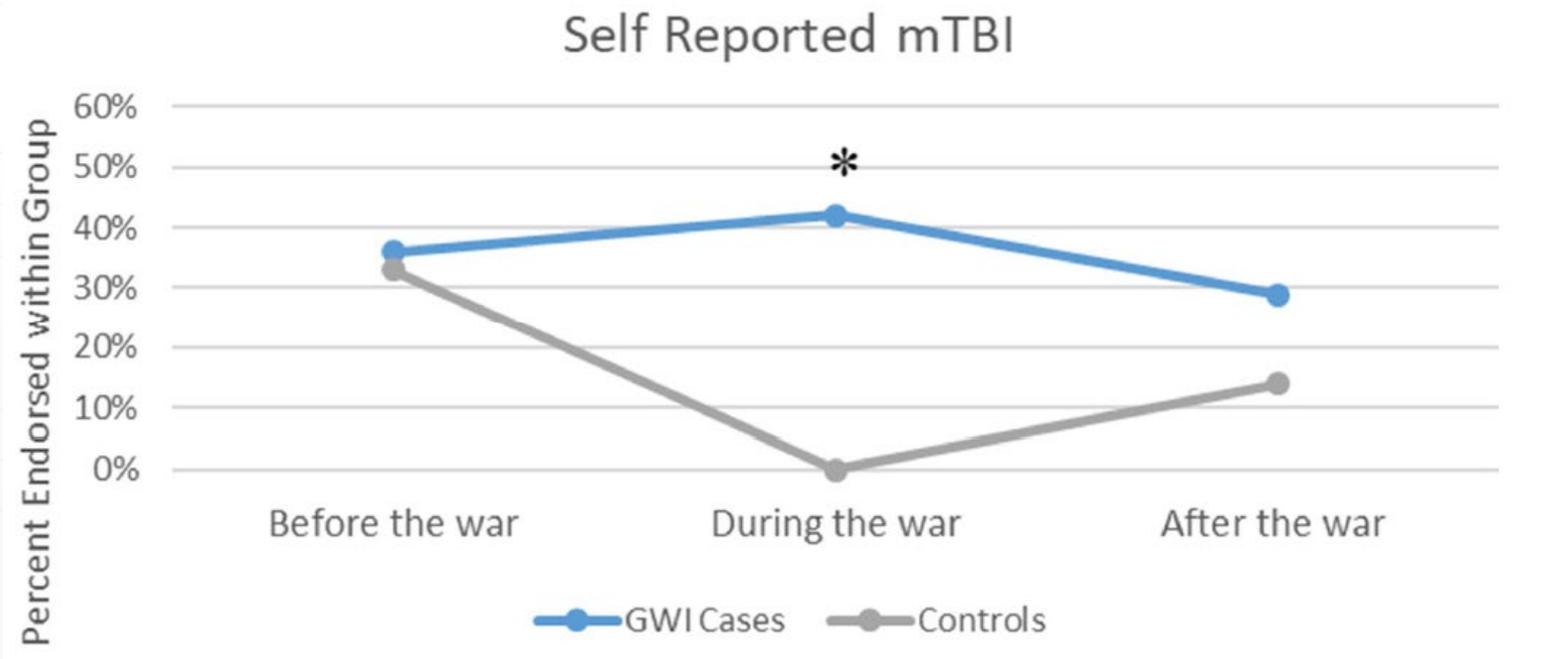
CONCLUSIONS:

Because TBI and multisymptom illness have some overlapping symptoms, history of TBI appears to be associated with increased rates of symptomatic illness in GW veterans if the illness is broadly defined (e.g., CDC CMI or mild-moderate CMI).



Yee et al. (2017) found higher rates of chronic multisymptom illness among GW veterans with more mTBIs

Janulewicz et al. (2018) found higher rates of Kansas GWI among veterans who sustained mTBIs during the Gulf War.



CONCLUSIONS:

Larger, better powered studies with more representative samples of GW Veterans will be needed to determine the nature of the relationship between TBI and rates of chronic symptomatic illness in this Veteran population.

Thank You