

Definitions and epidemiology of TBI

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International collaboration

TBI is a global problem

He may have been about as "cuddly as a cactus and as charming as an eel," but the Grinch definitely has enduring appeal.

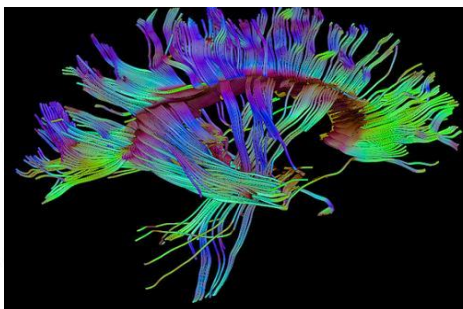
The book that introduced the grumpy, green Dr. Seuss creation who tried to thwart Christmas turns 50 next year.

To get a jump on the event, Warner Home Video last month released a 50th Birthday Deluxe Edition DVD of the animated special *Dr. Seuss' How the Grinch Stole Christmas*, the first time it has been remas-

tered. And tonight, the 20-minute special created in 1966 by veteran animator Chuck Jones marks its 40th anniversary as it airs on ABC (8 ET/PT).

"If yuletide comes, so comes the Grinch," says Audrey Geisel, 85, widow of Ted Geisel, aka Dr. Seuss, who died in 1991 at age 87. "Year after year after year *The Grinch* came out, and that rather surprised me as the years went by, but then I finally said it's going to be there every single season."

The book, which Seuss biographer Kathleen Krull says in a DVD interview took him "a week" to write (although the ending took "months"), is a perennial favorite. The animated special over the past five years has averaged 6.4 million viewers each airing. And the DVD, says Dorinda Marticorena of Warner Home Video, "every



holiday season sells so well."

The appeal, Geisel says, is the Grinch's message, of course:

Maybe Christmas, he thought, doesn't come from a store. Maybe Christmas ... perhaps ... means a little bit more.

"Ted liked the Grinch partic-

ularly because it went against the normal way of looking at Christmas," says Geisel in a phone interview from her home on a hilltop in La Jolla, Calif. (Parked outside is her beloved gray 1984 Cadillac with the GRINCH plates.)

The holiday had become too materialistic, she says, and "Ted wanted to bring back the ho, ho without all the dough, dough. Making a heart grow three times is a nice thought."

The craziness of Christmas was something Dr. Seuss felt even before he wrote about the Grinch, says Bill Dreyer, curator of the Seuss art collection.

"I just reviewed an artwork that Ted created in 1938 called *Xmas Chaos*," Dreyer says. "This has never been seen. It's been in a private collection for 70 years. It talks about in this artwork 20 years before *Grinch*, the treadmill or whirlpool of the holiday. You jump on and get thrown off. It's interesting that the Grinch is the medium through which Ted delivers his philosophical idea about the holiday (being) hijacked by commercialization."

Colorado

Feb 26 – March 2,
2012

Andrew Maas

Traumatic Brain Injury

- A silent epidemic
- A deadly killer
- A field in medicine with one of the highest unmet needs
- Can strike us all
- Changes lives for ever

Facts and Figures

- Leading cause of death and disability in young adults
- Annual number of deaths:
 - EU*: 60.000
 - US: 50.000
 - Globally: 1.5 million
- Number of individuals living with disability from TBI:
 - EU*: 7.7 million
 - US: 5.3 million

WHO: "2020: injuries are expected to rank No.3 as global burden of diseases"

* Old EU member states

Life long disability is common and includes:

- Impaired memory and problem solving
- Difficulty in managing stress and emotional upsets
- Problems in controlling ones temper
- Disturbed relationships
- Reduced life expectancy (3 times more likely to die)

Facts and Figures

- A major problem in emerging economies
- World wide increase
- Annual cost for TBI:

US: \$ 60 billion

Life time per patient cost:

\$ 0.4- 4 million

- US federal funding allocated per person per year:
 - AIDS: \$ 12.111,-
 - Breast Cancer \$ 295,-
 - TBI: \$ 2,25

Annual incidence TBI/100.000

	US	EU
- All TBI	538	546
- Admission	85	235
- Severe	25*	25~
Populations	307m	830m

* Langlois, CDC, 2006

~Tagliaferri et al 2006

Data collected in the literature for European countries for severe and moderate TBI

Region	Incidence/ 100.000	Reference
USA	103	Kelly and Becker 2001;Thurman 1999; Langlois et al 2006
EU -Germany -Italy -Denmark -Finland -Norway -Sweden	235 340 212-372 157-265 101 83-229 354-546	Tagliaferri et al 2006 Firsching and Woischneck 2001 Servadei et al 1988, 2002; Baldo 2003 Engberg and Teasdale 2001 Koskinen and Alaranta 2008 Ingebritsen et al 1998; Andelic et al 008 Andersson et al 2003; Styrke et al 2007

Global incidence of TBI

Region	Incidence/ 100.000	Reference
USA	103	Kelly and Becker 2001; Thurman 1999; Langlois et al 2004
EU	235	Tagliaferri et al 2006
Brazil	360	Maset and Andrade 1993
China	55-64	Zhao and Wang 2001
Pakistan	50	Raja et al 2001
South Africa	316	Nell and Brown 1991

Problems in comparing data

- Under-reporting of mild TBI
(rural areas, underdeveloped health care, sports)

Definition of TBI (ICD-9) head injury vs TBI

- Prehospital deaths (include or not, cause of death)
- No prevalence data (requires long term follow-up)
- Mortality (cause of death, additional injuries)
- Report ED visit, admission
(different admission criteria), discharge reports

Definition of TBI

“TBI is defined as an alteration in brain function, or other evidence of brain pathology, caused by an external force”

Menon et al 2010. Position statement: definition of traumatic brain injury.
Arch Phys Med Rehabil. Nov;91(11):1637-40.

Definition of TBI

- Background:
 - Increased awareness of additional injury mechanisms
 - Increasing recognition of the impact of mild TBI
 - Better understanding of more subtle neurocognitive sequelae
 - Technological advances for diagnosis
- Preference for clear and concise definition
- Necessary for consistent and transparent reporting

Alteration in brain function

- Any period of loss of or a decreased level of consciousness (LOC)
- Any loss of memory for events immediately before or after the injury (PTA)
- Neurological deficits
- Any alteration in mental state at the time of the injury

Diagnostic confounds

Mild Blast TBI

vs.

PTSD

Changing epidemiology

Worldwide increase

‘The motorcar emerged as the most persistent killer in the western world’.

(Gilbert 1997)

High income countries: decrease with a shift to older age groups



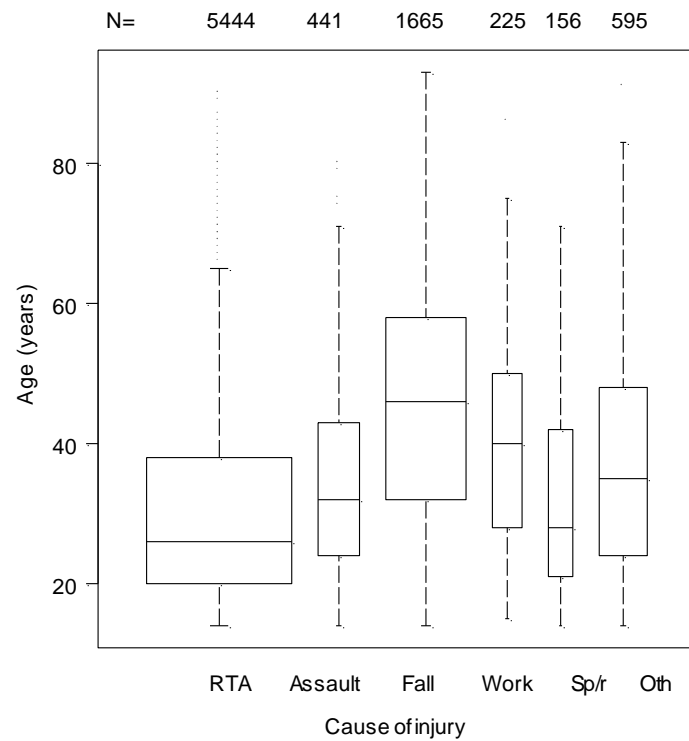
Increasing age in TBI

	Year of study	N	Median age	% > 50 yrs
Traumatic Coma Data Bank ⁷	1984 –1987	746	25	15
UK 4 Center study ⁸	1986 –1988	988	29	27
EBIC Core Data Survey ⁹	1995	847	38	33
Rotterdam cohort study (unpubl)	1999 – 2003	774	42	39
Austrian Severe TBI study ¹⁰	1999 – 2004	415	48	45

Consequences of increasing age

- Different pathology
- Co-morbidity
- Use of anticoagulants

Cause - Age



Odds Ratio

Ratio of the odds for poorer outcome in the presence of the predictor versus the odds in the absence of the predictor.

OR = 1: no effect

If CI does not include '1': statistically significant

Strength of relationship between cause of injury and outcome

	RTA*	Assault	Work-related	Sports/recreation	Other
Proportional OR					
Unadjusted	0.66 (0.60-0.73)	0.66 (0.52-0.84)	0.88 (0.68-1.14)	0.45 (0.28 –0.71)	0.91 (0.76-1.09)
Adjusted for age	1.08 (0.96-1.21)	1.03 (0.76-1.40)	1.21 (0.91-1.63)	0.74 (0.51-1.09)	1.06 (0.87-1.29)

Is outcome changing?

Relationship of aggressive monitoring and treatment to improved outcomes in severe traumatic brain injury

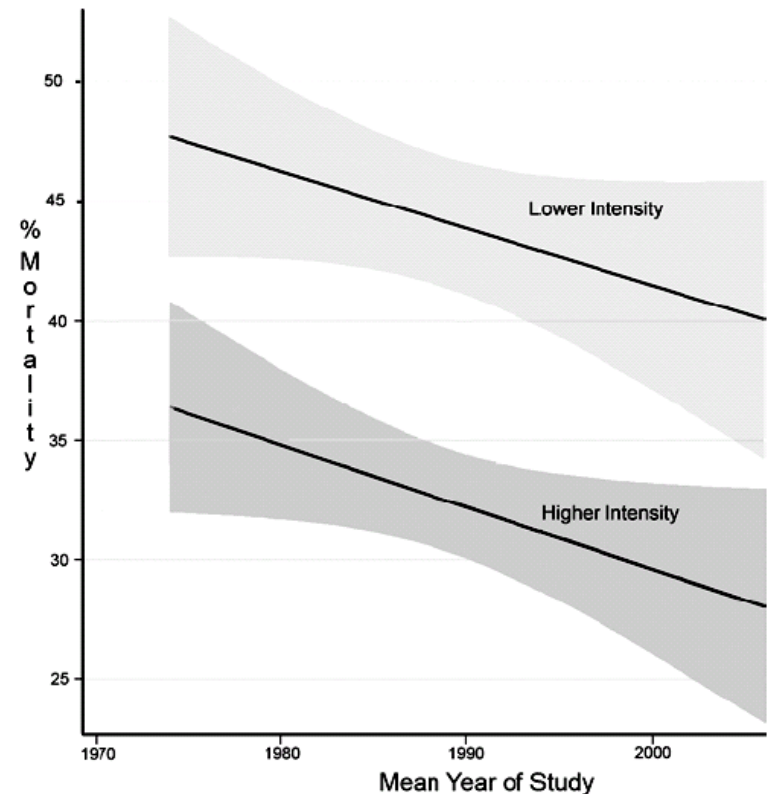
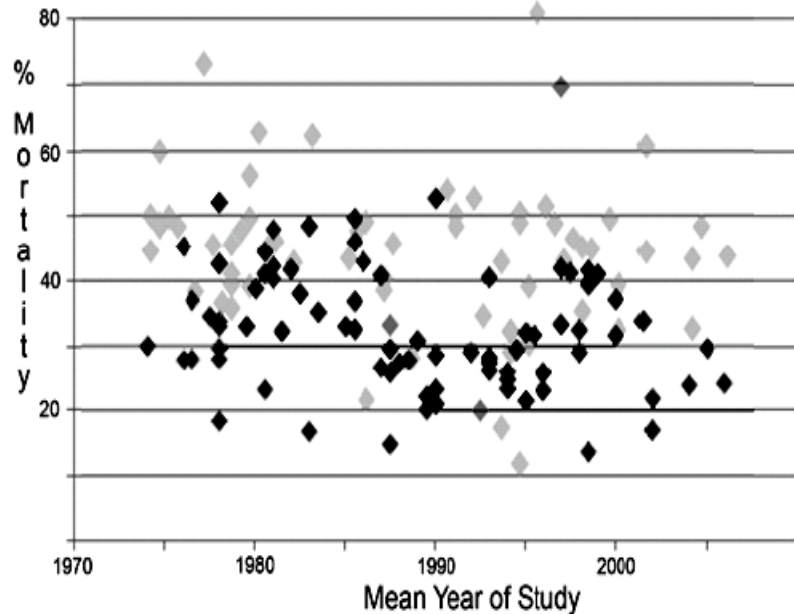
J Neurosurg 112:1105–1112, 2010

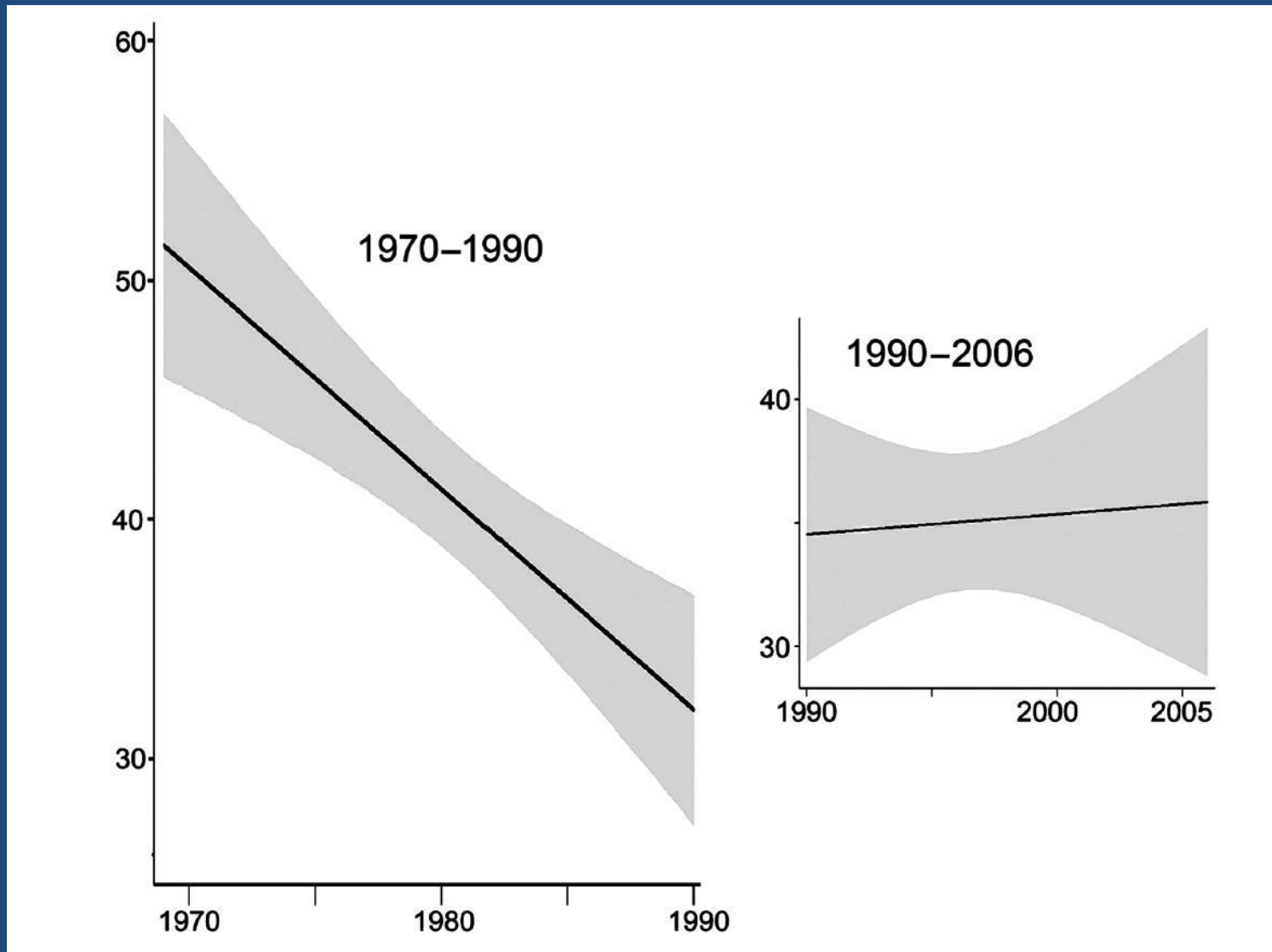
Clinical article

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KASIM L. MIRZA, B.S.E.,¹ AND OMAR M. EL FALAKY, M.D., PH.D.²

127 series; >125,000 patients

- ◆ High intensity
- ◆ Low intensity





Stein SC et al. 2010.

150 Years of Treating Severe Traumatic Brain Injury: A Systematic Review of Progress in Mortality. *J Neurotrauma*. 2010 Jul;27(7):1343-53.

Outcome over time in observational studies

Older observational studies (prior to 1999)

	Year of study	N	Setting	GCS on admission	Mortality	% unfav.	Author
	1968-1975	700	UK/NL/US	Coma \geq 6hrs	51%	62%	Jennett et al 1977 ²⁶
TCDB	1984-1987	746	US	\leq 8	39%	58%	Foulkes et al 1991 ¹
UK4 Centre	1986-1988	988	UK	\leq 8	39%	57%	Murray et al 1999 ²⁷
EBIC core data	1995	796	Europe	\leq 12	31%	49%	Murray et al 1999 ²⁸
		481*	Europe	\leq 8	40%	60%	

* Severe subset

Observational studies (1999-2005)

	Year of study	N	Setting	GCS on admission	Mortality	% unfav.	Author
Austria	1999-2004	492	Austria	\leq 8	38%	51%**	Rusnak et al 2007 ²⁹
ATBIS	2000	363	Australia-New Zealand	\leq 8	32%	55%	Myburgh et al 2008 ³⁰
	1999-2004	672	Singapore	\leq 8	36%	51%	Ng et al 2006 ³¹

** Unknown in 16%

Outcome over time in observational studies

Years of study	N	Weighted average	
		Mortality	% unfavourable
Prior to 1999	2915	42%	59%
1999 - 2005	1527	36%	52%
2005 - 2010	2143	39%	60%

Outcome over time in observational studies

More recent studies (2005-2010)							
	Year of study	N	Setting	GCS on admission	Mortality	% unfav.	Author
	2005-2007	518	Paris	≤ 8	51%	66%	Darnoux et al 2011 ³²
POCON	2008-2009	339	The Netherlands	≤ 8	46%	60%	Andriessen et al 2011 ³³
OPALS	?	538	Ontario (Canada)	≤ 8	33%***	63%***	Dowling et al 2010 ³⁴
	2008-2010	748	Latin America	≤ 8	31%	54%	Chesnut et al 2011 ³⁵

*** Outcome assessed at discharge

Conclusions (I)

Epidemiology is changing

- Overall incidence of TBI in Europe ↓
- Age ↑
- More falls/contusions
- Pathology is changing
- Outcome not changed

Conclusions (II)

Standardized epidemiological monitoring is essential towards:

- targeted prevention
- trauma organisation