



Penn Medicine

# Promoting Brain Health after TBI in Older Adults: Lessons Learned from the Epidemiology of Neurological and Vascular Outcomes

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# Disclosures

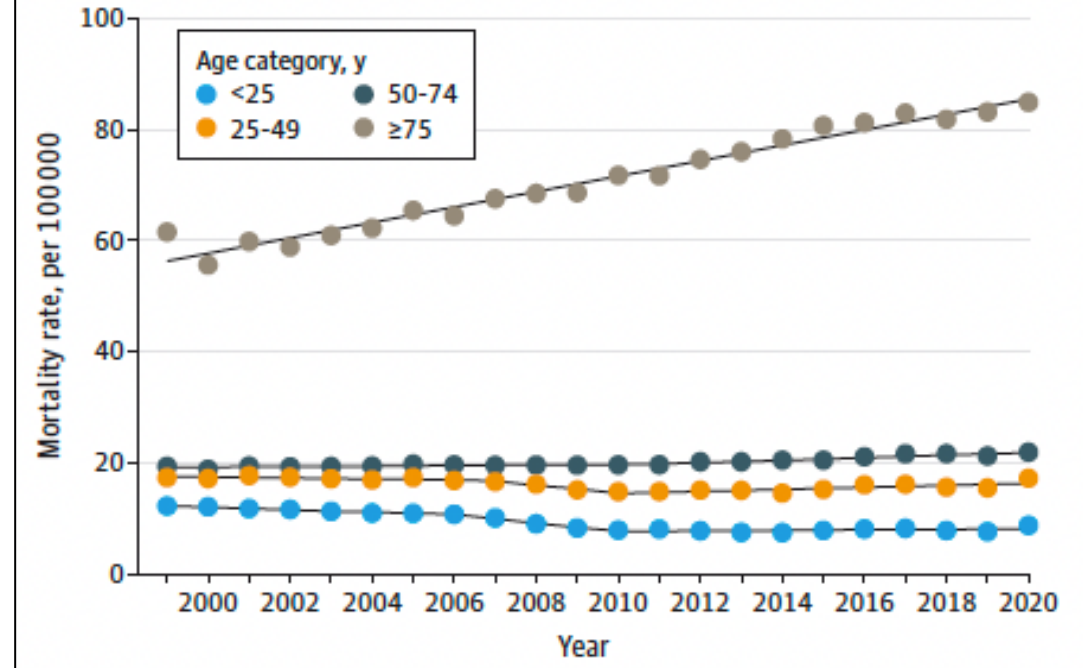
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# TBI-Related Mortality in the United States

Table. Age-Standardized Mortality Rates and Average Annual Percent Change (AAPC) for TBI-Related Mortality in the US, 1999-2020

	Age-standardized mortality rate per 100 000 (95% CI)		1999-2020 AAPC (95% CI) <sup>a</sup>	P value for trend <sup>a</sup>
	1999	2020		
<b>Overall</b>	<b>18.64 (18.31 to 18.96)</b>	<b>19.34 (19.05 to 19.63)</b>	<b>0.14 (-0.60 to 0.88)</b>	<b>.72</b>
Sex				
Male	28.90 (28.31 to 29.49)	30.17 (29.64 to 30.70)	0.12 (-0.66 to 0.91)	.76
Female	9.49 (9.18 to 9.81)	9.31 (9.04 to 9.59)	-0.05 (-0.35 to 0.25)	.73
Race and ethnicity				
Non-Hispanic American Indian or Alaska Native	24.19 (20.10 to 28.62)	30.89 (26.81 to 35.11)	1.04 (-0.96 to 3.08)	.31
Non-Hispanic Asian or Pacific Islander	10.42 (9.05 to 11.80)	8.49 (7.71 to 9.26)	-0.87 (-1.36 to -0.37)	.001
Non-Hispanic Black	20.40 (19.39 to 21.41)	21.29 (20.43 to 22.16)	-0.11 (-0.84 to 0.62)	.76
Hispanic	14.67 (13.66 to 15.67)	13.04 (12.41 to 13.67)	-0.87 (-1.67 to -0.07)	.03
Non-Hispanic White	19.03 (18.65 to 19.41)	20.85 (20.47 to 21.22)	0.46 (0.22 to 0.70)	<.001
Age, y <sup>b</sup>				
<25	12.19 (11.97 to 12.41)	8.66 (8.48 to 8.84)	-1.92 (-2.90 to -0.93)	<.001
25-49	17.33 (17.07 to 17.58)	17.08 (16.84 to 17.33)	-0.32 (-1.47 to 0.84)	.59
<b>50-74</b>	<b>19.32 (18.97 to 19.68)</b>	<b>21.81 (21.62 to 22.11)</b>	<b>0.64 (0.48 to 0.80)</b>	<b>&lt;.001</b>
<b>≥75</b>	<b>61.43 (60.23 to 62.63)</b>	<b>84.78 (83.60 to 85.97)</b>	<b>1.97 (1.80 to 2.15)</b>	<b>&lt;.001</b>

Figure. TBI-Related Mortality Rates in the US by Age, 1999-2020



CDC WONDER

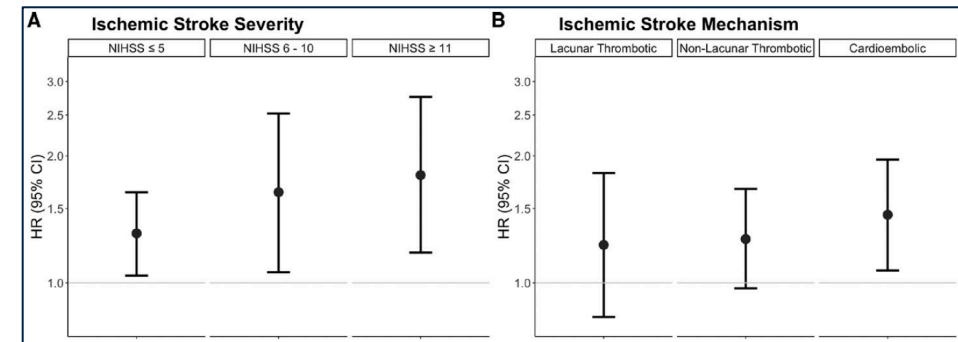
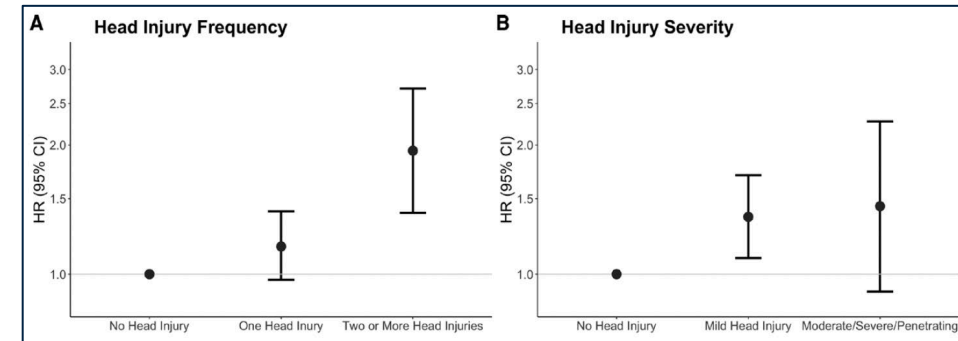
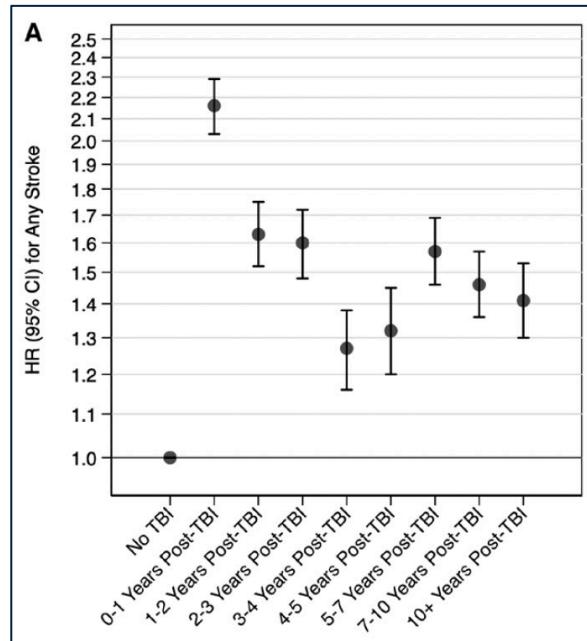
# Long-term Outcomes after TBI in Older Adults

- ▶ Stroke
- ▶ Cognitive Decline and Dementia
- ▶ Epilepsy
  
- ▶ How do we study long-term outcomes after TBI when very few studies designed to study TBI from the time of injury have long-term follow-up (i.e., 30+ years)?
  - Leverage data from ongoing, deeply phenotyped epidemiologic studies such as the Atherosclerosis Risk in Communities (ARIC) Study
  
- ▶ The study of long-term outcomes after TBI in older adults has methodological challenges that must be addressed
  - Repeated measures
  - Attrition and missing data

# Long-term Outcomes after TBI – Stroke

- ▶ 306,796 Veterans with TBI matched 1:1 to 306,796 Veterans without TBI
- ▶ TBI associated with 1.7 times the risk of incident (ischemic or hemorrhagic) stroke over a median of 5 years

- ▶ TBI associated with 1.3 times the risk of ischemic stroke among 12,813 community-dwelling participants followed for a median of 27 years

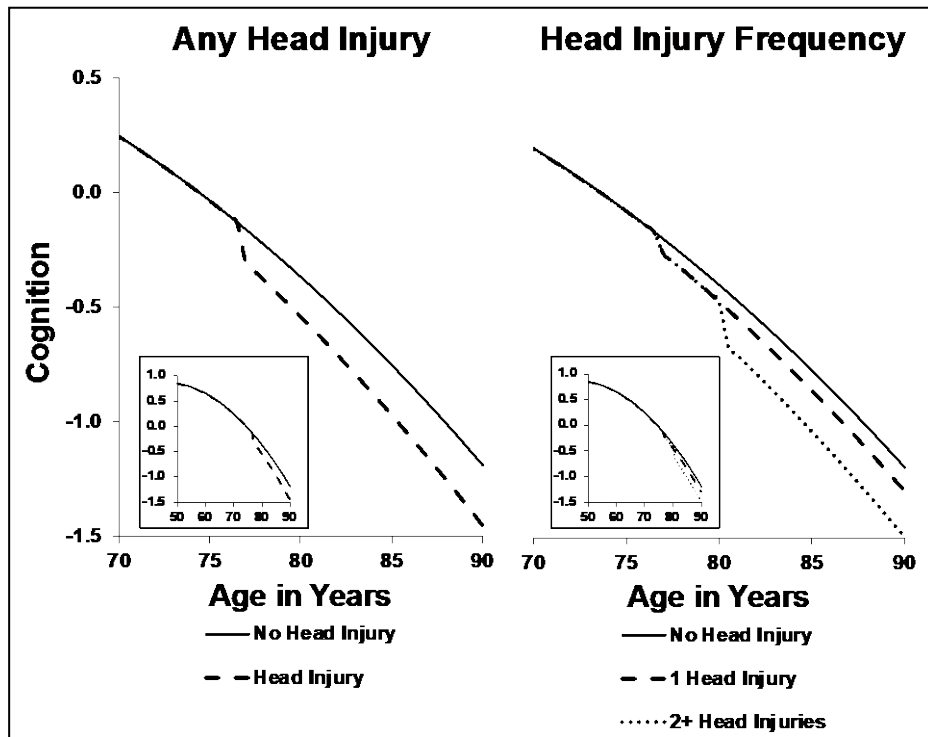


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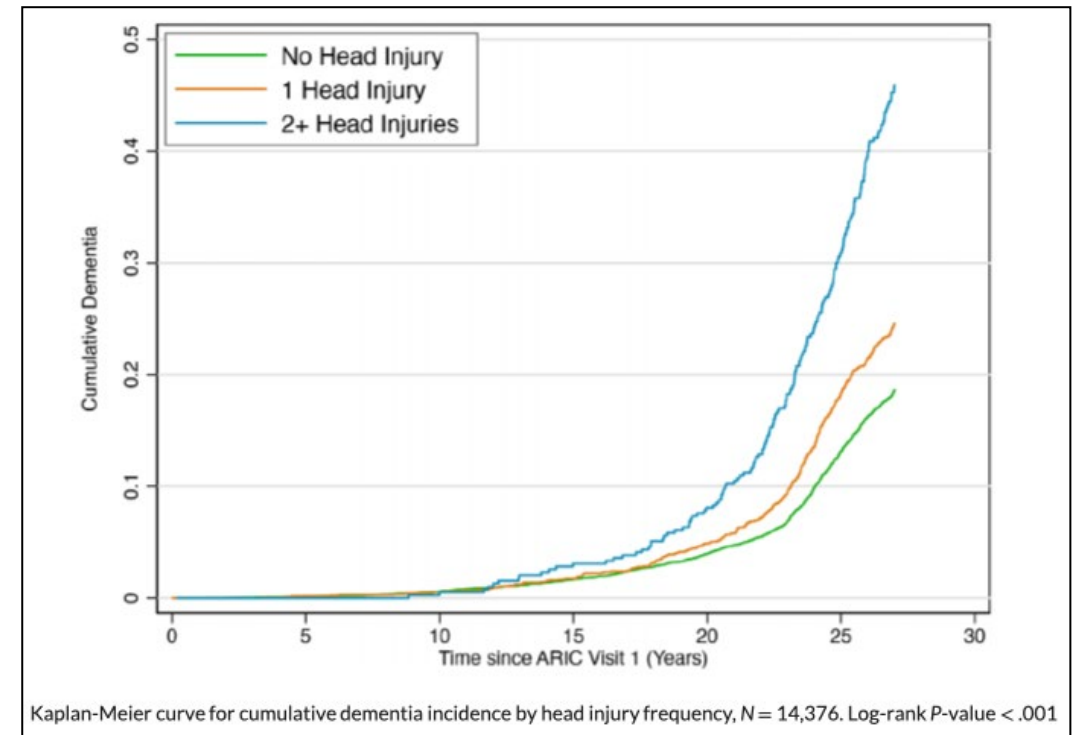
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# Long-term Outcomes after TBI – Cognitive Decline and Dementia

- ▶ Over 30-years, the difference in cognitive decline between individuals with versus without TBI is equivalent to individuals with TBI being 7.4 years older at baseline

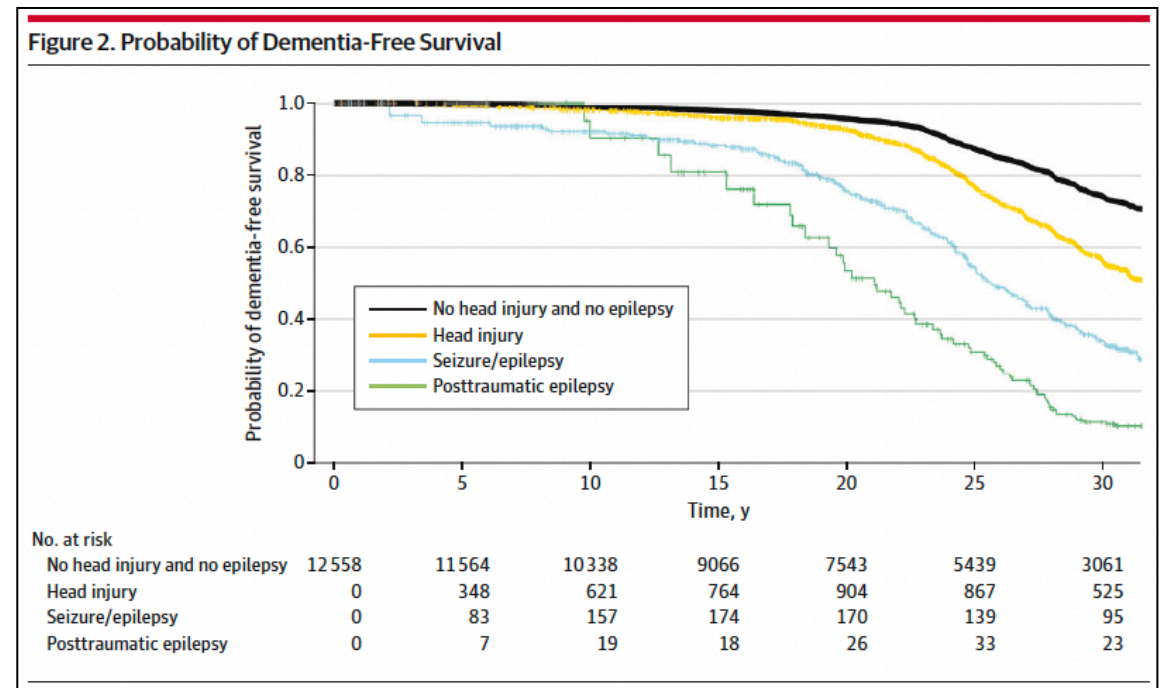
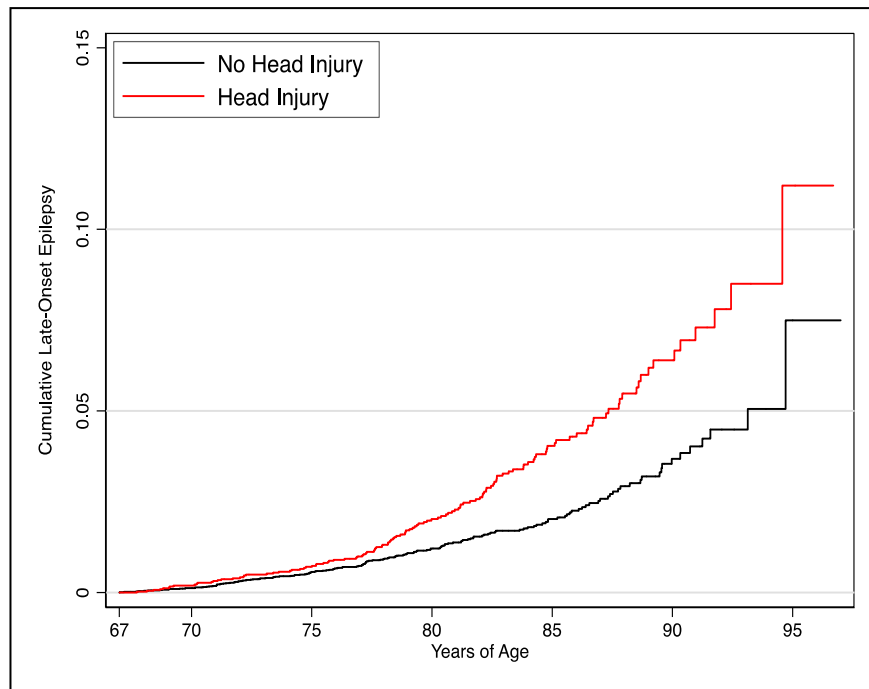


- ▶ TBI was associated with 1.4 times the risk of dementia over a median of 25 years



# Long-term Outcomes after TBI – Epilepsy and Dementia

- ▶ Among 8,878 participants, TBI was associated with 1.9 times the risk of epilepsy over a median of 11 years
- ▶ Over a median of 25-years of follow-up of 12,558 individuals, post-traumatic epilepsy was associated with greater dementia risk than TBI or epilepsy alone



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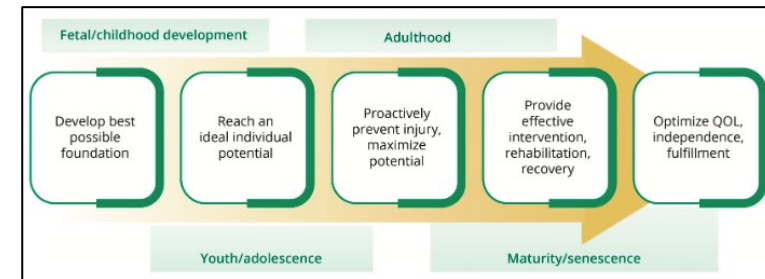
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# Research Gaps and Recommendations for Research Priorities

- ▶ Research to date has focused on TBI as an independent risk factor for later-life outcomes
- ▶ Recommendation: Focus on contextualizing associations of TBI with long-term outcomes through the lens of “brain health”

Brain health is a continuous state of attaining and maintaining the optimal neurologic function that best supports one's physical, mental, and social well-being through every stage of life.

- ▶ Recommendation: Consider how pre- and post-injury risk and resilience factors across the life course may influence associations of TBI with long-term outcomes
  - Medical comorbidities
  - Social and environmental determinants of health



- ▶ Recommendation: Prioritize leveraging existing longitudinal datasets to gain new insights (with appropriate consideration of methodological challenges)