

Head Trauma in Youth and Serious Mental Illness and Substance Use Disorders



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Lifetime History of TBI:	Any TBI	TBI with LOC	Mod/Sev TBI
Colorado non-institutionalized adults (Whiteneck et al.)	43%	24%	6%
Ohio non-institutionalized adults (Corrigan et al.)	unk	22%	3%

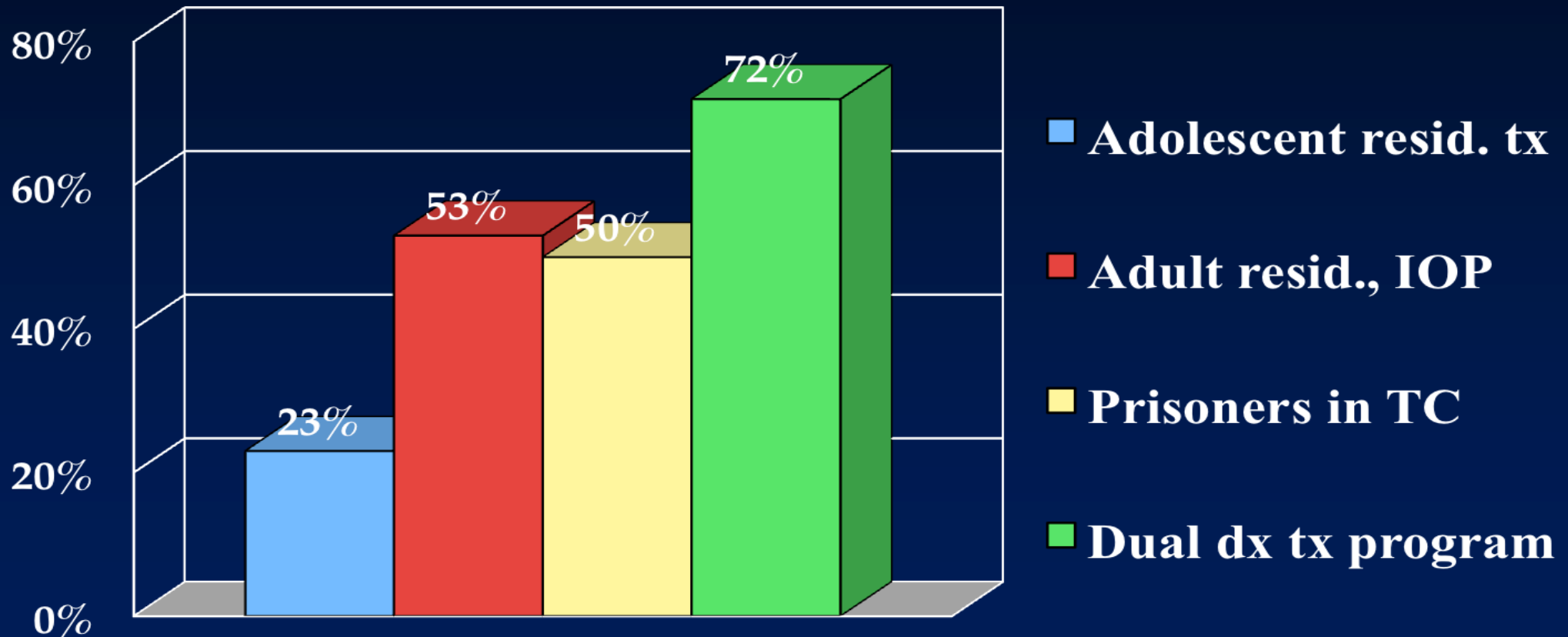
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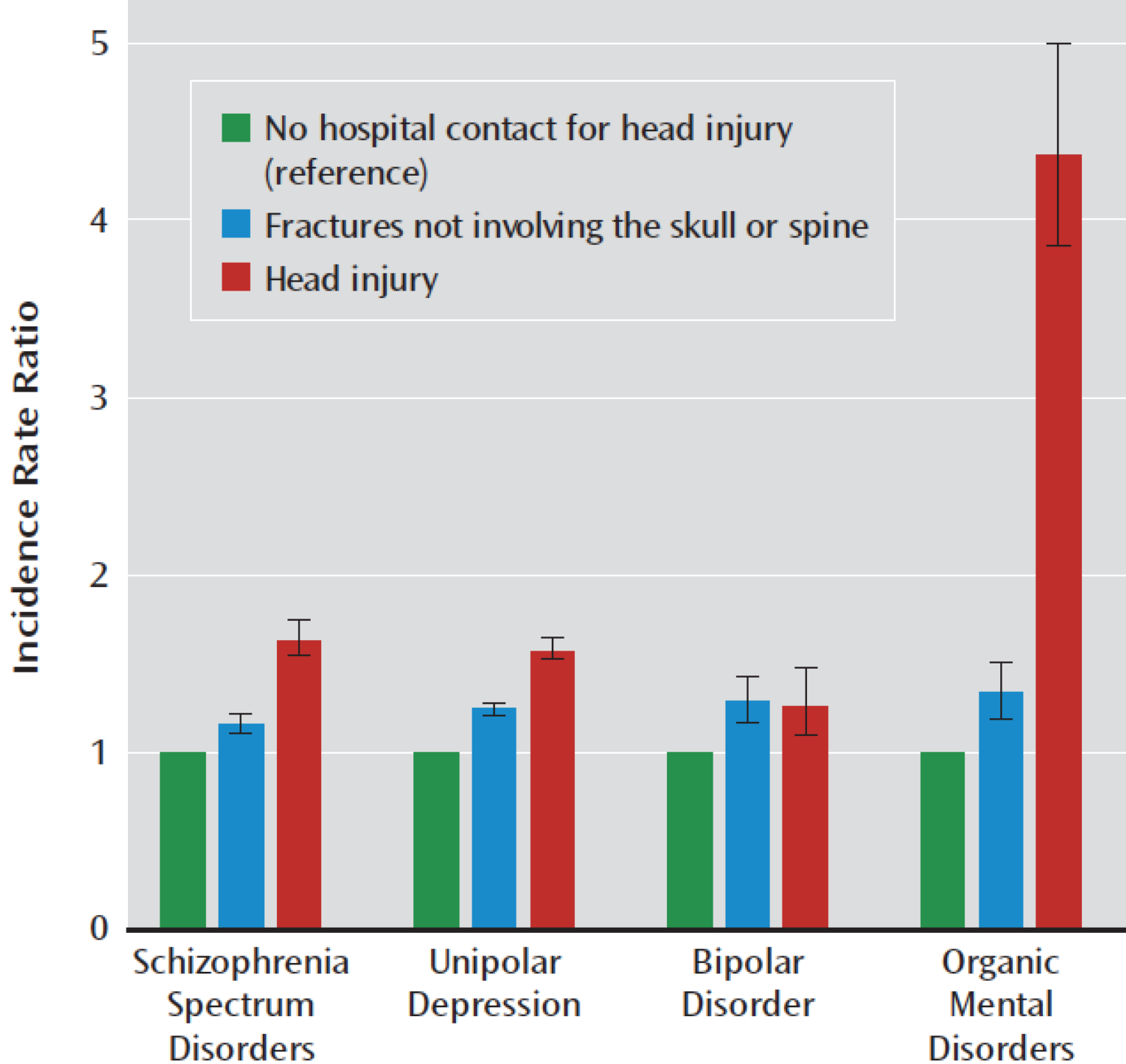
Substance Abuse Treatment Clients Who Have Had a TBI with Loss of Consciousness



Danish Population Registry

(Orlovska et al., 2014)

- 1.4 million people born in Denmark from 1977-2000
- Followed until 12/31/2010 (10-33 years)
- 114,000 with a hospital contact for a TBI
- Records matched to the Danish Central Psychiatric Register
- Case excluded if psychiatric diagnosis preceded TBI
- Compared to persons without injury or with orthopedic injuries



Suicide and Prior History of TBI

- Swedish mortality N=2.6 M (Fazel et al., 2014)
 - prior TBI vs same sex & age (AOR=3.3)
 - prior TBI vs uninjured siblings (AOR=2.3)
- Danish suicides N=7.4 M (Madsen et al., 2018)
 - prior TBI vs same sex, age & era (IRR=2.6)
 - prior severe TBI vs same sex, age & era (IRR=3.4)
- U.S. suicides N=270,074 (Ahmedani et al., 2018)
 - prior TBI vs same sex, age, psychiatric dx & SUD (AOR=8.8) [the highest of all co-morbid conditions]



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Addictive Behaviors

journal homepage: www.elsevier.com/locate/addictbeh

Commentary

The intersection of lifetime history of traumatic brain injury and the opioid epidemic

John D. Corrigan^a, Rachel Sayko Adams^{b,*}

Persons with TBI more likely prescribed opioids

- Headache and orthopedic pain common with TBI
- Persons with persistent post-concussive syndrome more likely prescribed opioids
- 70% of patients receiving rehabilitation for TBI prescribed opioids

Persons with TBI more susceptible to addictive influence of opioids

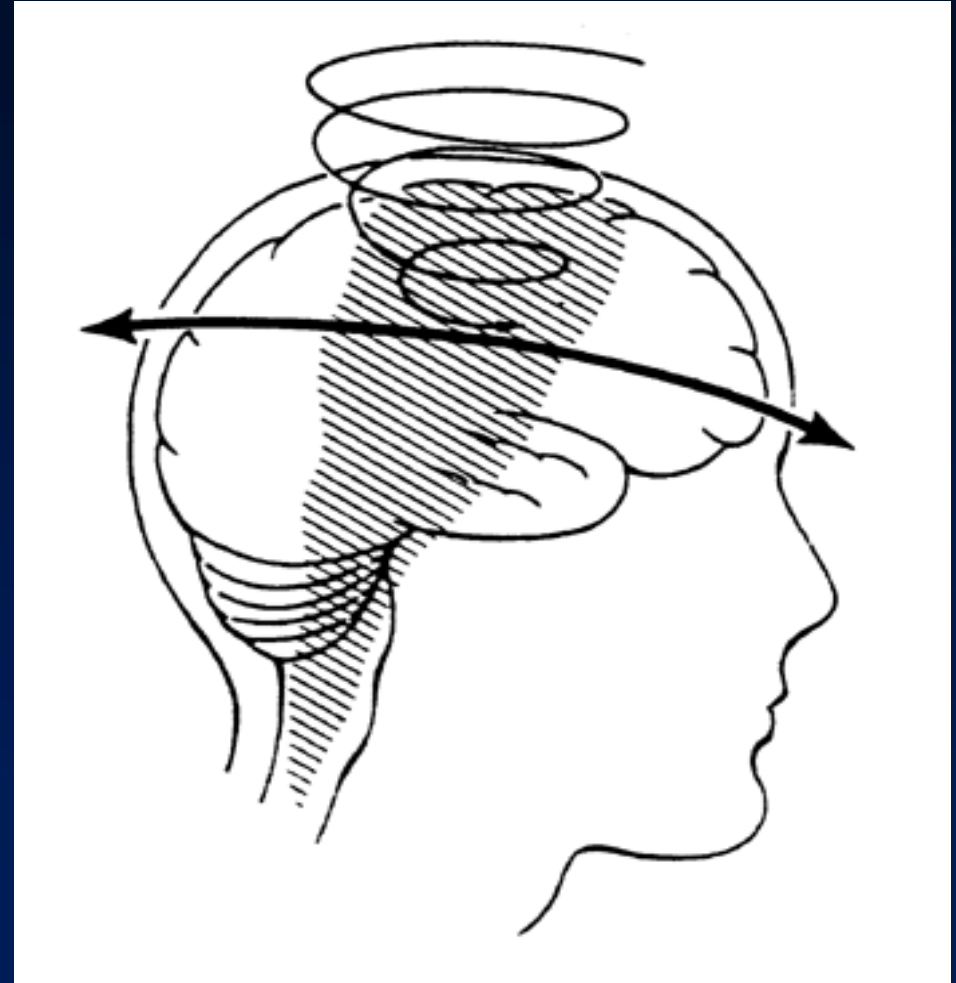
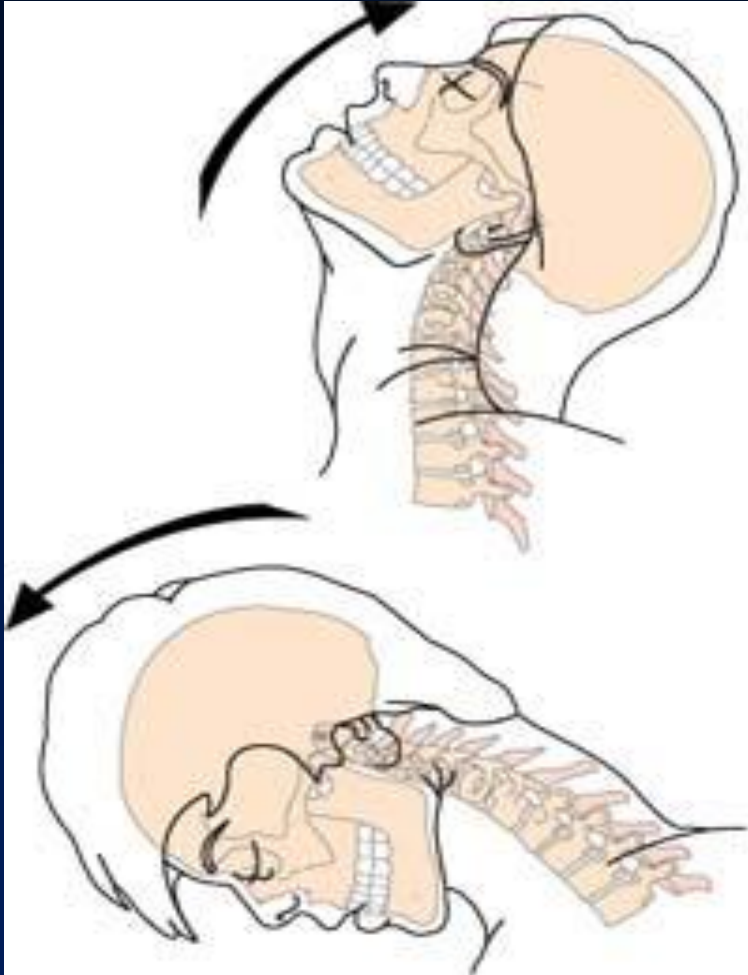
Persons with TBI have more challenges for successful treatment

Why would TBI be
associated with
behavioral problems?

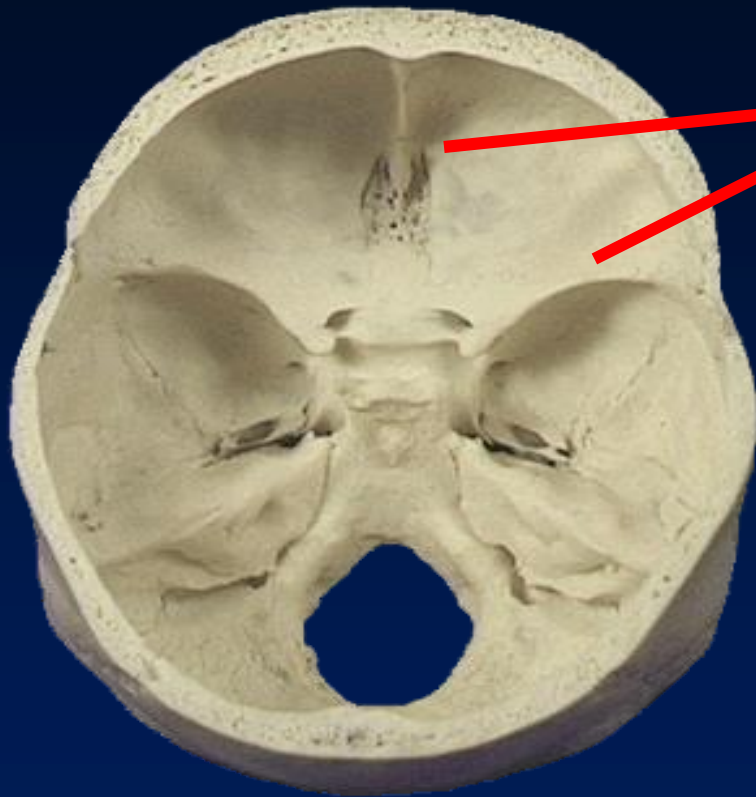
The “Fingerprint” of TBI

Frontal areas of the brain, including the frontal lobes, are the most likely to be injured as a result of TBI, regardless the point of impact to the head

The brain is set into motion along multiple axial planes



Interior Skull Surface



Bony ridges

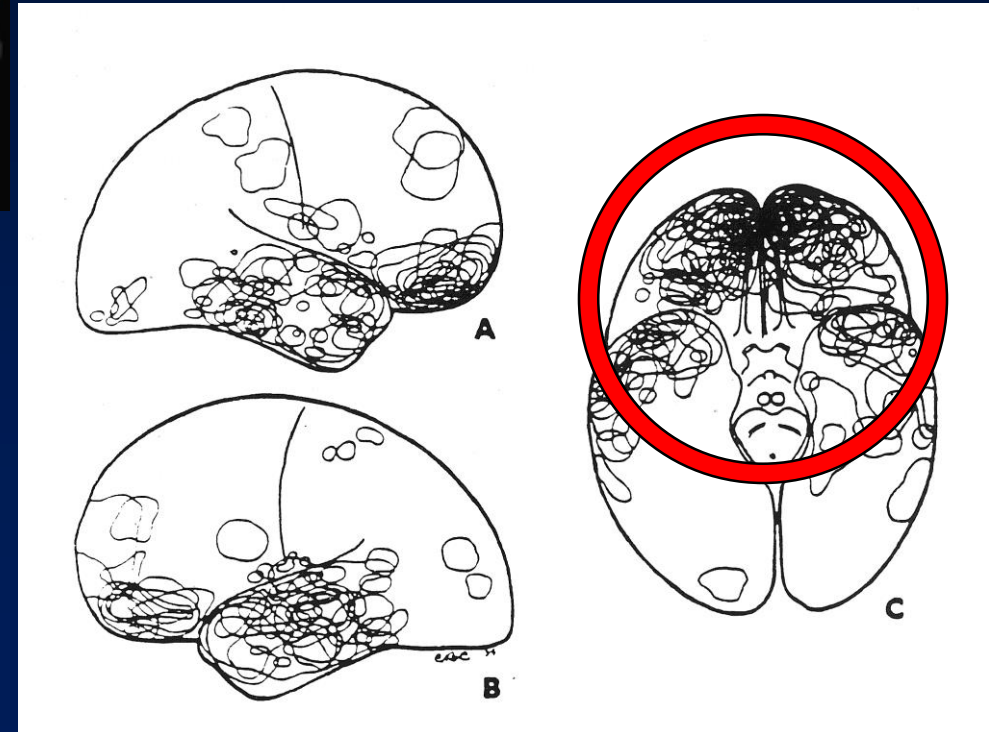


Injury from contact with skull



Areas of contusion in
(Courville, 1950)

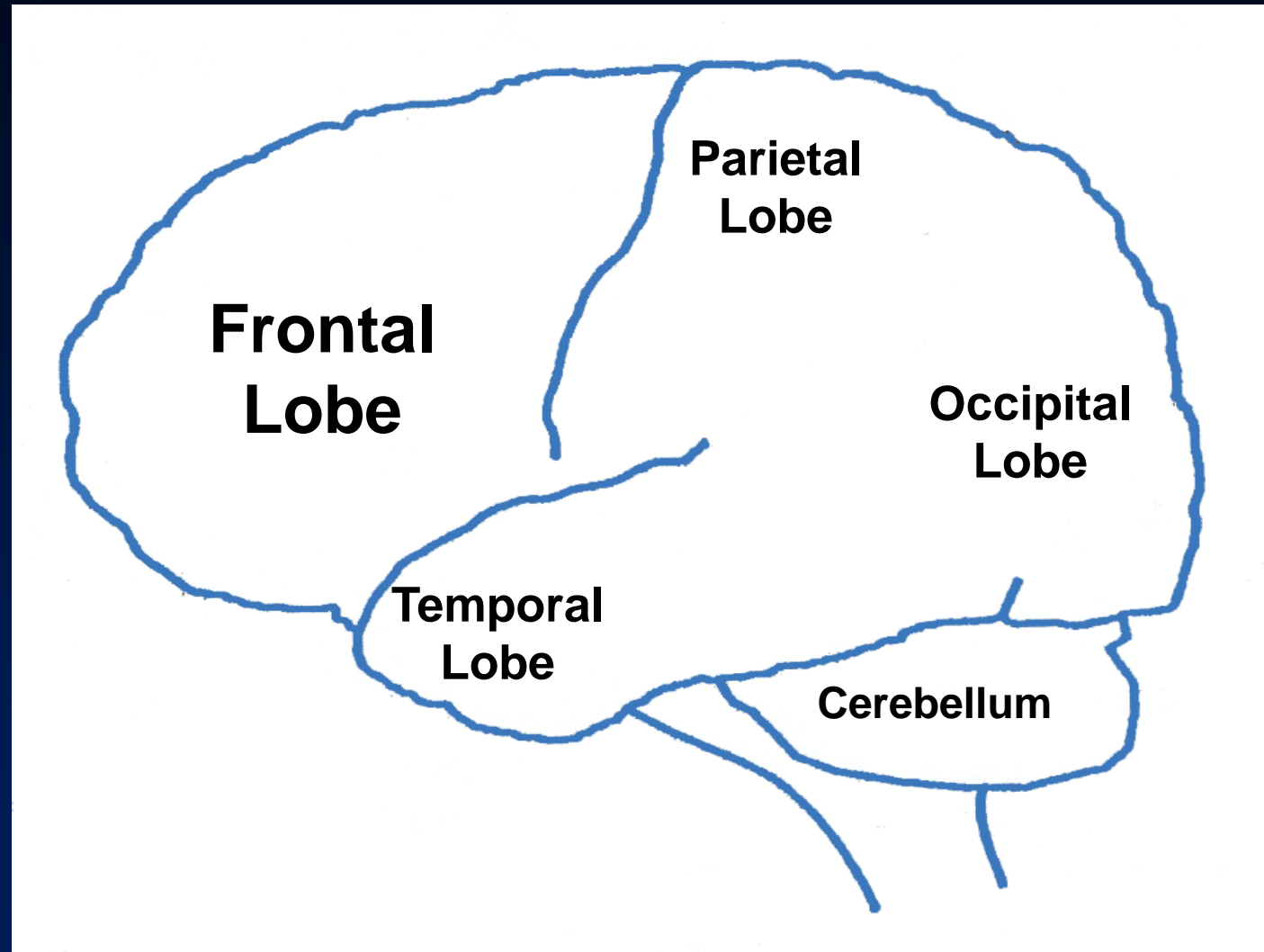
Loss of gray matter one
year post-injury
(Bigler, 2007)

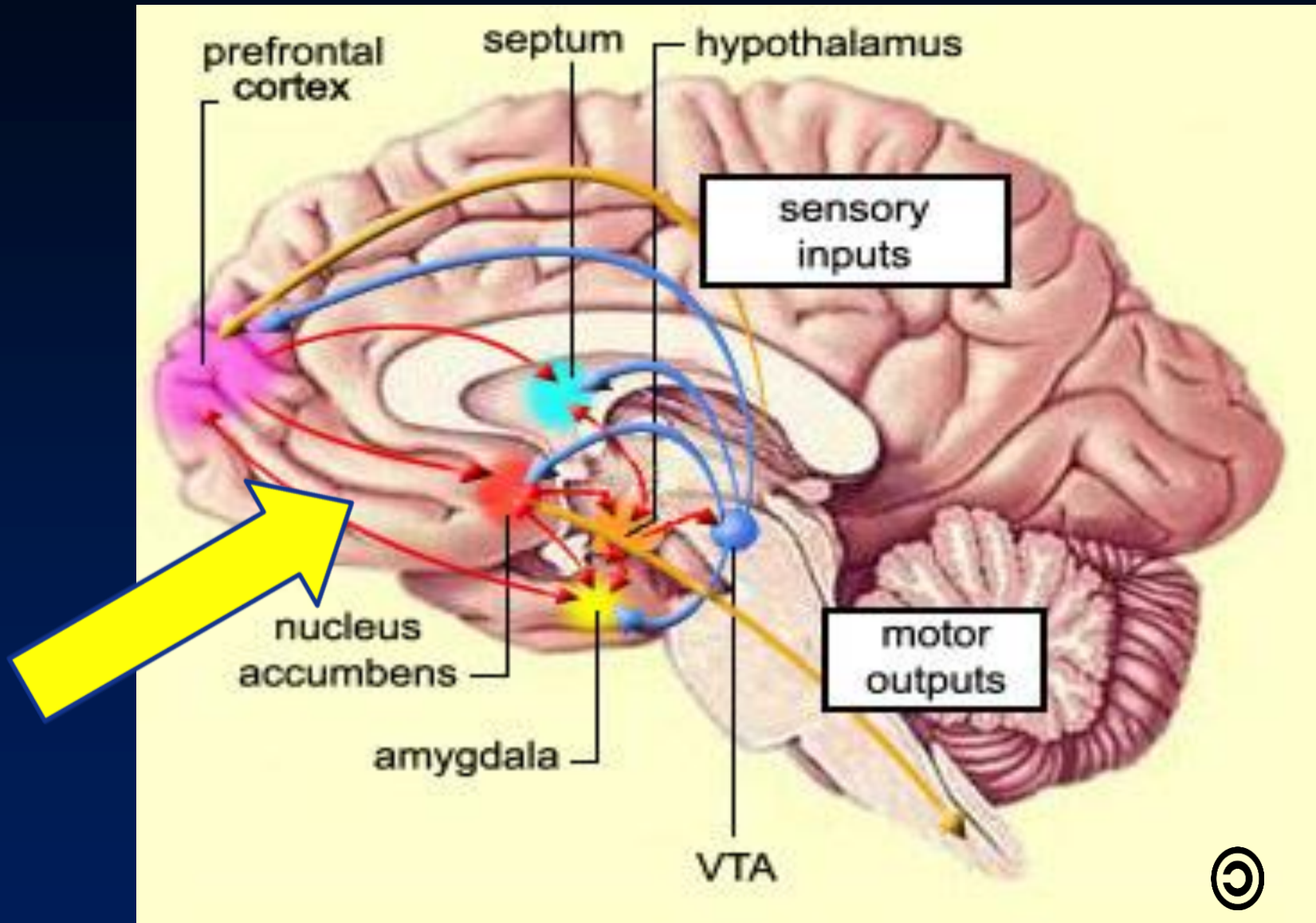


Simplified Brain Behavior Relationships

Frontal Lobes

- Initiation
- Problem solving
- Judgment
- Inhibition of impulse
- Planning/anticipation
- Self-monitoring
- Motor planning
- Personality/emotions
- Awareness of self
- Organization
- Concentration
- Mental flexibility
- Speaking





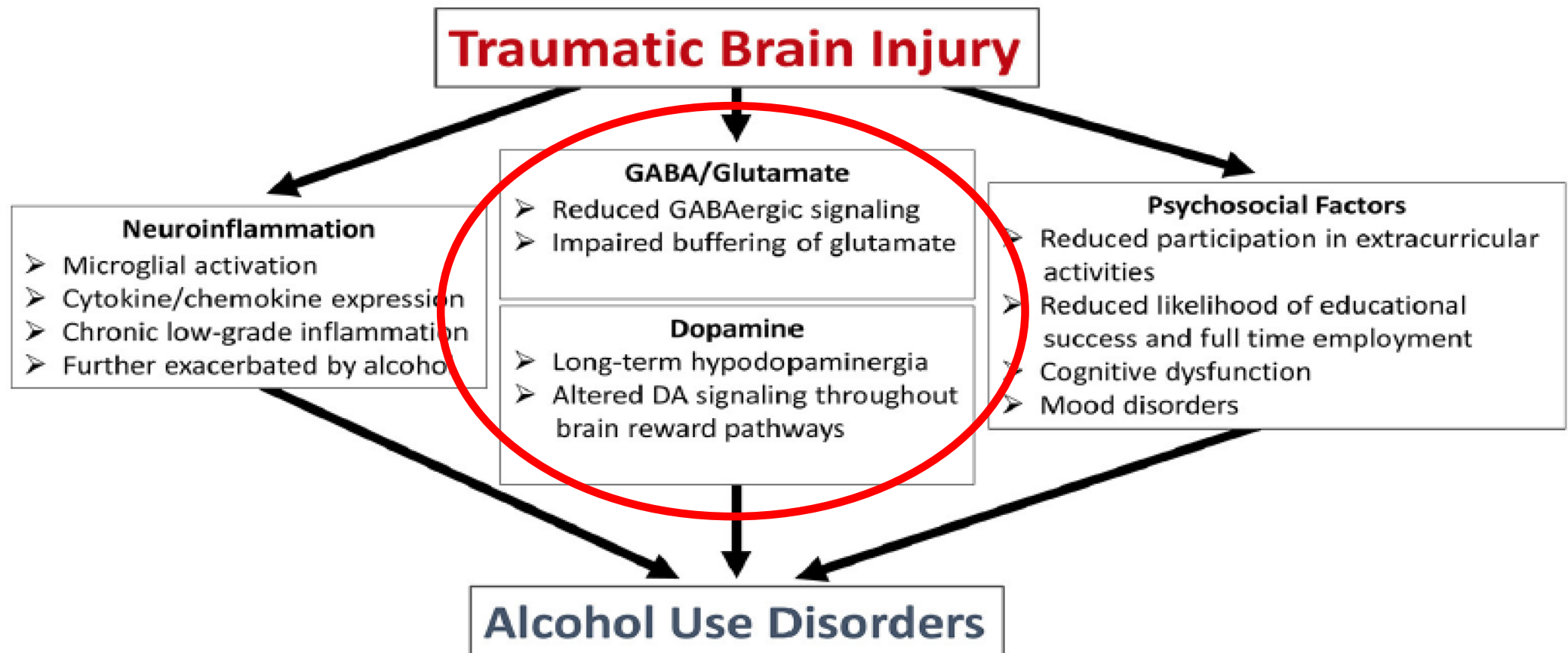
Traumatic Brain Injuries during Development: Implications for Alcohol Abuse

MINI REVIEW
published: 20 July 2017
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 **frontiers**
in Behavioral Neuroscience

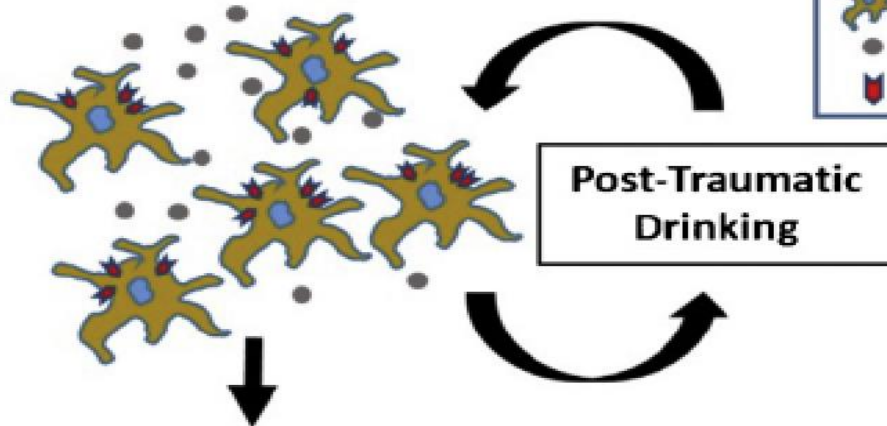
Zachary M. Weil* and Kate Karelina

Behavioral Neuroendocrinology Group, Department of Neuroscience, Center for Brain and Spinal Cord Repair, Ohio State University Wexner Medical Center, Columbus, OH, United States

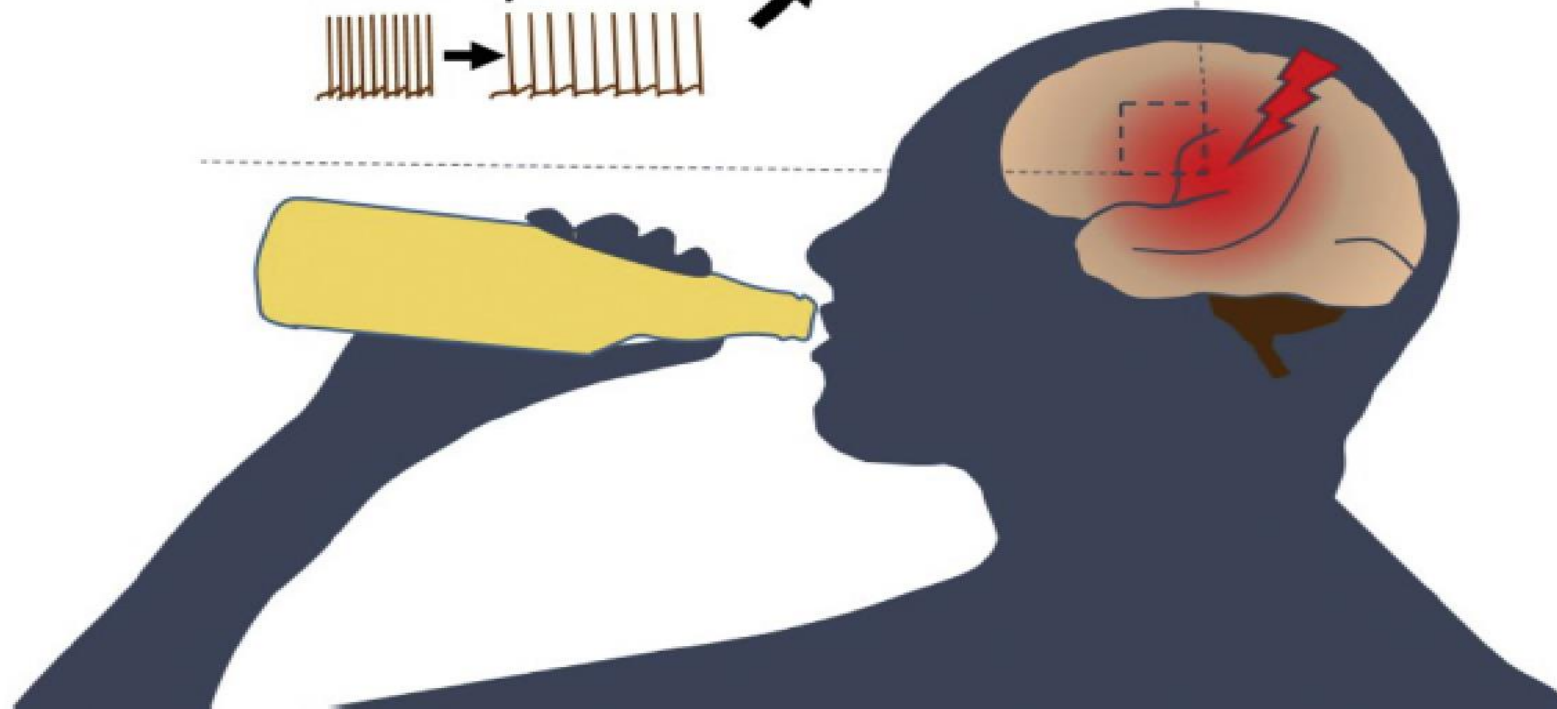
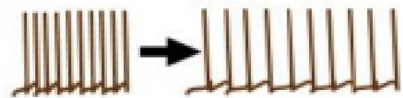


Neuroinflammation

TBI-induced Neuroinflammation



Reward dysfunction



Do childhood TBIs,
even if mild, have
adult consequences?



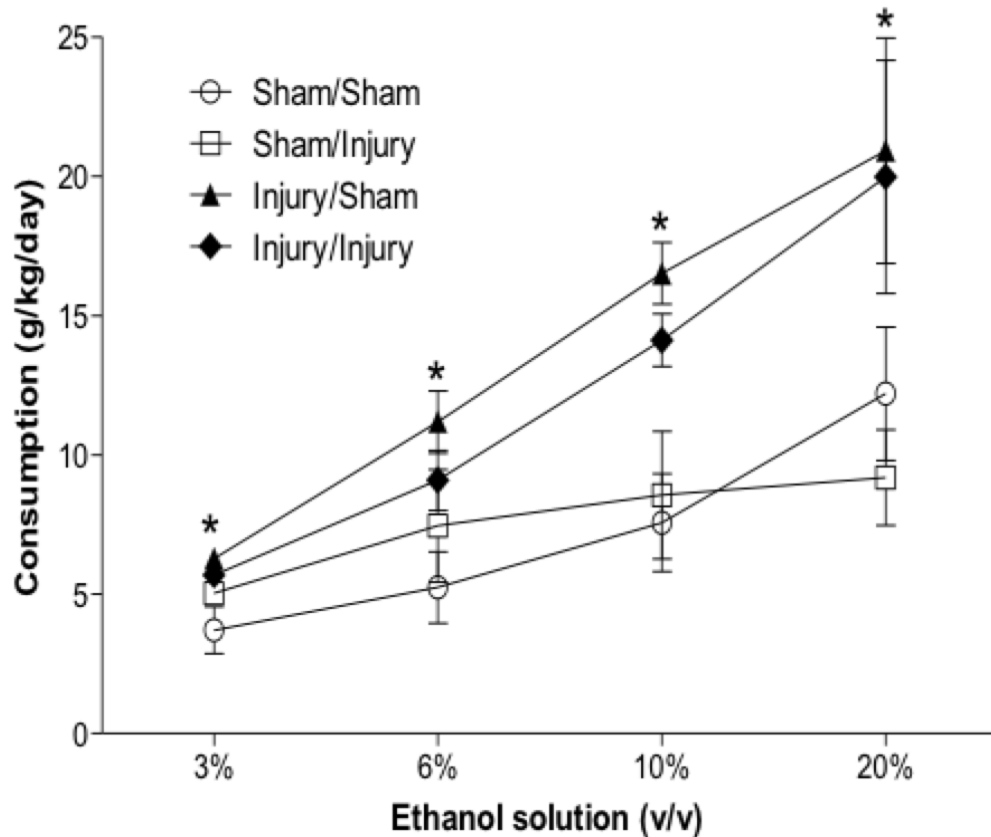
Childhood injuries predispose to adolescent &/or adult substance abuse

- Birth cohorts: Christchurch NZ (McKinlay & colleagues), Northern Finland (Winqvist, Timonen & colleagues), Avon UK (Kennedy, Heron & Munafo, 2017)
- Lifetime exposure: TBI Model Systems (Corrigan et al., 2013), TRACK-TBI (Dams-O'Conner et al., 2013)
- Age and sex effects in animal models (Lowing et al. 2014; Mayeux et al., 2015; Teng et al., 2015; Weil et al., 2016)

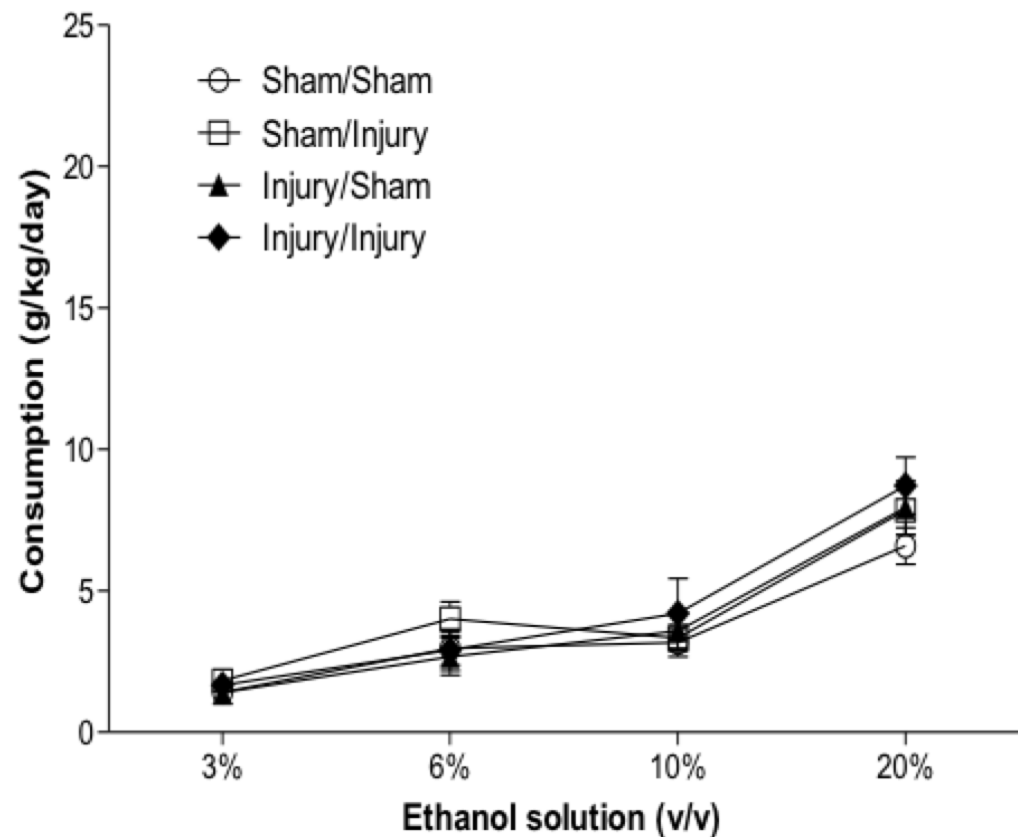
Juvenile TBI & Adult Alcohol Preference in Female Mice

(Weil et al., 2015)

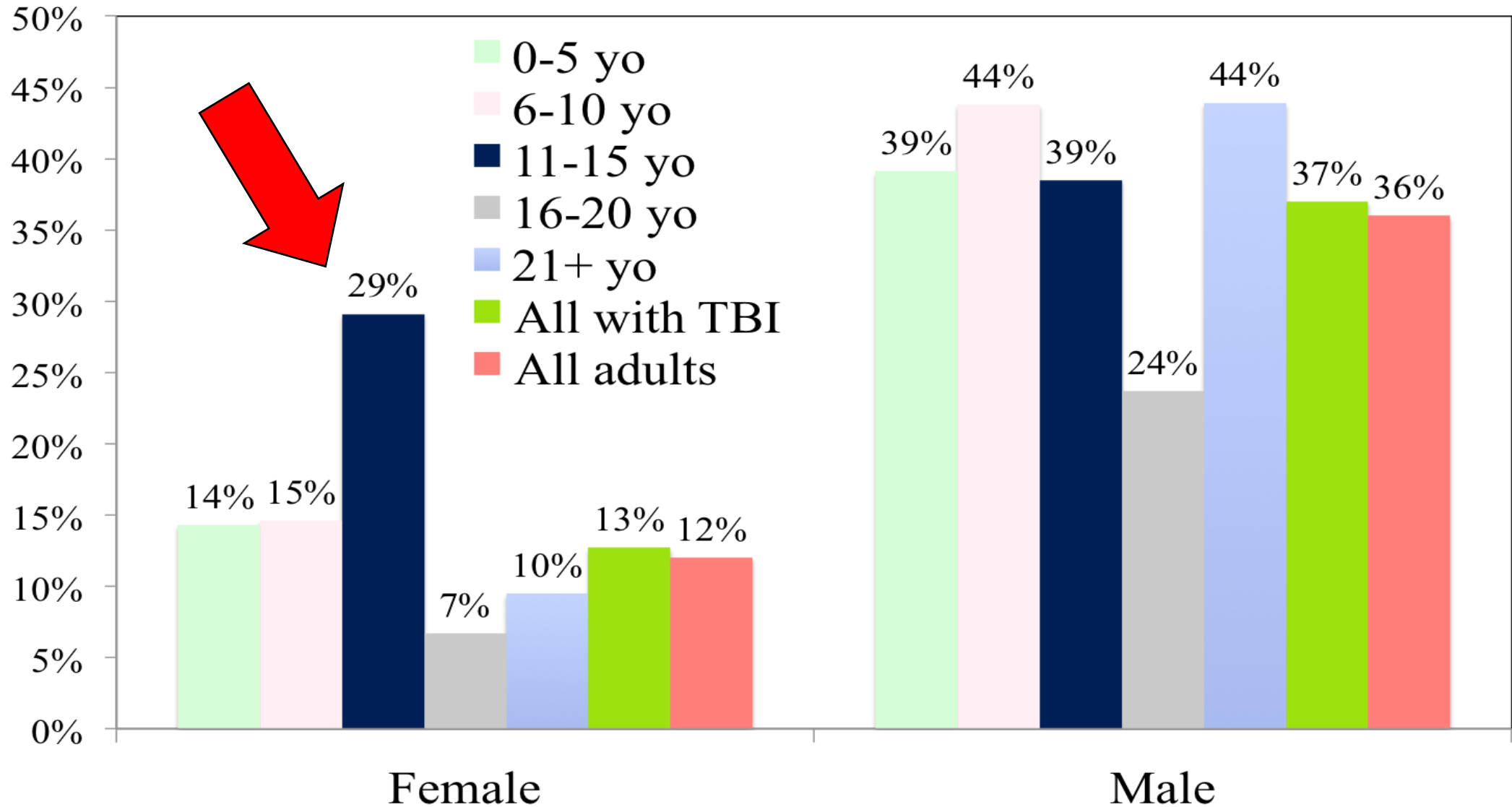
Ethanol Consumption - FEMALES



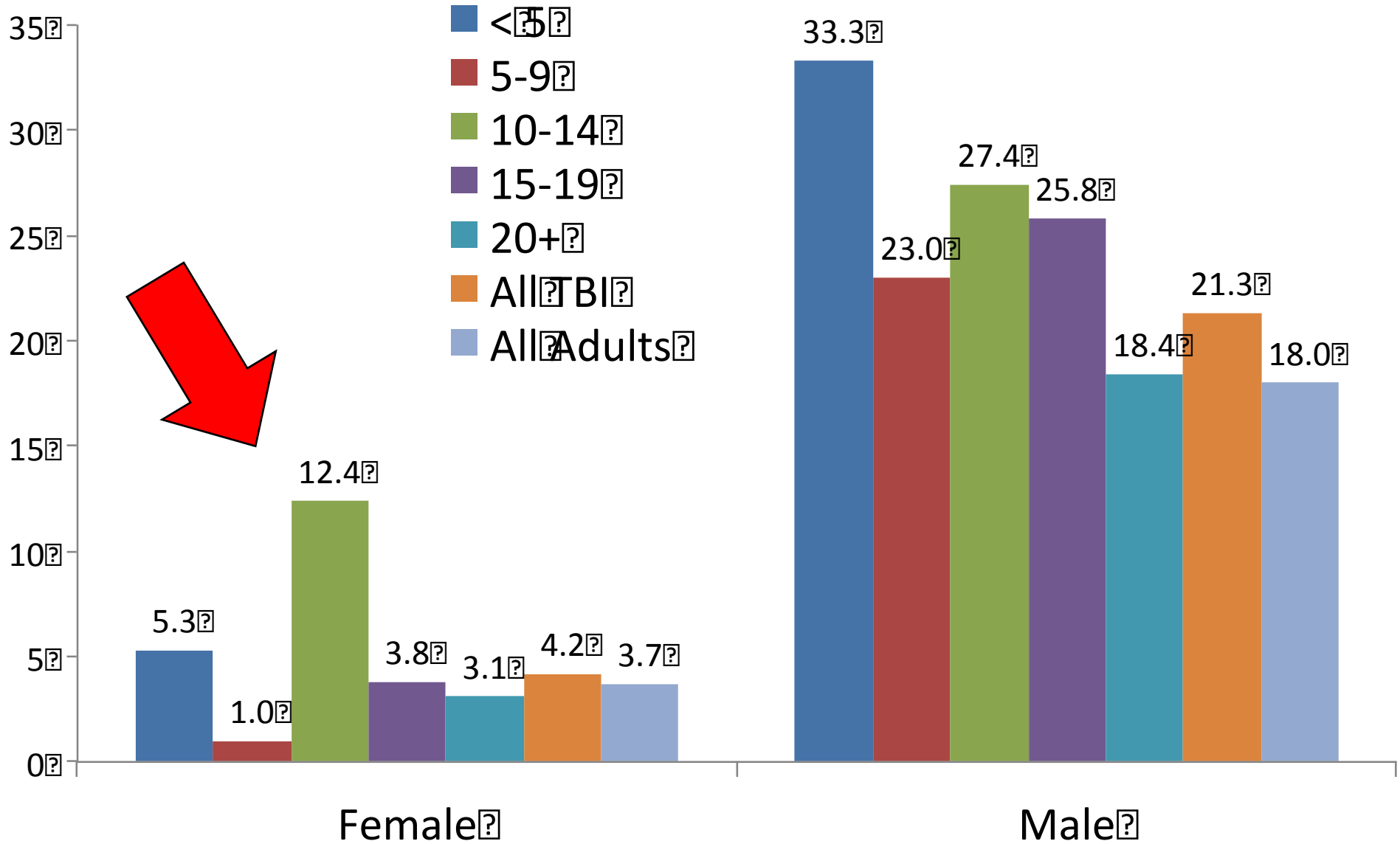
Ethanol Consumption - MALES



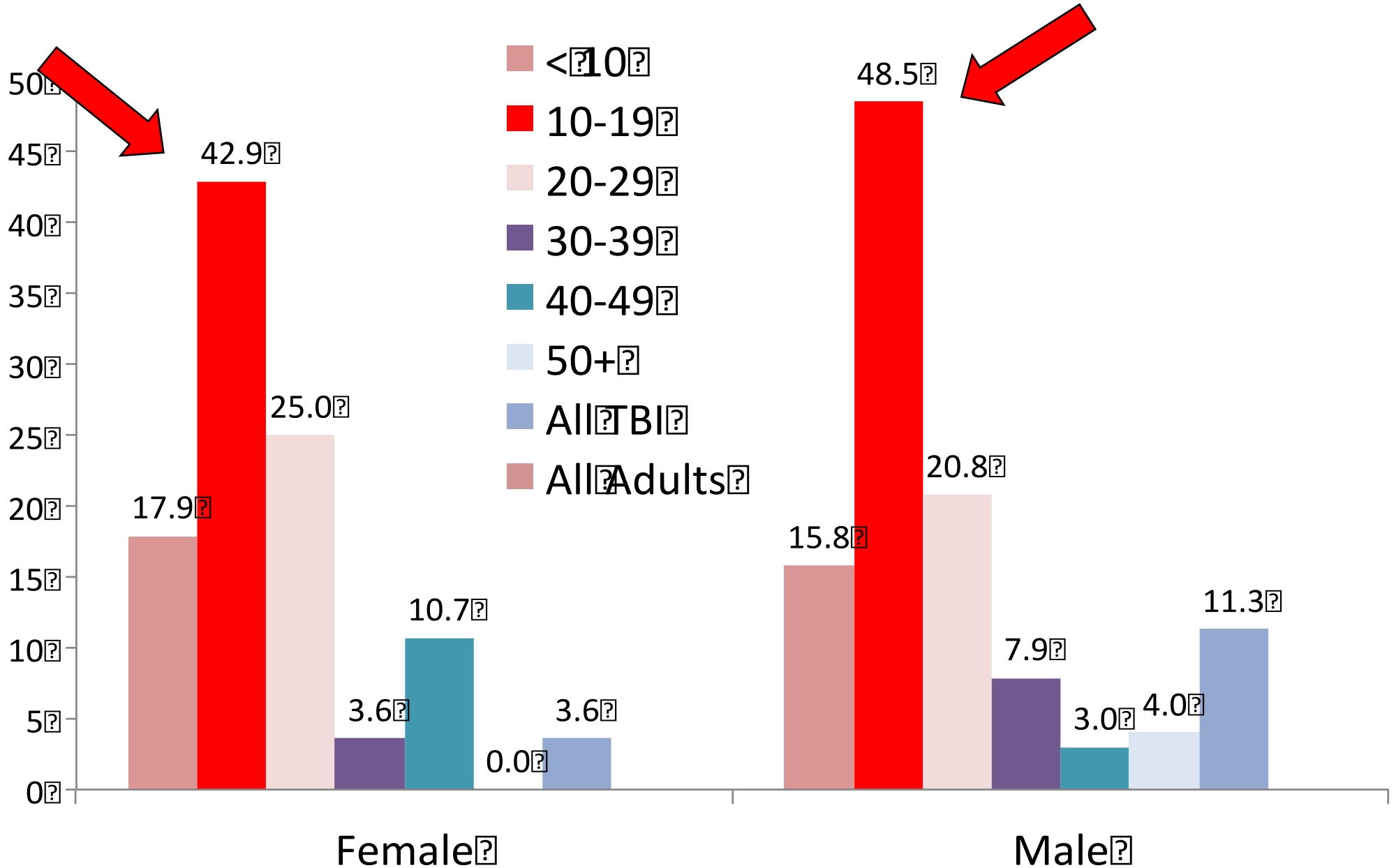
Adult Coloradoans Misusing Alcohol by Age at First TBI



Percent of Adult Ohioans' Binge Drinking by Age at First TBI



Percent of Adult Australians' Hazardous/Harmful Drinking by Age at First TBI



Swedish Population Registry

(Sariaslan et al., 2016)

- 1.1 million Swedish citizens born between 1973 and 1985 and followed to 2013
- 9.1% had a medically treated TBI by age 25
- Over next 10 years looked at likelihood of the following outcomes:
 - psychiatric treatment
 - psychiatric hospitalization
 - premature mortality
 - disability from work
 - receiving welfare benefits
 - low educational attainment

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Adjusted Odds of Negative Consequences from Any TBI

	Adjusted for demographics
Psychiatric visit	1.52
Psychiatric hospitalization	1.95

Adjusted Odds of Negative Consequences from Any TBI

	Adjusted for demographics	Demo-graphics + SES & parental history
Psychiatric visit	1.52	1.37
Psychiatric hospitalization	1.95	1.69

Adjusted Odds of Negative Consequences from Any TBI

	Adjusted for demographics	Demo-graphics + SES & parental history	Demo-graphics + SES & parental history + siblings without TBI
Psychiatric visit	1.52	1.37	1.31
Psychiatric hospitalization	1.95	1.69	1.57

x Age at 1st Injury

	Ages 0-4	Ages 5-9	Ages 10-14	Ages 15-19	Ages 20-24
Psychiatric visit	1.18	1.19	1.40	1.60	1.78
Psychiatric hospitalization	1.24	1.33	1.68	2.04	2.47

x Age 1st Injury compared to Siblings Without TBI

	Ages 0-4	Ages 5-9	Ages 10-14	Ages 15-19	Ages 20-24
Psychiatric visit		1.11	1.28	1.24	1.53
Psychiatric hospitalization			1.42	1.62	1.92

x Age 1st Injury compared to Siblings Without TBI

	Ages 0-4	Ages 5-9	Ages 10-14	Ages 15-19	Ages 20-24
Psychiatric visit		1.11	1.28	1.24	1.53
Psychiatric hospitalization			1.42	1.62	1.92

Above when limited to Mild TBIs Only

	Ages 0-4	Ages 5-9	Ages 10-14	Ages 15-19	Ages 20-24
Psychiatric visit		1.10	1.27	1.27	1.67
Psychiatric hospitalization			1.40	1.66	1.98

Do childhood TBIs, even if mild, have adult consequences?

- Causality remains elusive, but alternate hypotheses are narrowing.
- Mounting evidence for a biological mechanism.



It is worthwhile to know the
lifetime history of TBI in
the people we treat.

THANK YOU

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