

## **Estimating the Global Incidence of Traumatic Brain Injury**

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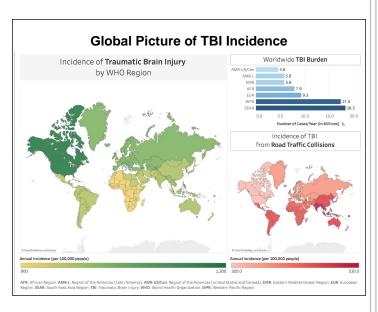


#### Introduction

Traumatic brain injury (TBI) – the 'silent epidemic' – contributes more to death and disability worldwide than any other traumatic insult. Yet, TBI incidence and distribution across regions and socioeconomic divides remain unknown. In an effort to promote advocacy, understanding, and targeted intervention, we sought to quantify the case burden of TBI across World Health Organization (WHO) regions and World Bank (WB) income groups.

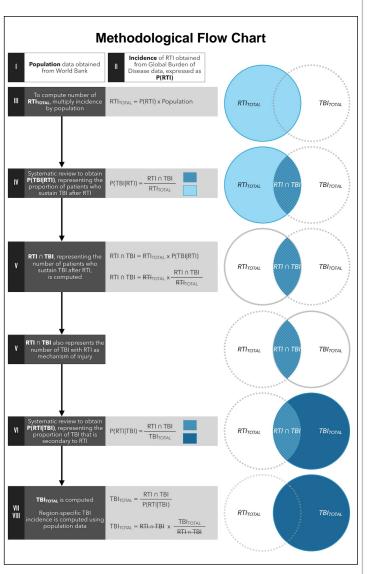
#### **Methods**

Open-source epidemiological data on road traffic injuries were used to model the incidence of traumatic brain injury using literature-derived ratios. First, a systematic review on the proportion of road traffic injuries (RTI) resulting in TBI was conducted, and a meta-analysis of study-derived proportions was conducted. Next, a separate systematic review identified primary source manuscripts describing mechanisms of injury contributing to TBI, and an additional meta-analysis produced a proportion of TBI that is secondary to the mechanism of RTI. Then, the incidence of RTI published by the Global Burden of Disease Study 2015 (GBD 2015) was applied to these two ratios to generate the incidence and estimated case volume of TBI for each WHO region and WB income group.



## **Learning Objectives**

- Estimate the global incidence of TBI
- Model incidence figures from global disease databases



## Acknowledgements

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## Results

Relevant manuscripts and registries were identified via systematic review; study quality was higher in high-income countries (HICs) compared with lowand middle-income countries (LMICs). Sixty-nine million (95% CI [64-74 million]) individuals worldwide are estimated to sustain TBI each year. The proportion of TBI resulting from road traffic collisions was greatest in Africa and South-East Asia (both 56%) and lowest in North America (25%). The incidence of RTI was similar in South-East Asia (1.5% of population per year) and Europe (1.2%). Overall incidence of TBI per 100,000 people was greatest in North America (1,299; 95% CI [650-1,947]) and Europe (1,012; 95% CI [911-1,113]) and least in Africa (801; 95% CI [732-871]) and the Eastern Mediterranean (897; 95% CI [771-1,023]). LMICs experience nearly three times more cases of TBI proportionally than HICs.

# Proportion, incidence, and volume of traumatic brain injury (TBI) worldwide by World Bank income group and WHO region.

									TBI Incidence	
Grouping	Population	P(RTI)	RTITOTAL	P(TBI RTI)	RTI∩TBI	P(RTI TBI)	TBITOTAL	95% CI	(per 100,000)	95% CI
LMIC	6,160,384,080	0.01308	80,577,165	0.344	27,727,408	0.555	49,954,794	30,597,109 -	811	497 - 1,125
								69,312,478		
HIC	1,188,267,169	0.01300	15,448,795	0.289	4,464,702	0.249	17,903,925	8,963,471 -	1,507	754 - 2,259
								26,844,378		
AFR	990,267,592	0.01292	12,798,416	0.344	4,404,063	0.555	7,934,534	7,247,018 -	801	732 - 871
								8,622,050		
AMR-L	634,315,984	0.01368	8,677,844	0.335	2,906,427	0.504	5,765,538	4,840,302 -	909	763 - 1,055
								6,690,774		
AMR-	357,270,594	0.01121	4,004,087	0.289	1,157,181	0.249	4,640,418	2,323,192 -	1,299	650 - 1,947
US/Can								6,957,645		
EMR	648,060,427	0.01300	8,425,138	0.330	2,783,097	0.479	5,814,715	4,999,254 -	897	771 - 1,023
								6,630,175		
EUR	916,755,857	0.01201	11,007,015	0.310	3,416,926	0.368	9,278,934	8,354,033 -	1,012	911 - 1,113
								10,203,834		
SEAR	1,928,530,522	0.01529	29,484,574	0.344	10,145,937	0.555	18,279,321	15,387,571 -	948	798 – 1,098
				0.007				21,171,070	924	mom 1 0 c t
WPR	1,873,450,273	0.01405	26,331,186	0.336	8,853,523	0.511	17,312,953	14,746,696 – 19,879,210	924	787 – 1,061
Global	7,348,651,249						69,026,412	64,213,245 -	939	874-1,005
								73,839,580		

### **Conclusions**

Sixty-nine million [64-74 million] individuals are estimated to suffer TBI from all causes each year, with the South-East Asian and Western Pacific regions experiencing the greatest overall burden of disease. Head injury following road traffic collision is more common in LMICs, and the proportion of TBI secondary to road traffic collision is likewise greatest in these countries. Meanwhile, the estimated incidence of TBI is highest in regions from where higher-quality data exist, specifically in North America and Europe.