

# Learning Healthcare Systems for TBI in the Department of Veterans Affairs

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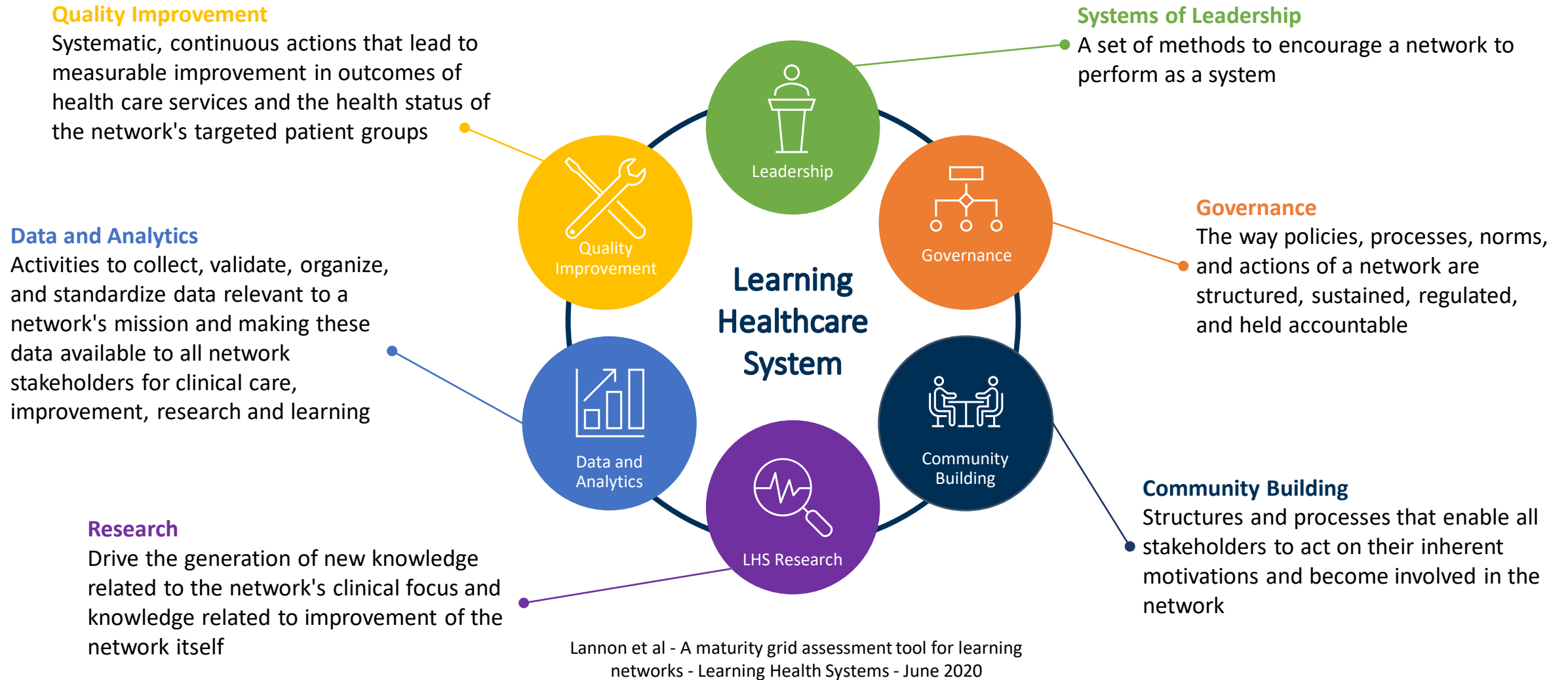
Office of Research and Development

Department of Veterans Affairs

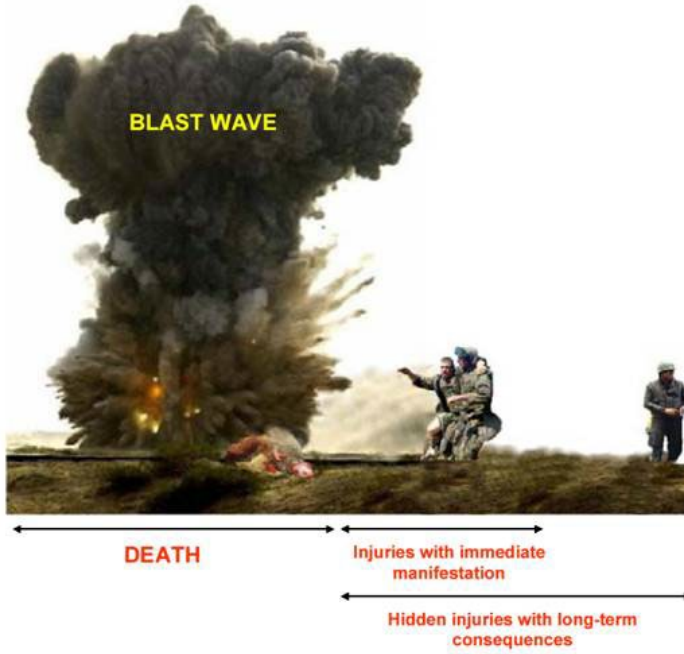


U.S. Department  
of Veterans Affairs

# Components to creating a productive Learning Healthcare System



# The nature of TBI makes it especially difficult for Veterans to navigate



Mental Health  
Provider

Neurology  
Provider

Physical  
Medicine and  
Rehabilitation  
Provider

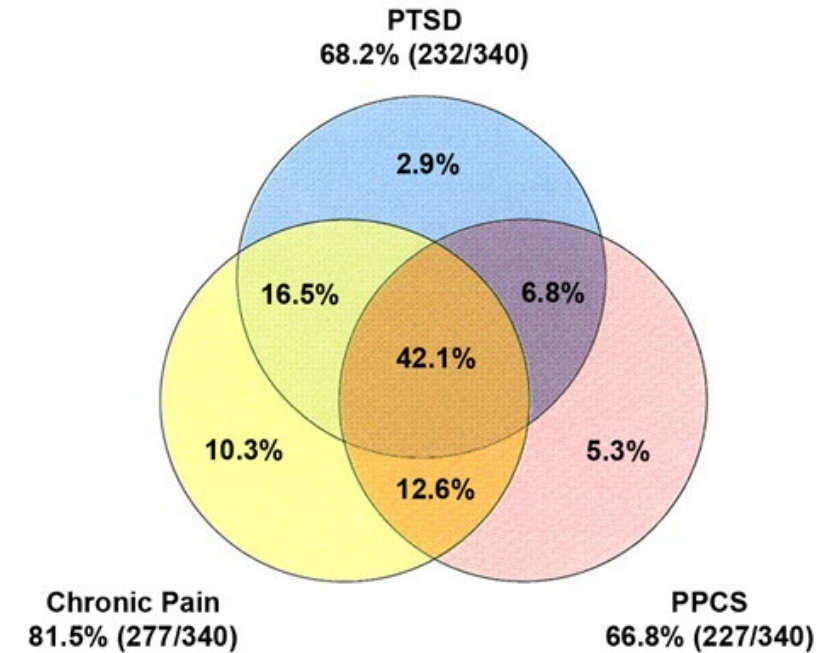
# The impact of TBI on Brain Health and Function is complex

**TBI can stem from a Veterans life-long history of injury or exposure, and can present itself in both moderate and severe forms**

- Concussion are an example of mild TBI (mTBI) that occurs frequently over multiple instances
- At least 1/3 that report mTBI have a first occurrence < 18 years old
- Long-term effect of injury can present TBI such as neurodegeneration and chronic inflammation

**TBI has many co-occurring conditions**

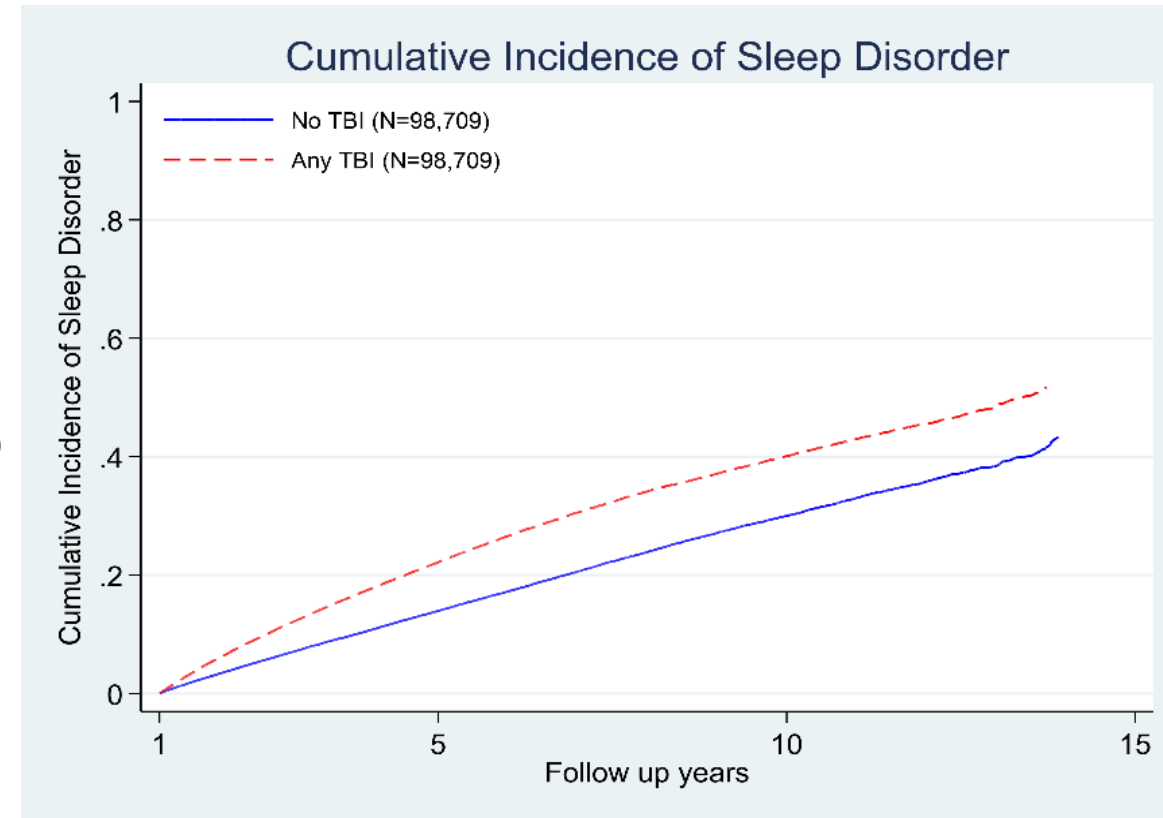
- Sensory (Peripheral or Central)
- Psychological (PTSD, depression, SUD, suicide)
- Chronic Pain
- Mobility (Traumatic amputation, SCI, or Directly TBI)
- Cognitive
- Executive Dysfunction
- Effort Control Impairment
- Endocrine dysfunction



The complexity of TBI was demonstrated in 2009 and treatment of mental health and physical medicine remains today

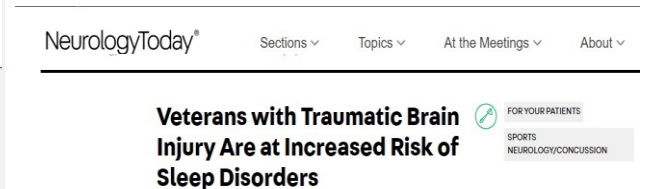
# TBI and Risk of Sleep Disorders in Nearly 200,000 US Veterans

- Veterans with TBI were 41% more likely to develop any sleep disorder, adjusting for demographics and medical and psychiatric conditions: HR=1.41 (1.37-1.44)
- Veterans with TBI were more likely to develop
  - Sleep apnea HR=1.28 (1.24-1.32)
  - Insomnia HR=1.50 (1.45-1.55)
  - Hypersomnia HR=1.50 (1.39-1.61)
  - Sleep-related movement disorders HR=1.33 (1.16-1.52)



# TBI and Risk of Sleep Disorders in Nearly 200,000 US Veterans

- This study is the first to show a longitudinal association between TBI and risk of sleep disorders in Veterans
- Early identification and prevention strategies for sleep disorders are needed to improve quality of life and long-term outcomes in TBI patients



Leng et al., *Neurology*, 2021

# Progress: TBI, Cardiovascular Disease, and Risk of Dementia among Older

- CVD and TBI are both important risk factors for dementia; however, little is known about how they interact on this risk
- Age, sex, and race-matched sample of Veterans aged 55+ with and without TBI (mean age=67 years), with no dementia at baseline
  - N=195,416 per group
  - At least 1 year of follow-up; average=6.6 years
- Preliminary Results:

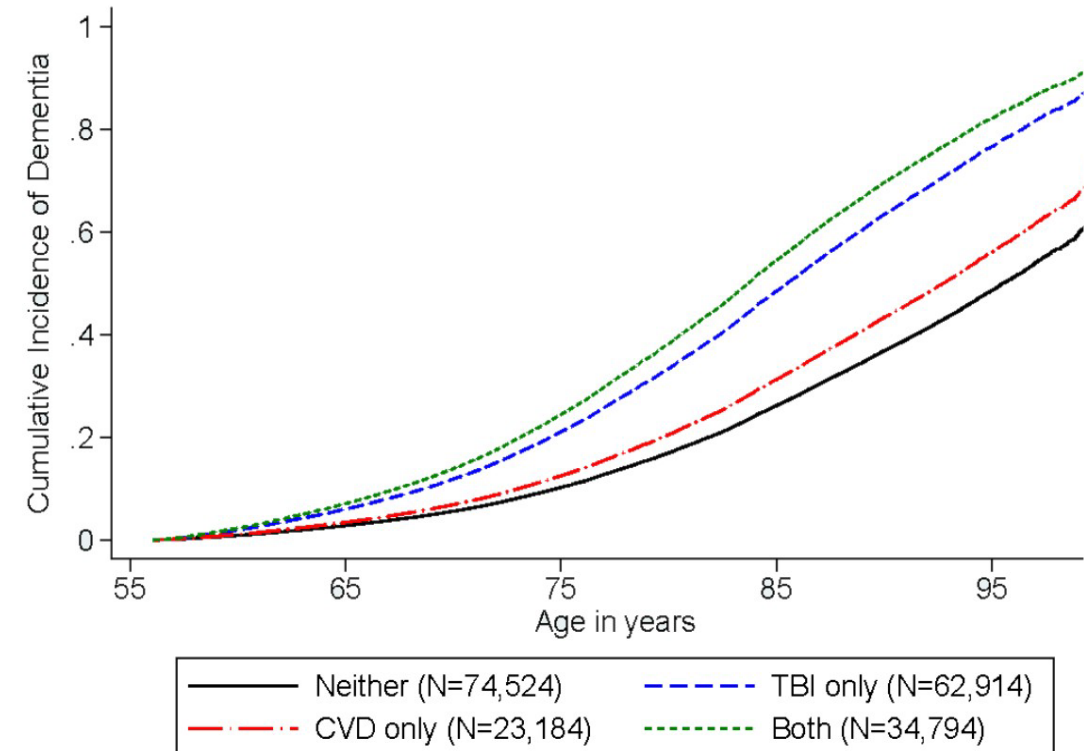
CVD and CV risk factors are 2X higher in people with TBI

TBI only: HR=2.35 (2.26-2.43)

CVD only: HR=1.26 (1.20-1.33)

TBI + CVD : HR=2.83 (2.72-2.94)

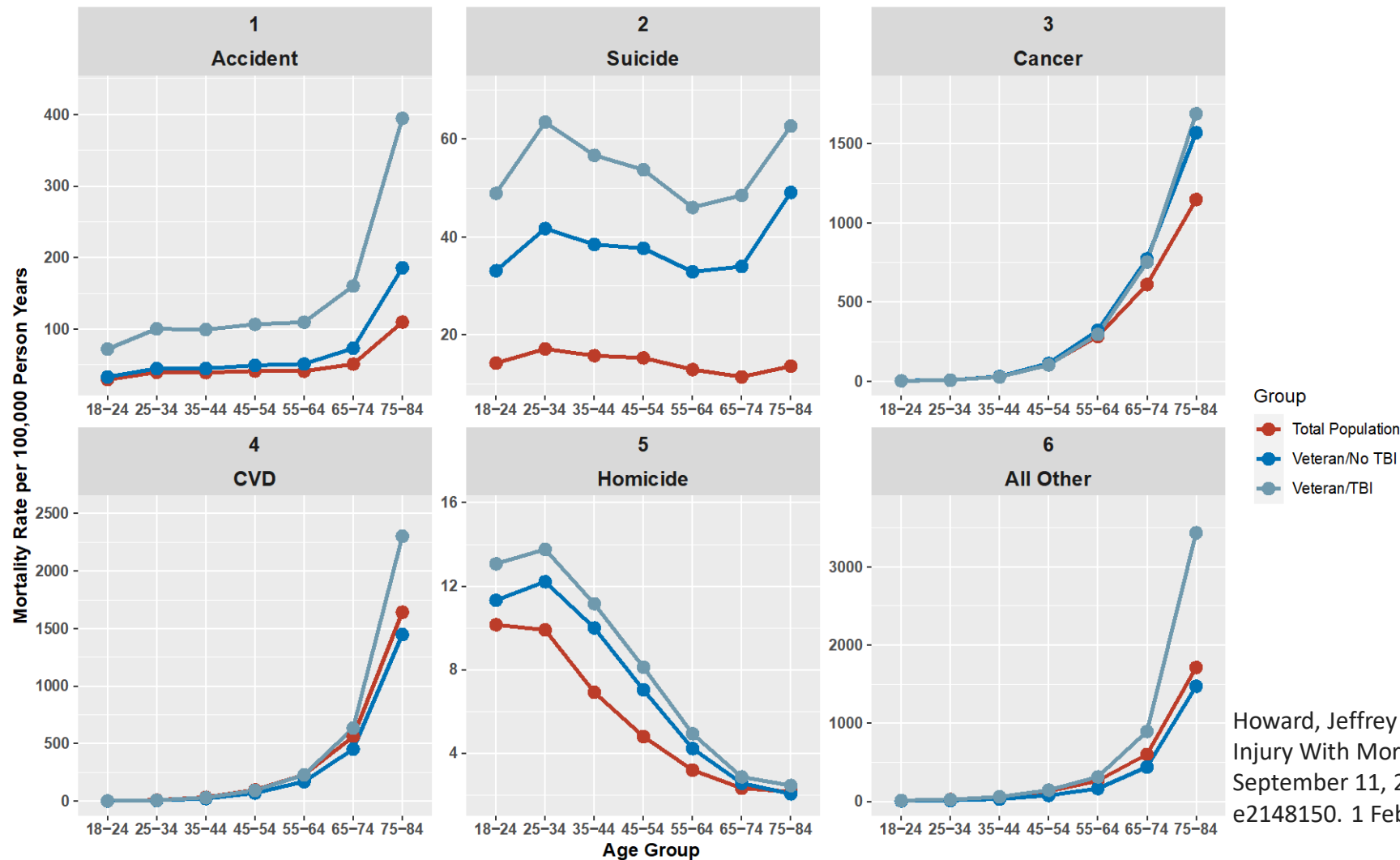
Additive effect between TBI and CVD; no interaction



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# Multivariable Adjusted Mortality Rates by TBI Status

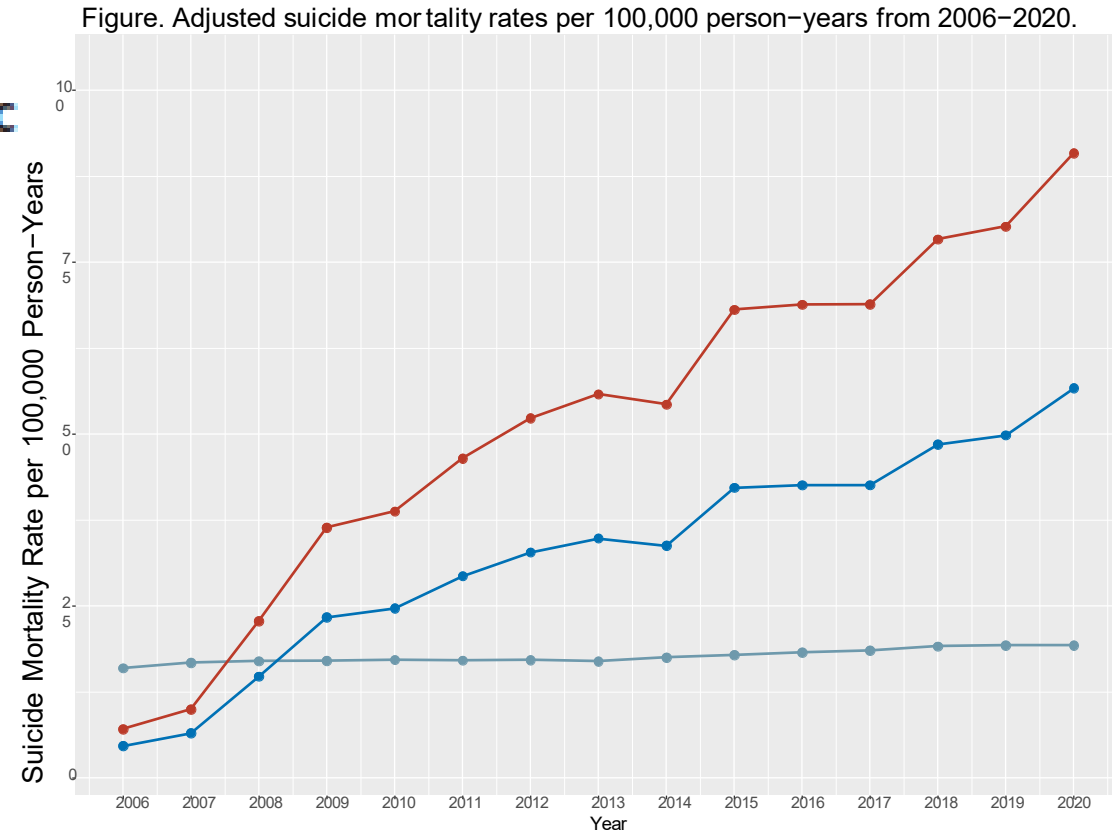
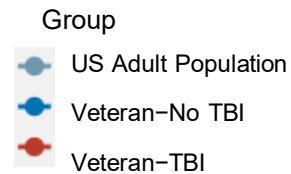


Howard, Jeffrey T et al. "Association of Traumatic Brain Injury With Mortality Among Military Veterans Serving After September 11, 2001." *JAMA network open* vol. 5,2 e2148150. 1 Feb. 2022,

# TBI and Suicide Completion

## RESEARCH LETTER

### Trends in Suicide Rates Among Post-9/11 US Military Veterans With and Without Traumatic Brain Injury From 2006-2020



Note: Average annual percent change for Veteran-TBI was 14.8 (95% CI: 10.5–19.2;  $p < 0.001$ ), for Veteran-No TBI was 14.4 (95% CI: 10.2–18.7;  $p < 0.001$ ) and for US Adult Population was 1.2 (95% CI: 0.9–1.4;  $p < 0.001$ ).

Published Online:

August 28, 2023. doi:[10.1001/jamaneurol.2023.2893](https://doi.org/10.1001/jamaneurol.2023.2893)

# TBI Research and the Commander John Scott Hannon Act (PL116-171)

## Requirement:

According to Section 305, the VA will fund an initiative to **identify, validate, and integrate brain and mental health biomarkers among veterans**, launching the “Precision Mental Health for Veterans Initiative”.

## Initiative Model:

- The studies will include **brain structure and function measurements**, such as functional magnetic resonance imaging and electroencephalogram.
- To expedite with ongoing clinical research efforts such as **Long-term Impact of Military-relevant Brain Injury Consortium-Chronic Effects of Neurotrauma Consortium (LIMBIC-CENC)** and **The Translational Research Center for TBI and Stress Disorders (TRACTS)**.

# Current Examples of How VA is Utilizing Research Infrastructure and Integration with Clinical Care to Support Better Outcomes For Veterans With TBI



## Current Opportunity



## Infrastructure Needs

### Consistent Identification of TBI

- Identifying Veterans with TBIs can help to **inform clinical providers to properly assess Veterans** who are at most risk for various physical and mental health conditions

Funding for developing and implementing a **virtual comprehensive evaluation** for TBI to improve rate identification

### TBI Interdisciplinary Care

- The **complex co-morbidities** associated with TBI require interdisciplinary care
- Upon completion of QUERI evaluation for IETP, **implementation research** will focus on the next level of Polytrauma Network Sites

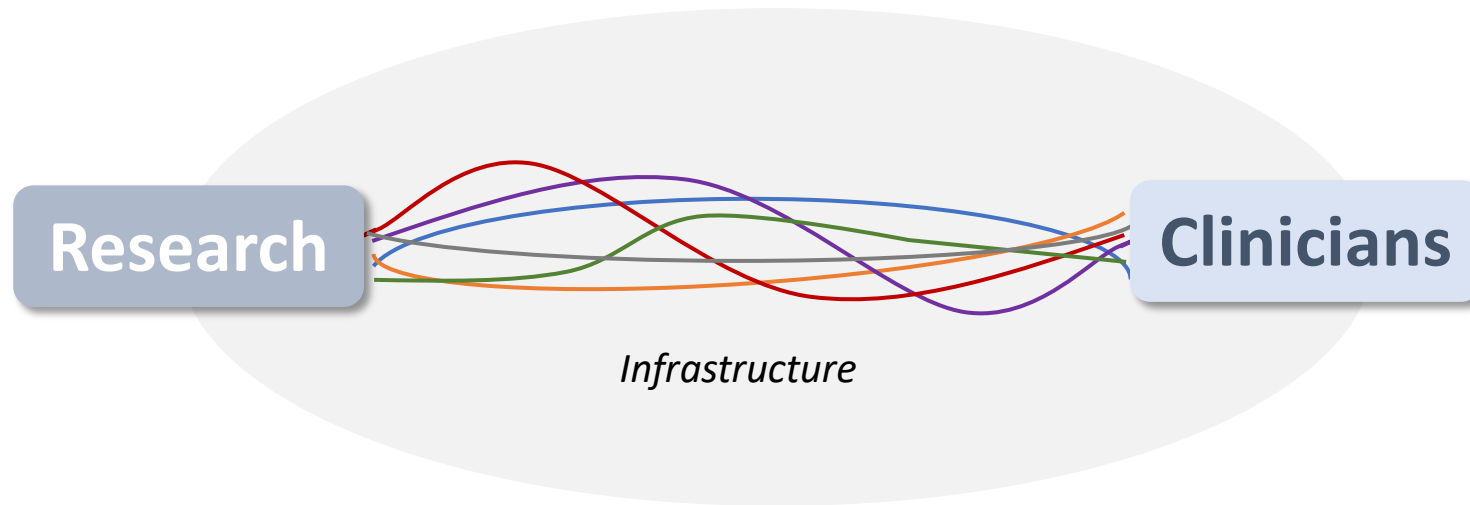
The next phase will be to **scale this program to network sites** through investment and research focus on how to create interdisciplinary out-patient capabilities

### Longitudinal Study of Mild to Severe TBI

- There remains a **gap for severe TBI progression**, especially regarding disorders of consciousness
- Currently, these Veterans are **cared for at skilled nursing facilities, at home by family, or lost to follow**

**Building on existing infrastructure** of the Long-term Impact of Military-relevant Brain Injury Consortium (LIMBIC) effort. In addition, build a **system to track Veterans with severe TBI** to better understand the progression of condition to improve care.

# Infrastructure is how VA actualizes the Learning Healthcare System



**Infrastructure** includes **coordination centers**, **research coordinators**, **time support for clinicians**, **materials** (i.e., imaging), and the **pathways of communications** (e.g., governance bodies) of research across service lines