



Military Risk Factors and Risk of Dementia in Female Veterans

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Poll Question #1:

What is your primary role at the VA?

- a) Student, trainee, fellow
- b) Clinician
- c) Researcher
- d) Administrator

Poll Question #2:

How familiar are you with research involving big datasets (epidemiology)?

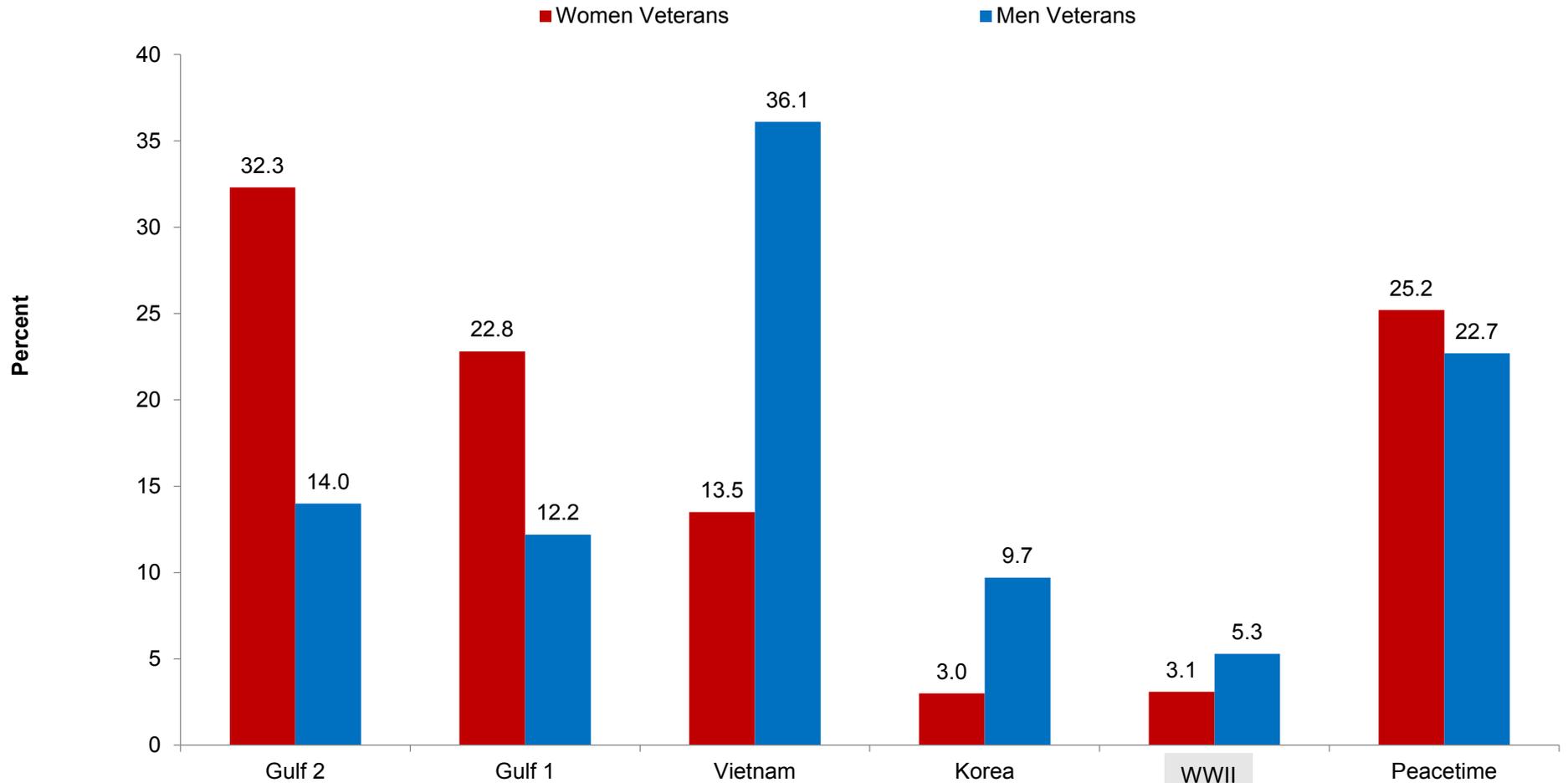
- a) Very familiar
- b) Somewhat familiar
- c) Not familiar at all

Women Veterans: A Growing Population at Risk

- Over 2 million women veterans in the US
 - 9% of all veterans are women
 - 30% of women veterans are 55+
- Number of women using VHA nearly doubled in past decade
- In 2012, 45% of women veteran patients in the Veterans Health Administration (VHA) had a mental health condition



Period of Service of Veterans by Sex, 2014



Dementia in Veterans

- Lifestyle and health-related factors can increase the risk of dementia
- Military service may lead to increased rates of certain risk factors, such as post-traumatic stress disorder (PTSD) and traumatic brain injury (TBI)
- Other risk factors may be elevated in veterans, such as smoking and sleep disturbances
- Few studies have focused on dementia in women veterans and what risk factors they may experience



Study 1 Objective



To determine the prevalence of cognitive impairment and associated psychiatric and medical conditions in older women veterans

Methods

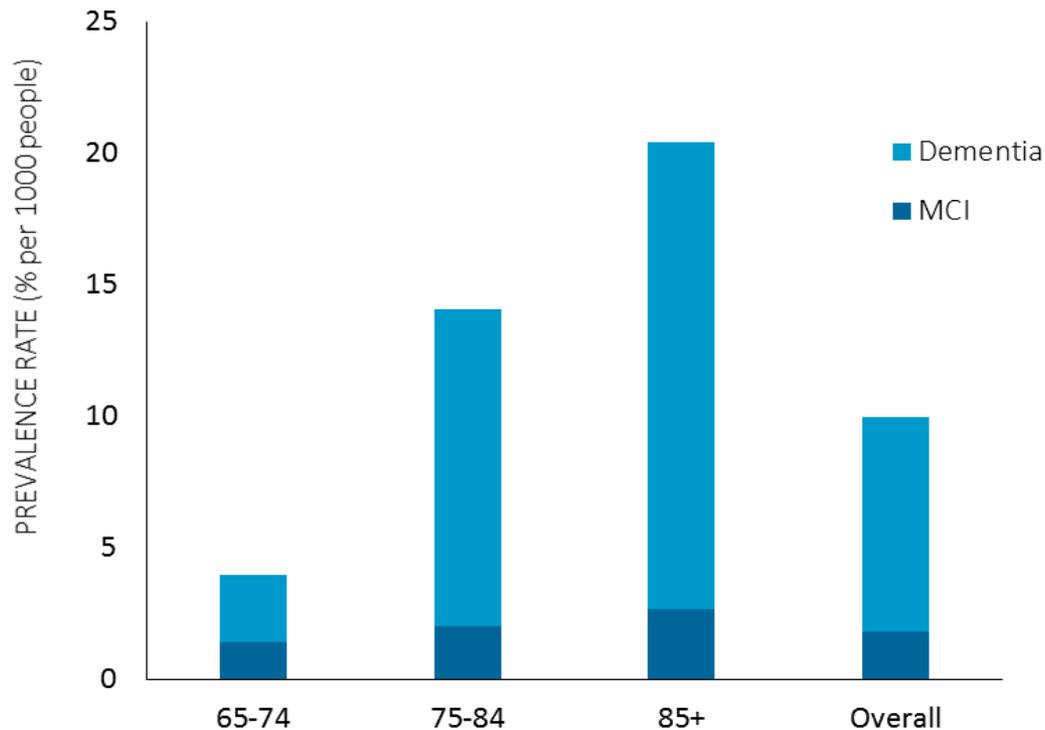
- All female veterans 65+ in VHA from 2005-2015
 - N = 168,111
- Cognitive impairment (CI) diagnoses
 - Mild cognitive impairment (MCI): ICD-9 codes
 - Dementia: ICD-9 codes or dementia medication prescription (donepezil, galantamine, rivastigmine, or memantine)
- Medical and psychiatric conditions
 - Identified by ICD-9 codes
 - Diagnosed ≥ 2 years before receiving cognitive impairment diagnosis or ≥ 2 years before last medical encounter (for veterans without impairment)



Results

- 10% of female veterans had CI
 - 2% with MCI
 - 8% with dementia

10 year prevalence of Cognitive Impairment



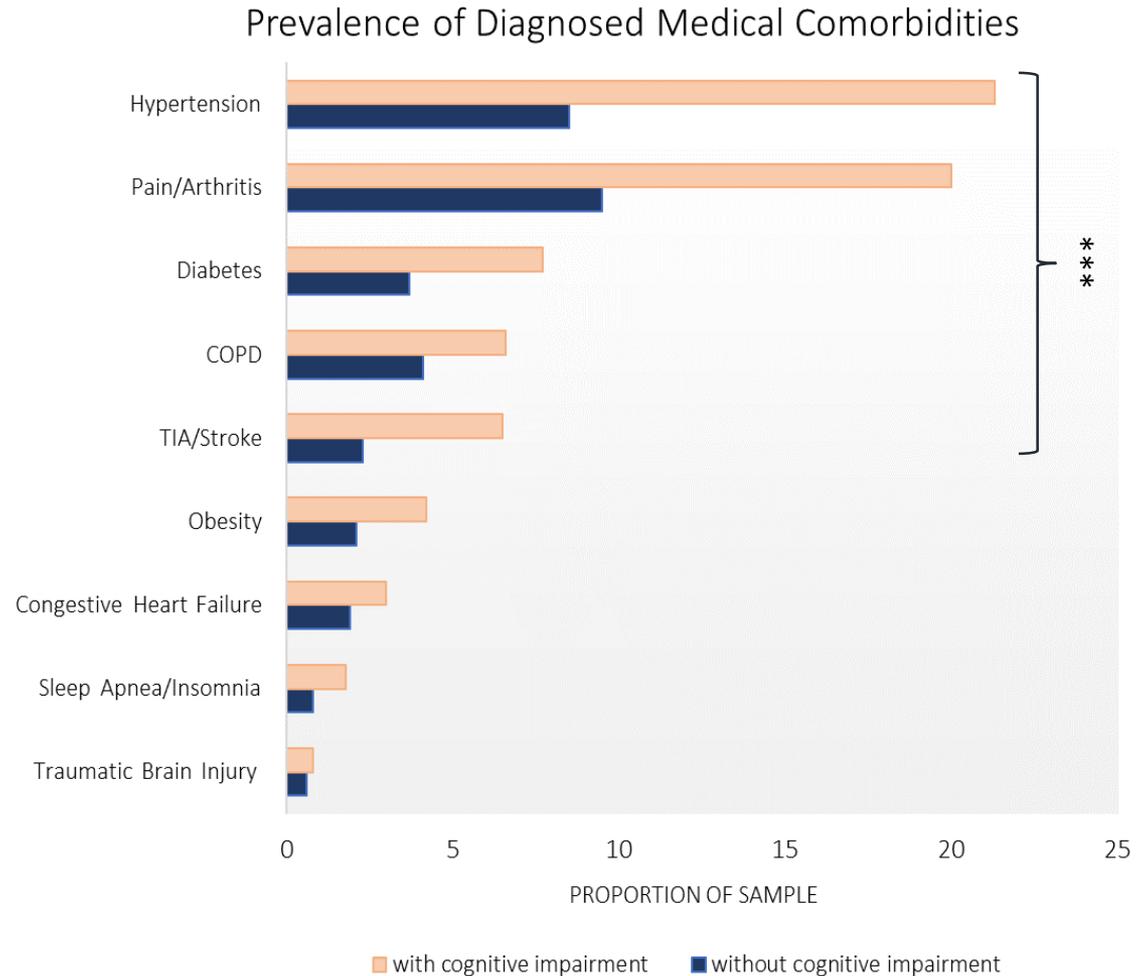


Results

Dementia Subtype	Female Veterans with Dementia Subtypes (N = 5,091) N (%)
All subtypes	5,091 (37.3)
Alzheimer's disease	3,700 (72.7)
Vascular dementia	1,197 (23.5)
Frontotemporal dementia	41 (0.8)
Lewy body dementia	120 (2.4)
Other	33 (0.7)

Results

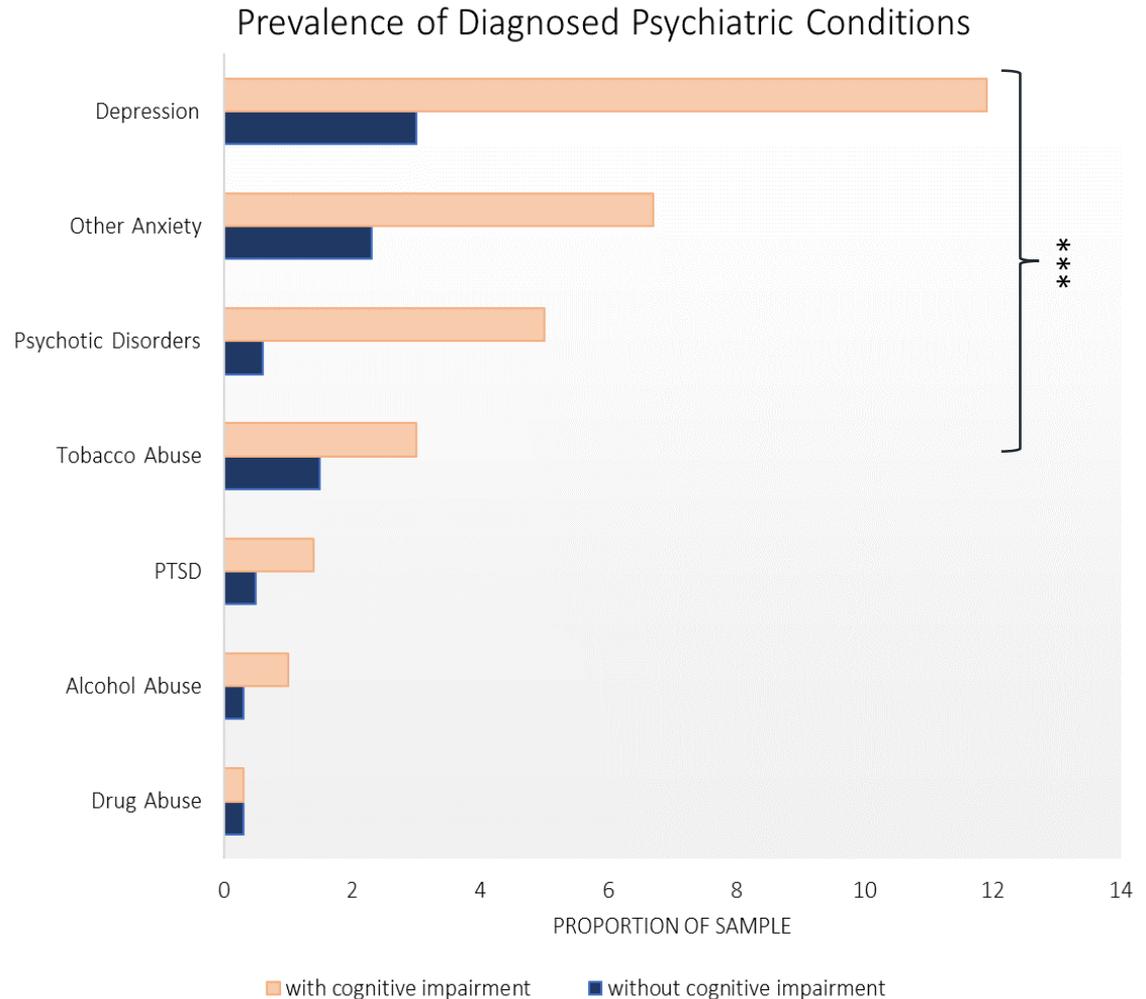
The prevalence of having one medical comorbidity was 2x higher for veterans with CI compared to without CI



*** = $P < 0.001$; demographically adjusted

Results

The prevalence of having one psychiatric comorbidity was 3x higher for veterans with CI compared to without CI



Conclusions

- One of the first studies to report prevalence of CI in older female veterans
- MCI: Prevalence of 1% at 65, increasing slightly to 3% by age 85+
- Dementia: Prevalence of 3% at 65, increasing to 18% for 85+
- Older women with CI have 2x more medical and 3x more psychiatric conditions compared to women without CI

Discussion

- The rates of MCI and dementia in women veterans in this study were similar to or slightly lower than population-based studies of non-veteran women
- This study found multiple comorbid conditions associated with or perhaps contributing to CI
 - Veterans have higher rates than non-veterans
- Many of these conditions are modifiable and possible areas for interventions
 - Better controlled cardiovascular risk factors
 - Mental health treatment

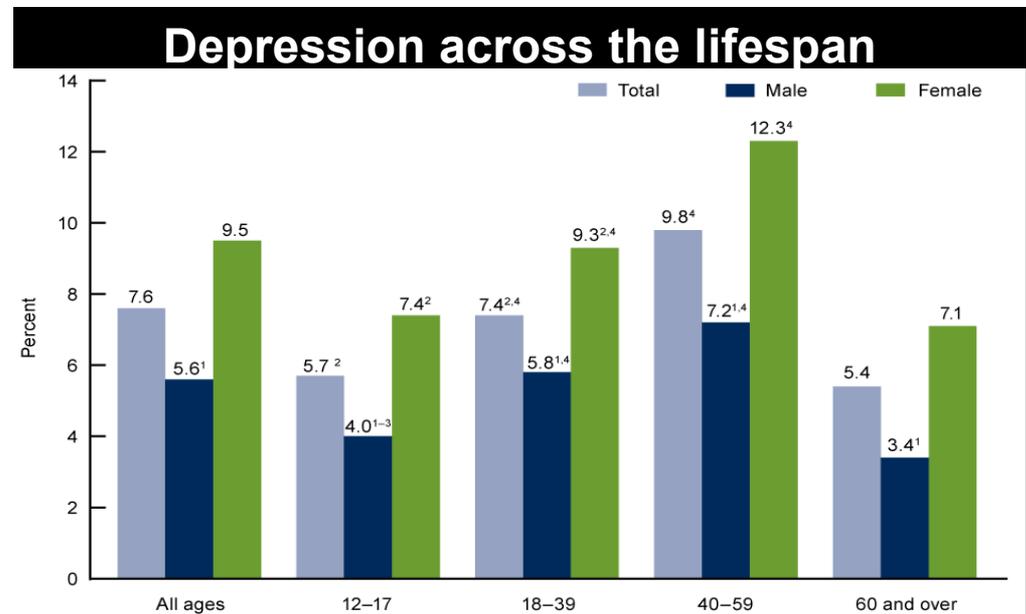
Military Risk Factors for Dementia in Women

- Veterans have a unique constellation of risk factors such as depression, PTSD, and TBI
- As women's roles in the military change, they may become exposed to higher levels of these risk factors
- Very little research on older female veterans



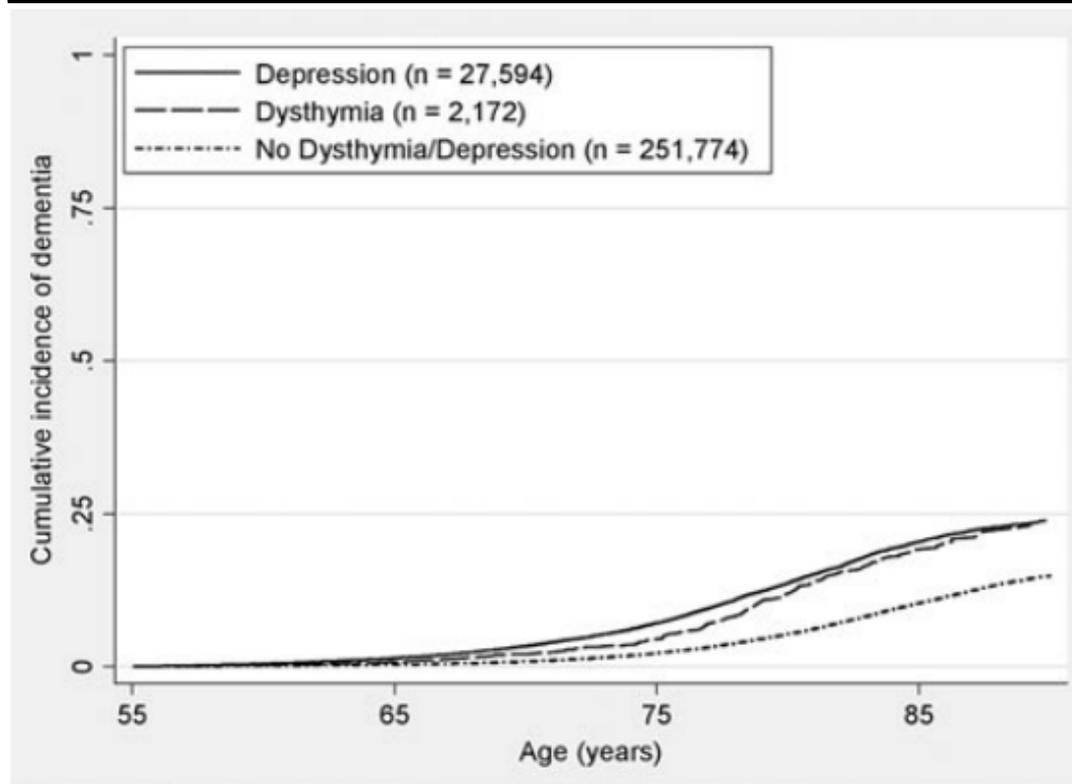
Sex Differences in Military Risk Factors

- Women diagnosed with depression 2x more than men
- PTSD is 2.3 times higher in women than men exposed to traumatic events
- TBI is 2x as prevalent in men than women, but nearly 10% of women will experience a TBI in their lifetime
- All these military risk factors increase dementia risk in male veterans



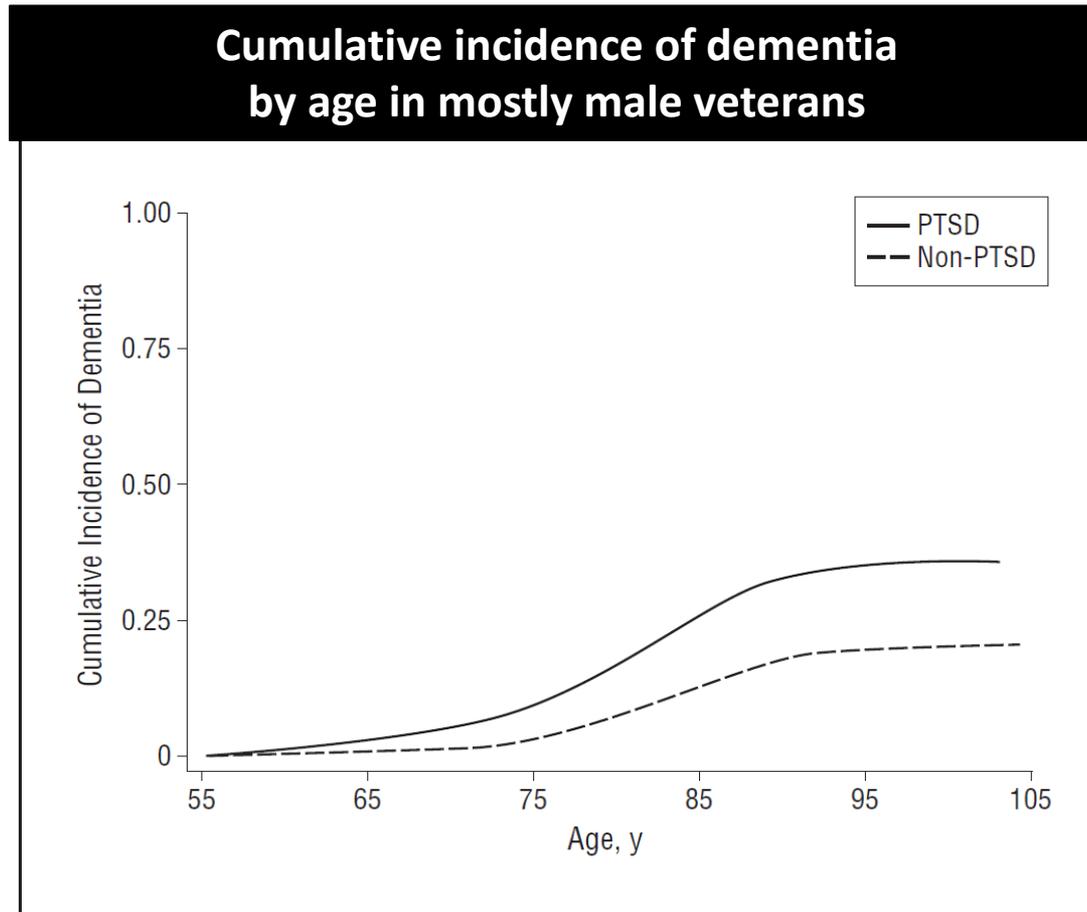
Depression Increases Risk of Dementia

Cumulative incidence of dementia by age in mostly male veterans



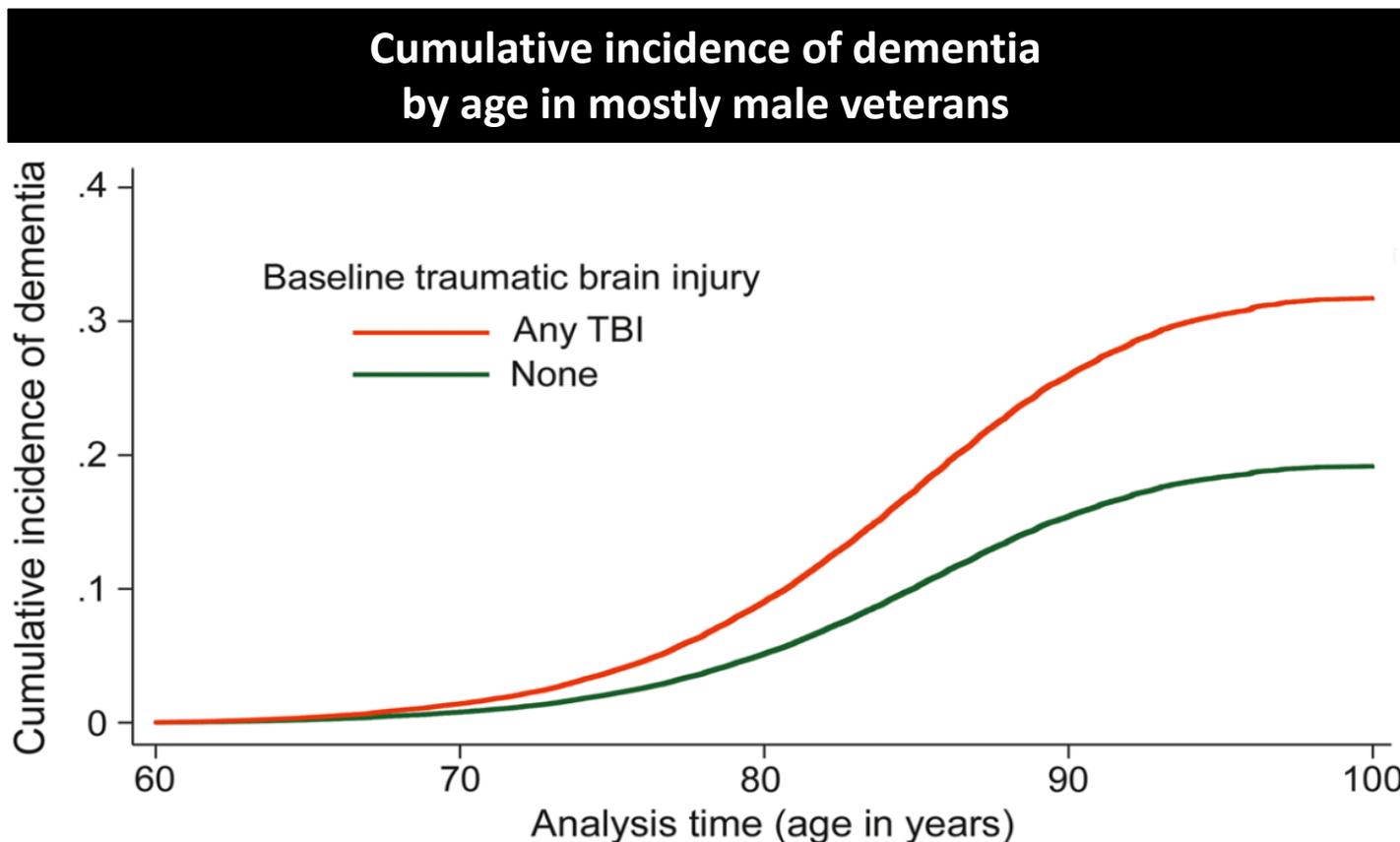
Adjusted Depression HR: 2.18; 95% CI (2.08–2.28)

PTSD Increases Risk of Dementia



Adjusted HR: 1.77; 95% CI (1.70–1.85)

TBI Increases Risk of Dementia



Adjusted HR: 1.57; 95% CI (1.35–1.83)



Study 2 Objective



To determine whether older female veterans with military risk factors are at an increased risk of developing dementia

Study Population

N = 109,140

- All female veterans aged 55+ in VHA who had at least two visits between 2005-2015
- All inpatient and outpatient medical encounters
- Depression/PTSD/TBI diagnoses
 - Defined by ICD-9 codes
 - Two year baseline period

Measures/Analysis

- **Incident Dementia** defined by ICD-9 codes during follow-up
 - Excluded women with dementia during two year baseline
- **Confounders/Comorbidities**
 - Demographics, health habits, income and medical disorders
 - Defined by ICD-9 codes during two year baseline
- Fine-Gray proportional hazards models, accounting for the competing risk of death
 - Censoring at death or last medical encounter
 - Age as time scale

Baseline Characteristics of 109,140 Older Women Veterans

	Depression				> 1 risk factor	P value
	None N = 81,835	TBI only N = 488	only N = 20,410	PTSD only N = 1,363		
Age, mean	69.2	69.4	66.9	65.1	63.8	<0.001
Race, %						<0.001
Non-Hispanic White	72.8	69.5	79.0	75.9	72.8	
Non-Hispanic Black	12.2	13.1	10.0	13.6	15.1	
Hispanic	0.6	1.4	0.7	0.4	1.0	
Others/Unknown	12.8	12.3	9.8	8.9	10.7	
>25% college-educated in zip code, %	48.4	43.0	43.0	47.1	46.8	<0.001
Medical History, %						
Diabetes mellitus	15.9	19.9	28.0	23.8	27.7	<0.001
Hypertension	47.6	54.5	71.9	58.1	67.6	<0.001
Myocardial infarction	1.9	3.5	3.3	2.5	3.0	<0.001
TIA/Stroke	6.5	16.0	11.6	8.9	12.5	<0.001
Alcohol abuse	0.9	2.7	5.2	8.8	13.3	<0.001
Tobacco use/smoking	11.1	14.3	26.0	21.5	29.5	<0.001



Association between Incident Dementia and **TBI** in Older Women Veterans

	Hazard Ratio (95% CI)		
	Adjusted for Age	Model 1	Model 2
None	<i>Reference</i>	<i>Reference</i>	<i>Reference</i>
TBI only	1.64 (1.12-2.39)	1.58 (1.07-2.32)	1.49 (1.01-2.20)

Model 1: adjusted for demographic (age, race, income)

Model 2: Model 1 + adjusted for comorbid conditions (diabetes, hypertension, myocardial infarction, TIA/stroke, alcohol abuse, tobacco use)

Association between Incident Dementia and Depression in Older Women Veterans

	Hazard Ratio (95% CI)		
	Adjusted for Age	Model 1	Model 2
None	<i>Reference</i>	<i>Reference</i>	<i>Reference</i>
Depression only	2.14 (2.01-2.28)	2.12 (1.98-2.26)	2.00 (1.87-2.13)

Model 1: adjusted for demographic (age, race, income)

Model 2: Model 1 + adjusted for comorbid conditions (diabetes, hypertension, myocardial infarction, TIA/stroke, alcohol abuse, tobacco use)

Association between Incident Dementia and PTSD in Older Women Veterans

	Hazard Ratio (95% CI)		
	Adjusted for Age	Model 1	Model 2
None	<i>Reference</i>	<i>Reference</i>	<i>Reference</i>
PTSD only	1.81 (1.37-2.39)	1.84 (1.39-2.43)	1.78 (1.34-2.36)

Model 1: adjusted for demographic (age, race, income)

Model 2: Model 1 + adjusted for comorbid conditions (diabetes, hypertension, myocardial infarction, TIA/stroke, alcohol abuse, tobacco use)

Association between Incident Dementia and >1 Military-Related Risk Factor in Older Women Veterans

	Hazard Ratio (95% CI)		
	Adjusted for Age	Model 1	Model 2
None	<i>Reference</i>	<i>Reference</i>	<i>Reference</i>
>1 Military-related risk factor	2.41 (2.07-2.80)	2.32 (1.99-2.71)	2.15 (1.84-2.51)

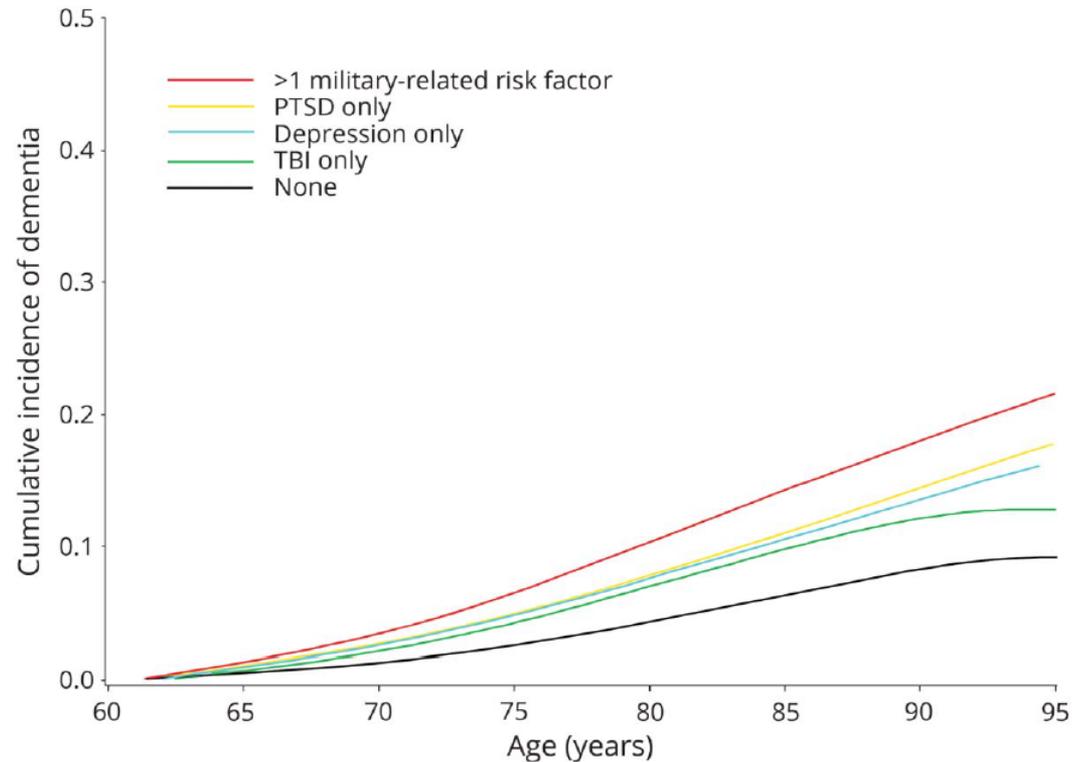
Model 1: adjusted for demographic (age, race, income)

Model 2: Model 1 + adjusted for comorbid conditions (diabetes, hypertension, myocardial infarction, TIA/stroke, alcohol abuse, tobacco use)

Incident Dementia in Older Women Veterans

Cumulative Incidence of Dementia

	Adjusted HR of Dementia (95% CI)
No Military-Related Risk Factors	Reference
TBI only	1.49 (1.01-2.20)
Depression only	1.67 (1.55-1.80)
PTSD only	1.78 (1.34-2.36)
>1 Military-Related Risk Factor	2.15 (1.84-2.51)



Summary

- Older women veterans with TBI, depression, or PTSD had 50%-80% increase in the risk of dementia compared to those without
- Having >1 military risk factor increased the risk >2-fold
- Association persisted after adjustment for demographics and comorbidities
- Similar findings after requiring two diagnoses, instituting two year lag for dementia incidence, and adjusting for number of medical visits per year

Conclusions

- Female veterans are also vulnerable to the effects of military-related risk factors
- Only about 2% of women had combat exposure but numbers expected to increase with changing roles in the military
- **Implications:** Older women with TBI, depression, and/or PTSD, particularly veterans, should be screened and monitored for dementia
- **Future Studies:** Large database of older veteran women will allow us to examine additional risk factors for dementia and other outcomes in this understudied population

Strategies to Improve Brain Health in All Veterans

- Treatment and screening of comorbidities
 - Depression/PTSD
 - Cardiovascular conditions
 - Sleep
- Increase/maintain healthy lifestyle behaviors
 - Smoking cessation
 - Physical activity
- Advances in dementia research point towards multi-domain prevention/intervention strategies

Thank You!

We are very grateful to the women veterans who entrust their care to the VA and made this study possible



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Questions/Comments?

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