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CLE Credits

General	1.0
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Certification Credits

Civil Trial	1.0
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Causation in the era of Daubert and Etherton

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HEALTH & SCIENCE
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Why is causation so difficult?

Why isn't it like diagnosis?

- ***Can*** “see” diagnosis
 - X-rays, MRI, CT
 - Labs
 - Surgical/ autopsy
- ***Can't*** “see” cause
 - Always based on inference (indirect observation),
i.e. circumstantial evidence

Diagnosis $\neq$ Cause



Diagnosis is based on observation



Cause is based on comparison of risk



Risk is the chance of something happening in the future, based on how often it has happened in the past

Where does risk come from?



Who is more likely to have a heart attack tomorrow?

...this is where epidemiology comes in

- Scientific study of populations with similar injury or disease characteristics (General Causation)
- Purpose is to describe injury or disease
 - Injury Frequency
 - Injury Risk Factors
- Epidemiologic concepts and data are woven into almost all causation opinions

How do we get from population-based risk to individual causation?

- Why do we vaccinate our children?
 - If we fail to vaccinate our child and he gets sick is our negligence the most likely *cause* of the illness?
- Why do we look both ways before we cross the street?
 - If we don't look both ways and we get run over what is the most likely *cause* of the crash
- Why do we use a seat belt?
 - If we get injured in a crash when we weren't wearing a seat belt, what is the most likely *cause* of the injury?

Knowledge gap

- Individual causation is most commonly determined by clinicians (medicine)
 - Individual causation depends on comparisons of risk
- Risk is assessed from populations (epidemiology)
 - Epidemiology is not directed at individuals
- There is no standardized training in individual (specific) causation in medicine or epidemiology

FORENSIC EPIDEMIOLOGY

Principles and Practice



Edited by

Michael D. Freeman and Maurice P. Zeegers



Forensic epidemiology is concerned with the methods of applying population-based information and techniques to the assessment of individual causation

Etherton

- 10th Circuit opinion (July 2016) that sets forth the generally accepted methodology for assessing injury causation, admissible under the Daubert criteria
- Discusses a “3 step” process by which clinicians could arrive at a determination of injury causation

FILED
United States Court of Appeals
Tenth Circuit

July 19, 2016

Elisabeth A. Shumaker
Clerk of Court

PUBLISH

UNITED STATES COURT OF APPEALS
FOR THE TENTH CIRCUIT

DONALD L. ETHERTON,

Plaintiff - Appellee,

v.

No. 14-1164

OWNERS INSURANCE COMPANY,

Defendant - Appellant.

APPEAL FROM THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLORADO
(D.C. No. 1:10-CV-00892-PAB-KLM)

App. Vol. V at 1454-55. In short, Dr. Ramos employed a three-step methodology to determine the injury's cause.

IV. CONCLUSION

We affirm on all grounds. First, the district court properly applied Rule 702/*Daubert* and did not abuse its discretion by finding Mr. Etherton's expert's methodology reliable and admitting his expert testimony. Second, the court correctly

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLORADO
Judge Philip A. Brimmer

Civil Action No. 10-cv-00892-PAB-KLM

DONALD L. ETHERTON,

Plaintiff,

v.

OWNERS INSURANCE COMPANY, a Michigan insurance company,

Defendant.

ORDER

At the November 17, 2011 Rule 702 hearing, Dr. Ramos described the methodology he used to assess injury causation in this case.³ He testified that his first step was to determine general causation, meaning whether or not the type of injury that plaintiff sustained could have been caused by the type of collision that plaintiff was in. Docket No. 48 at 14. His second step was to consider whether there was a temporal relationship between plaintiff's injury and the collision. *Id.* His third step was to perform a differential diagnosis, in which he assessed specific causation by examining plaintiff's physical symptoms, medical records, reported medical history, and the applicable medical literature to identify and rule out alternative causes of plaintiff's injury. *Id.*

³Dr. Ramos cited a number of articles and textbooks in support of his methodology. See Docket No. 48 at 24-27 (citing Randall L. Braddom, *Physical Medicine & Rehabilitation* 110 (4th ed. 2010); Michael D. Freeman, Christopher J. Centeno & Sean S. Kohles, *A Systematic Approach to Clinical Determinations of Causation in Symptomatic Spinal Disk Injury Following Motor Vehicle Crash Trauma*, 1 *Physical Medicine & Rehabilitation* 951 (October 2009); American Medical Association *Guides to the Evaluation of Permanent Impairment* 224 (6th ed. 2007); American Medical Association *Guides to the Evaluation of Disease & Injury Causation* (J. Mark Melhorn & William E. Ackerman eds., 1st ed. 2007); Samuel McLean, David Williams & Daniel Clauw, *Fibromyalgia After Motor Vehicle Collision: Evidence & Implications*, 6 *Traffic Injury Prevention* 97 (June 2005)).

A Systematic Approach to Clinical Determinations of Causation in Symptomatic Spinal Disk Injury Following Motor Vehicle Crash Trauma

Michael D. Freeman, PhD, MPH, DC, Christopher J. Centeno, MD, Sean S. Kohles, PhD

Clinical determinations of causation in cases of intervertebral disk (IVD) injury after a motor vehicle crash (MVC) are often disputed in medicolegal settings. No published systematic guidelines exist for making such determinations, which has resulted in infringement by nonclinical personnel into injury causation evaluations, a traditionally clinical activity. The result is causal determinations that are potentially disconnected from clinical observations of injury. The purpose of this review was to evaluate the current literature on causation, causal determinations after trauma and IVD injury after MVC, and to develop a practicable, logical, and literature-based approach to causation determinations of symptomatic IVD injury after MVC.

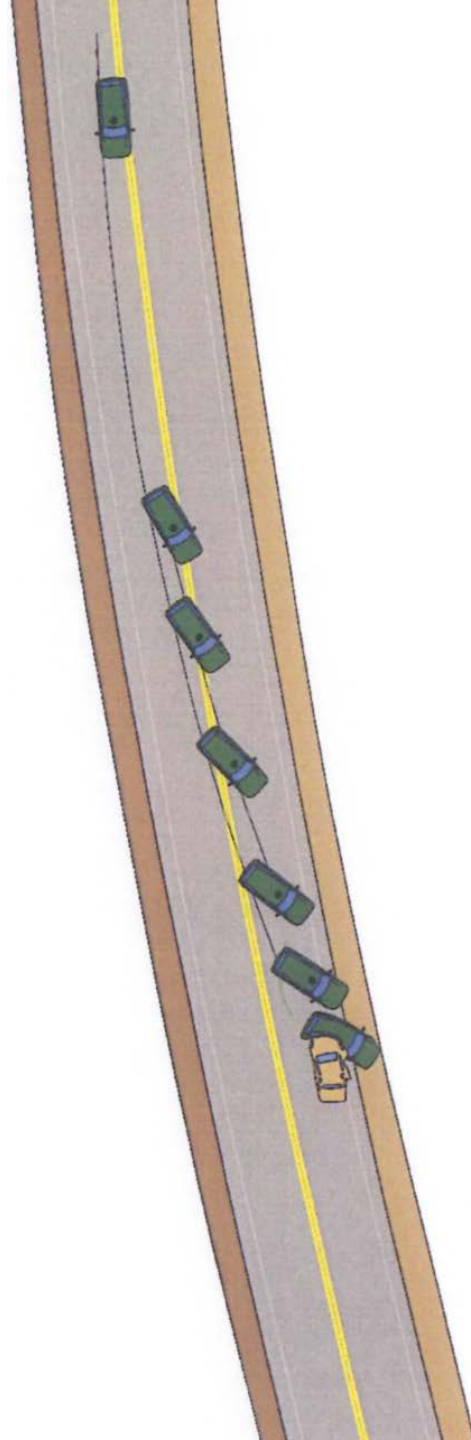
The results of the review indicate IVD injury can result from any MVC regardless of magnitude, thus meeting the first criteria of causation, biologic plausibility. Individual determinations of causation depend entirely on the temporal association between the collision and the symptom onset (the second criterion) and a lack of a more probable explanation for the symptoms (the third). When these causal elements are met, clinicians can assert causation on a “more probable than not” or “reasonable probability” basis. Because of a lack of an established or reliable relationship between collision force and the probability of IVD injury the investigation of collision parameters is not a useful adjunct to causal determinations.

2 case studies in causality

Double crash causation #1

- High speed double impact crash
- First crash
 - High speed frontal collision (car vs. car)
 - 35 mph delta V
- Second crash
 - Lower speed right rear impact (semi vs. car)
 - 15 mph delta V
- Injury
 - Left rear 3 yo passenger with transected spinal cord

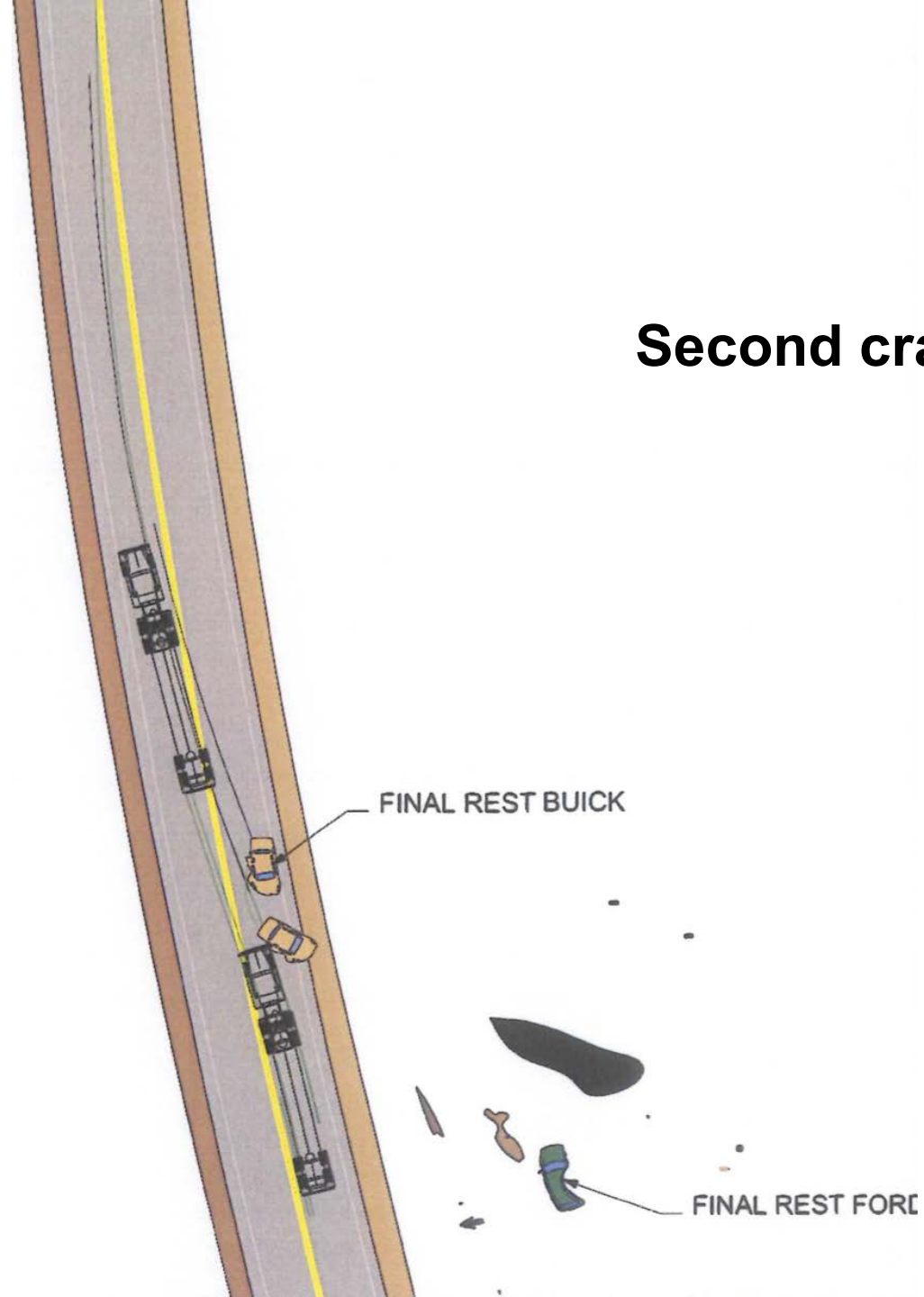
First crash







Second crash

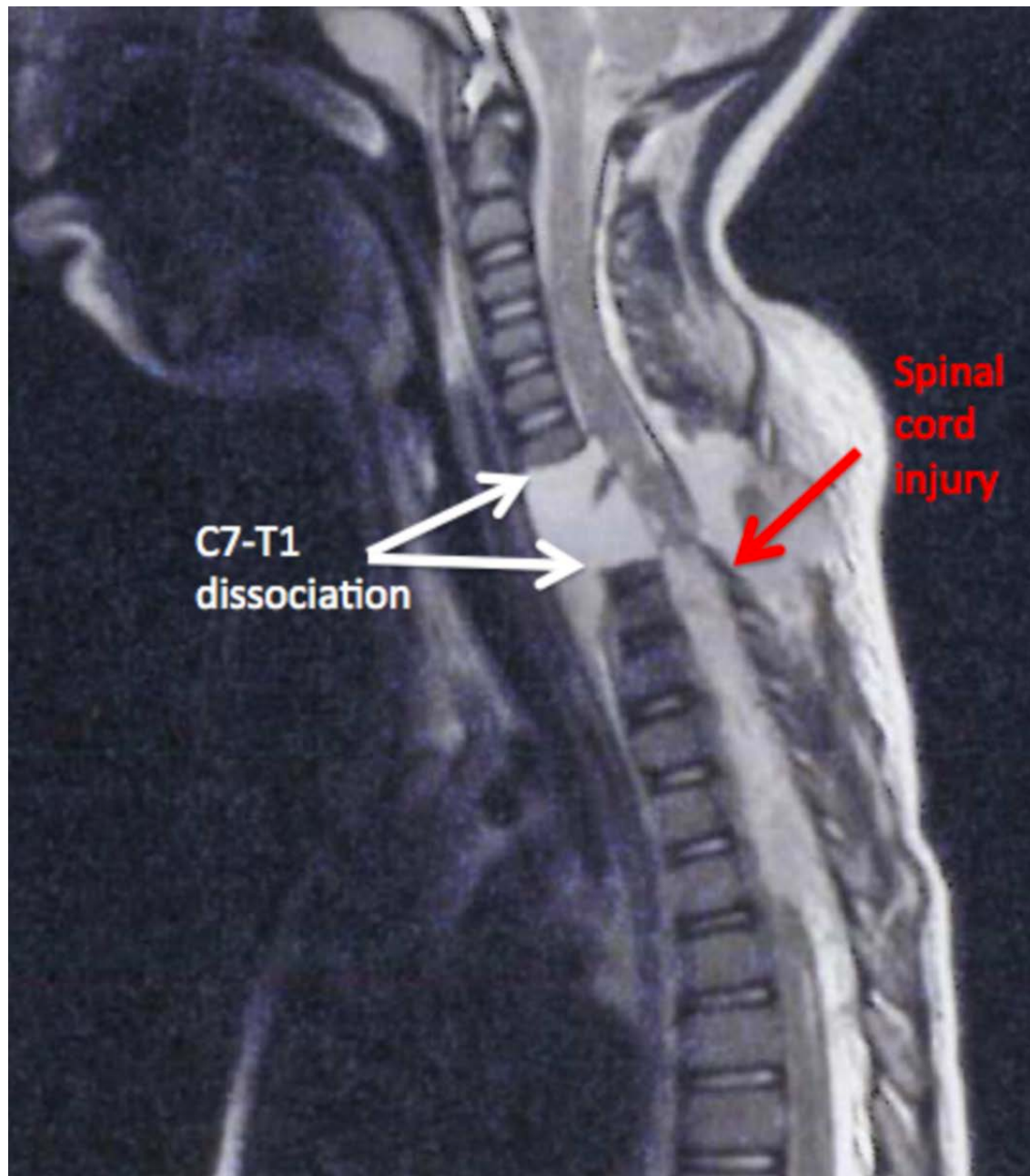


















Problems with case

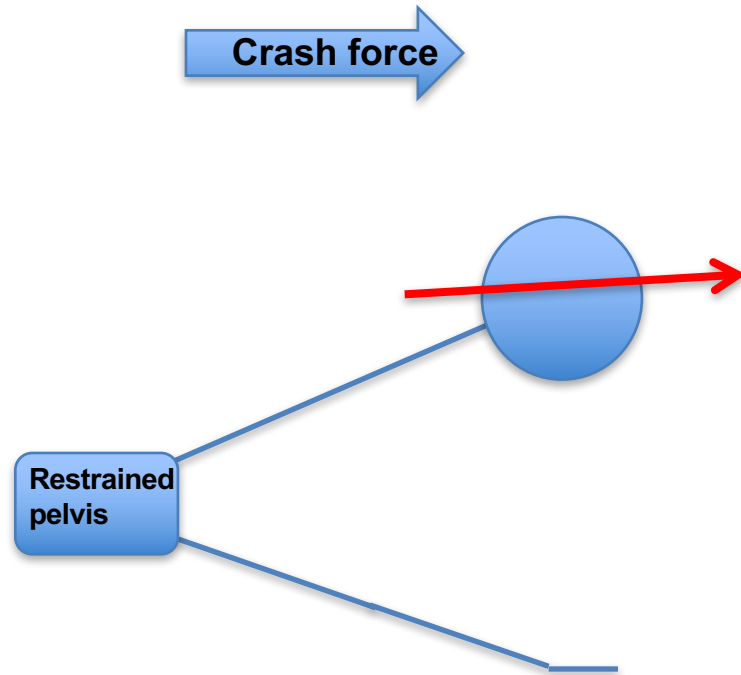
- The first crash insurer paid limits immediately
- The second crash was probably unavoidable (liability)
- Even if the second crash wasn't unavoidable the more severe first crash easily accounted for the child's injuries (causation)
- 3 national firms turned down the case

Knowledge of trucking law and common errors made by drivers revealed negligence on the part of the truck driver

- He overdrove his headlights

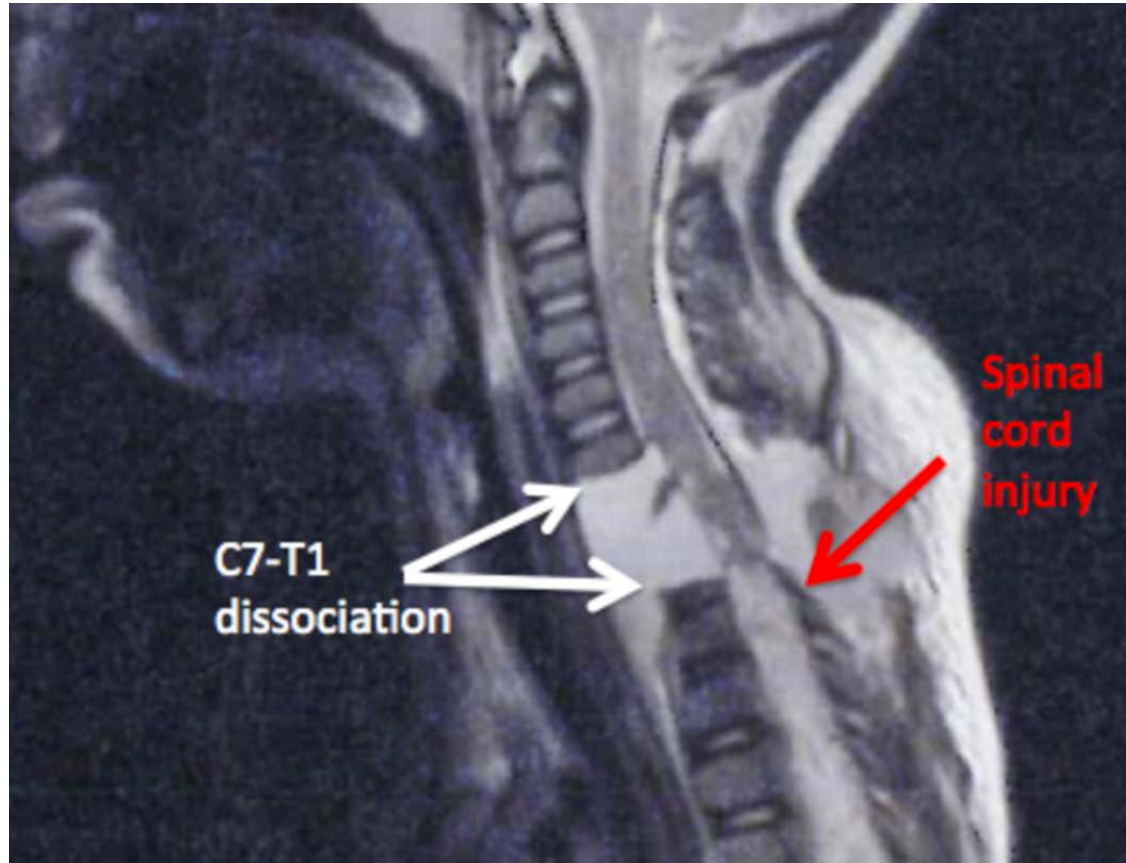
Causation was still problematic

- Several biomechanical experts were consulted
- All agreed that the first crash was the cause of the injury
- As the second crash was less severe, there was no way the first crash didn't cause the injury and the second crash did



The defense theory (BRC) was that the forces on the head were pure traction

This is a very unusual distraction injury



Biomechanical explanation for need for second crash

No single force was likely to both disrupt the spine and pull it apart at the same time



Contents lists available at [ScienceDirect](#)

Journal of Forensic and Legal Medicine

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



Original communication

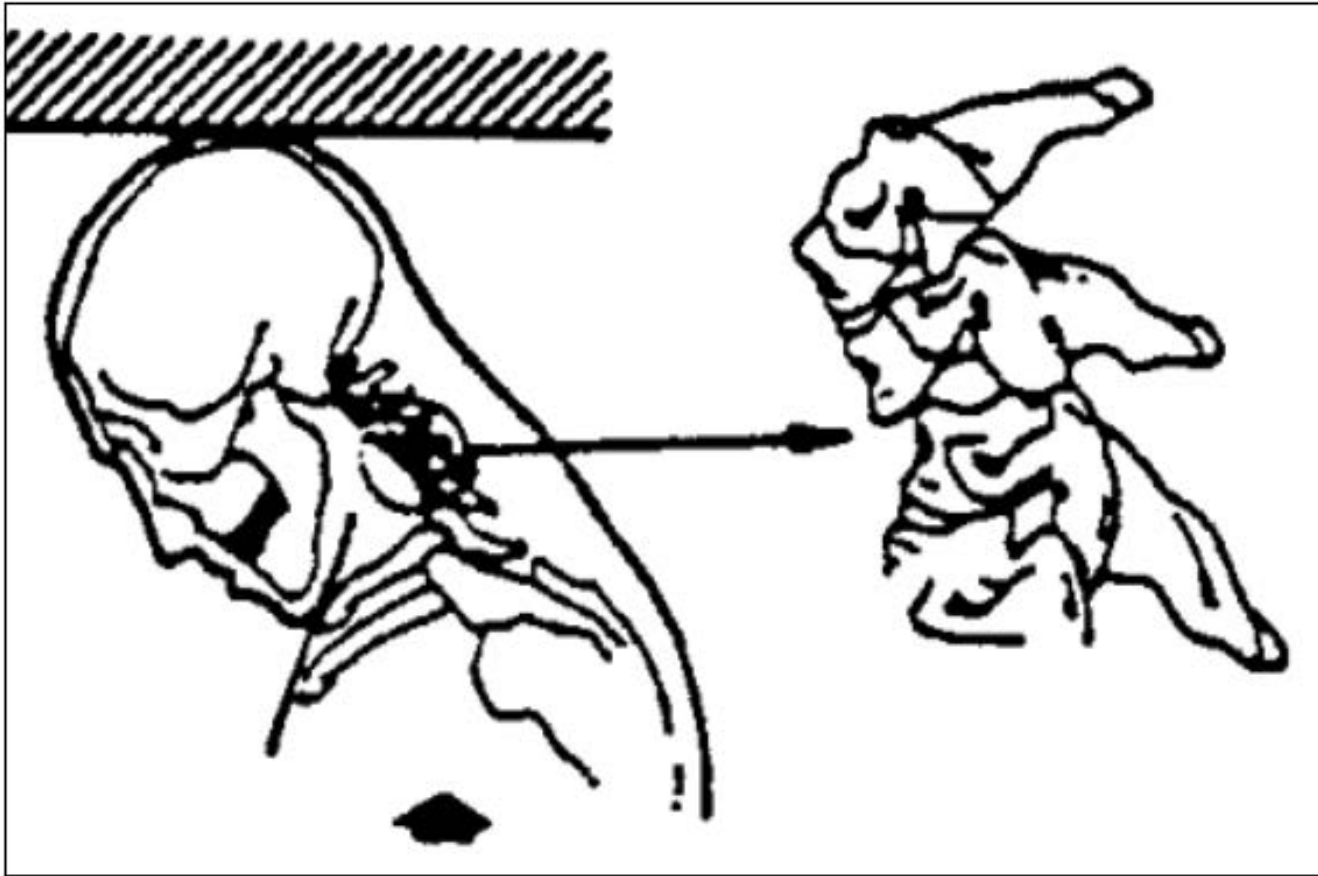
Head and neck injury patterns in fatal falls: Epidemiologic and biomechanical considerations

Michael D. Freeman, PhD MPH, Affiliate Professor^{a,b,c,*},
Anders Eriksson, MD PhD, Professor^b,
Wendy Leith, MS, Statistician with Forensic Research & Analysis^a

^a Department of Public Health & Preventive Medicine, Oregon Health & Science University, Portland, OR, USA
^b Section of Forensic Medicine, Umeå University, Umeå, Sweden
^c Department of Forensic Medicine, Aarhus University, Aarhus, Denmark

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ARTICLE INFO	ABSTRACT
Article history:	Fatal falls often involve a head impact, which are in turn associated with a fracture of the skull or cervical



The extreme flexion from the first crash would have torn the ligaments and disk at C7-T1, making the neck dangerously unstable



The whipping motion of the head in the second collision would have applied traction force to the injured part of the spine, resulting in stretch and tearing of the spinal cord

Epidemiologic explanation of the effect of the second crash

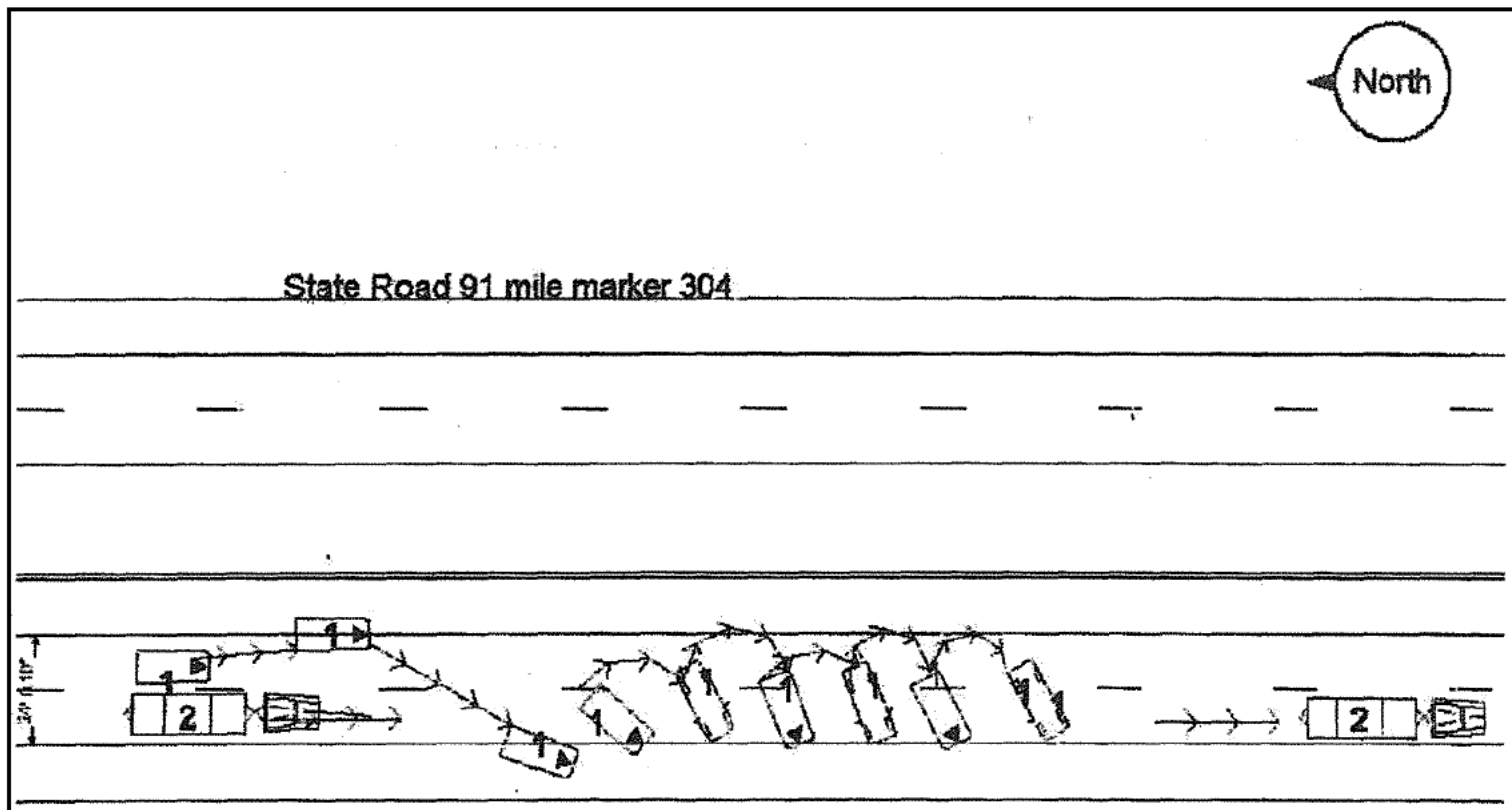
- Analysis of national crash injury data revealed the following:
 - Serious injuries that destabilize the spine (dislocation) occur in 3% of crashes
 - Critical injuries that sever the spinal cord occur in 0.8% of crashes
- If only the first crash had occurred it is 3.8 times more likely that it would have caused a dislocation rather than a severed spinal cord
- There is a 100% probability that if the spine was dislocated in the first crash that the second crash would have caused the distraction injury to the spinal cord

How this applies to our crash

- The lesser injury, occurring 3% of the time, requires the second crash to result in the more severe injury, and thus it is $(3\%/0.8\%) = 3.8$ times more likely that only the lesser injury occurred in the first crash
- Therefore, the second crash is $(2.2\%/3.0\%) = 73\%$ of the cause of the most severe injury

Double crash causation #2

- Ford Explorer rolls over 2.5 times after phantom semi intrudes into its lane
- 2 of the 4 passengers get out and 1 minute later the inverted vehicle is struck by a semi at 35 mph
- The remaining 2 passengers survive, but the driver is killed
- No one knows if she was dead before the second crash



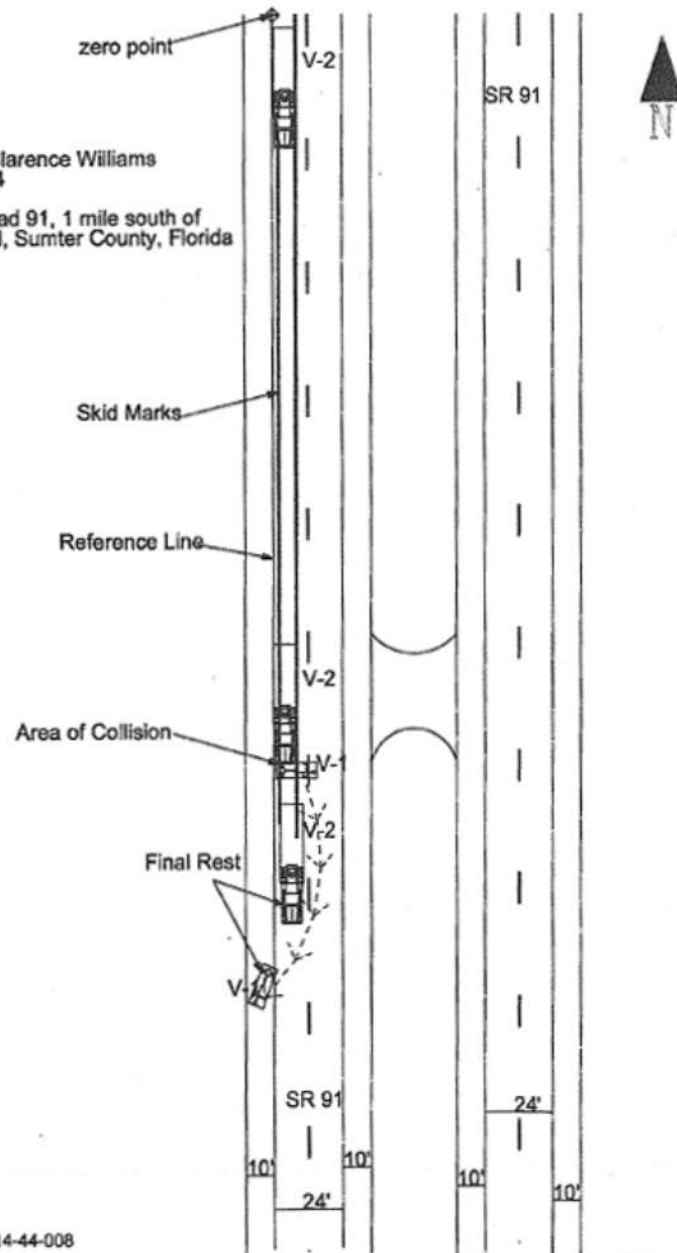
Police diagram of rollover crash (Explorer labeled "1")





DIAGRAM

Diagram by: Cpl Clarence Williams
Date: July 21, 2014
Time: 11:15 AM
Location: State Road 91, 1 mile south of
U S 301, Wildwood, Sumter County, Florida



Case Number FHP 714-44-008

Police diagram 2nd crash (Ford Explorer labeled "V-1")

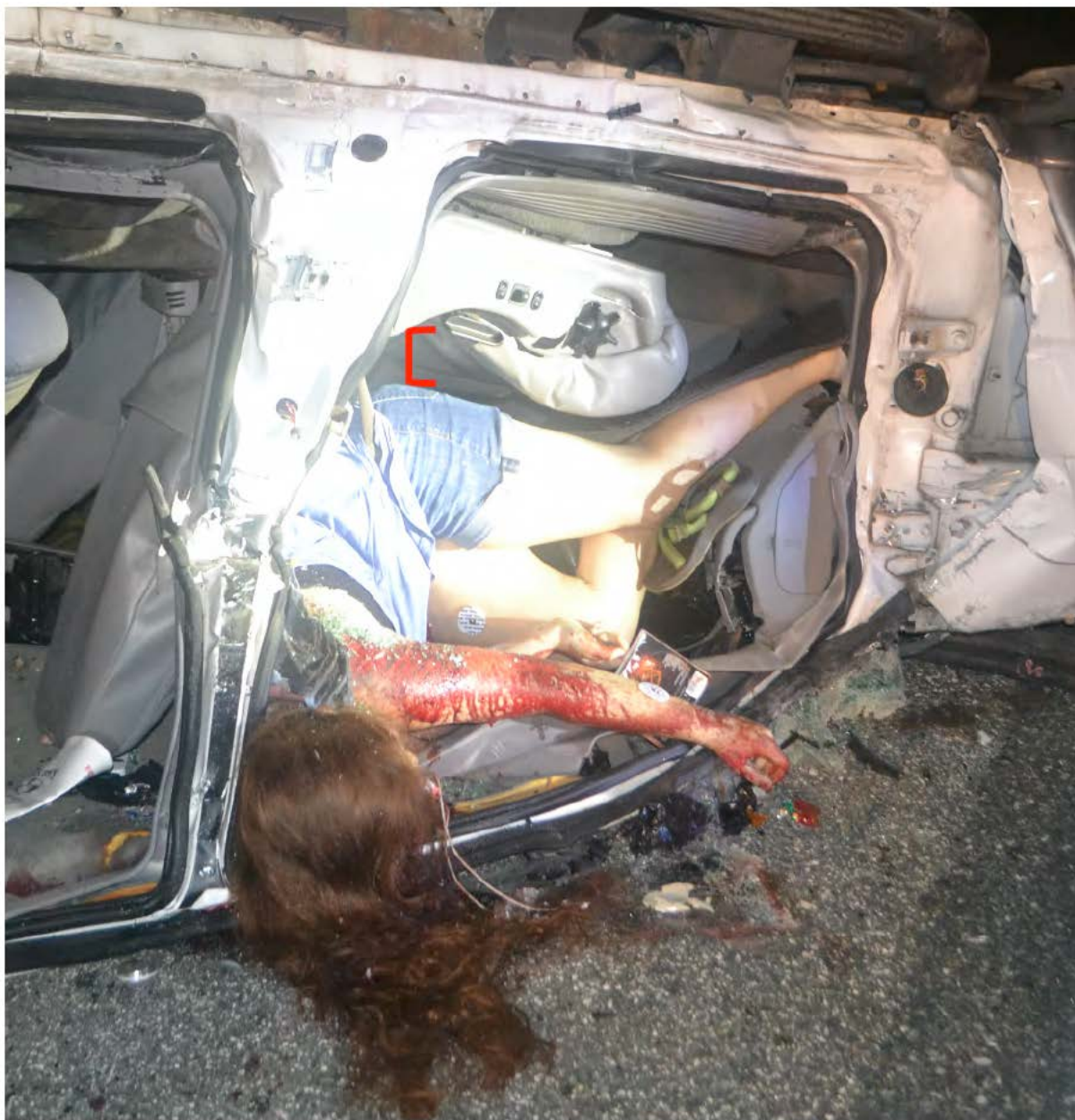


Vehicles at pre-impact positions

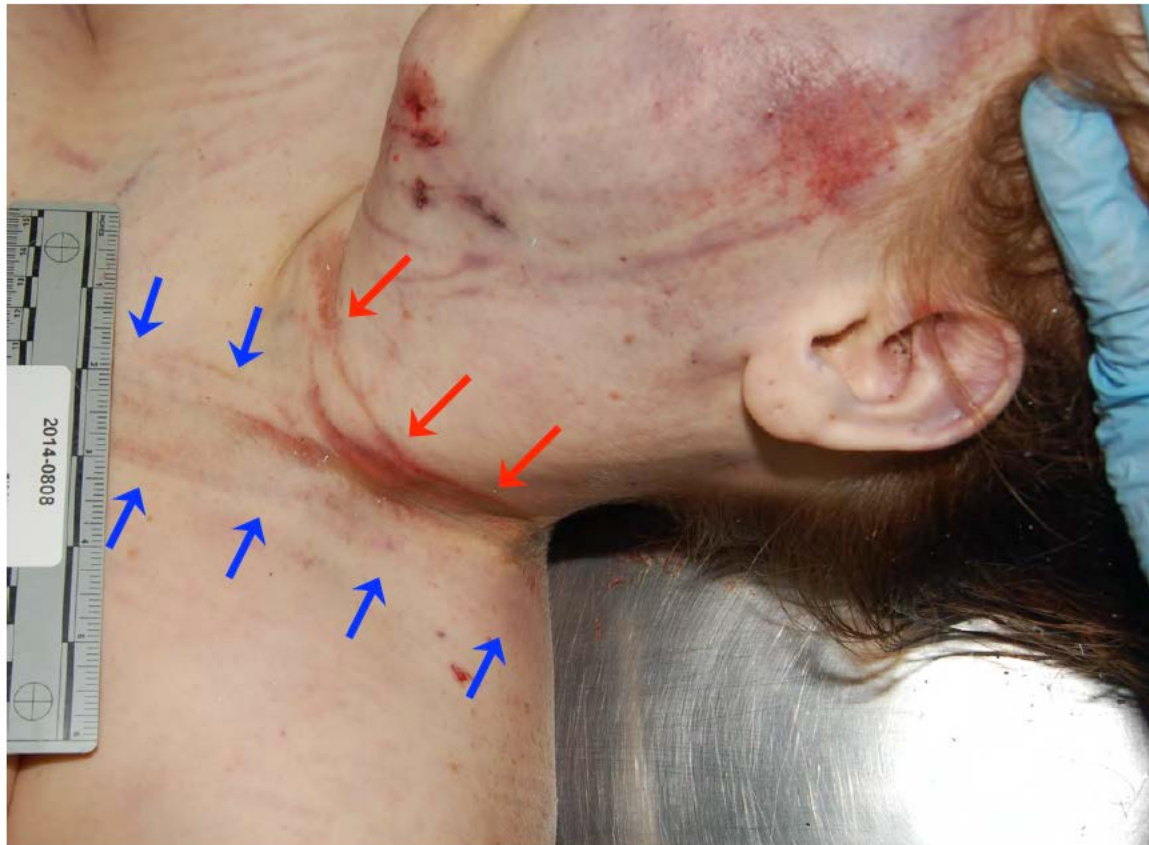


Position of vehicles at final rest





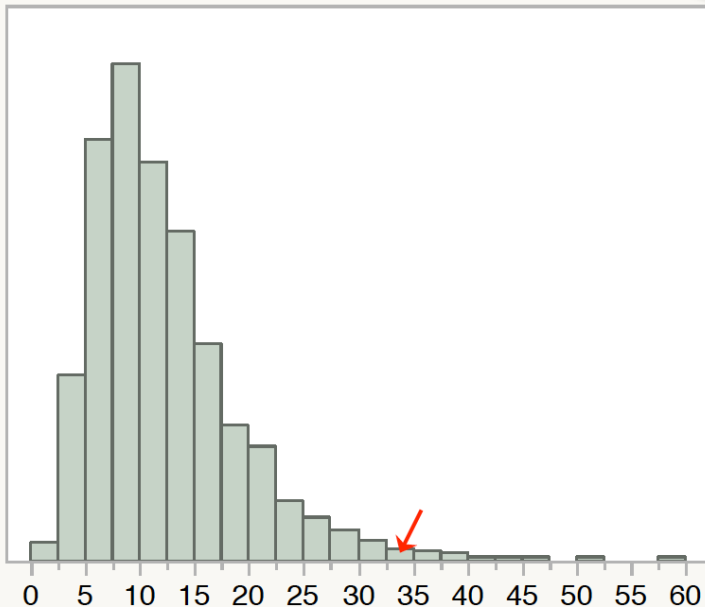
Physical evidence of 2 crashes



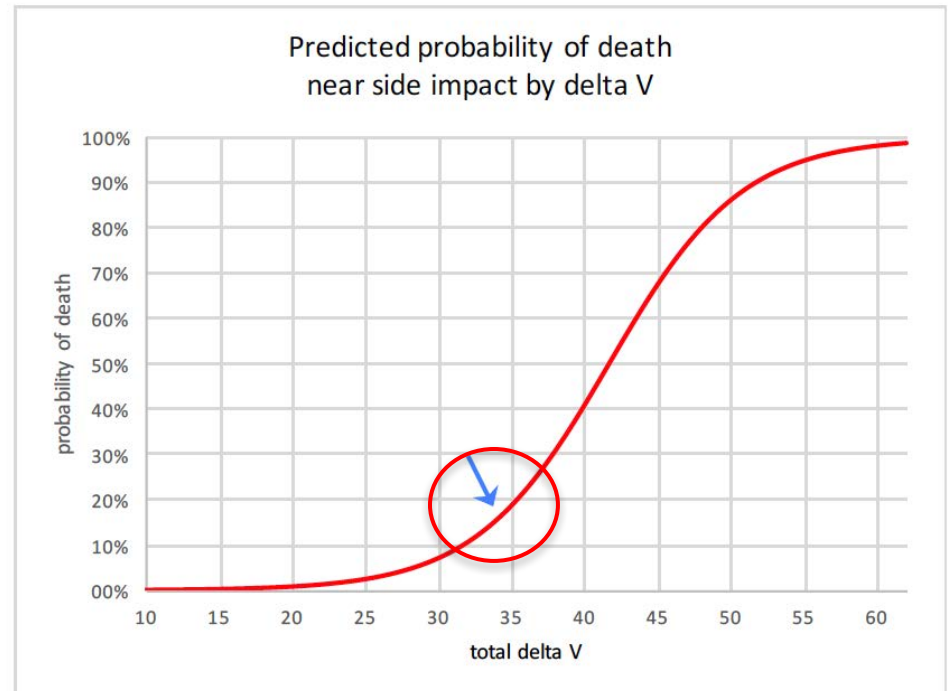
Epidemiologic analysis

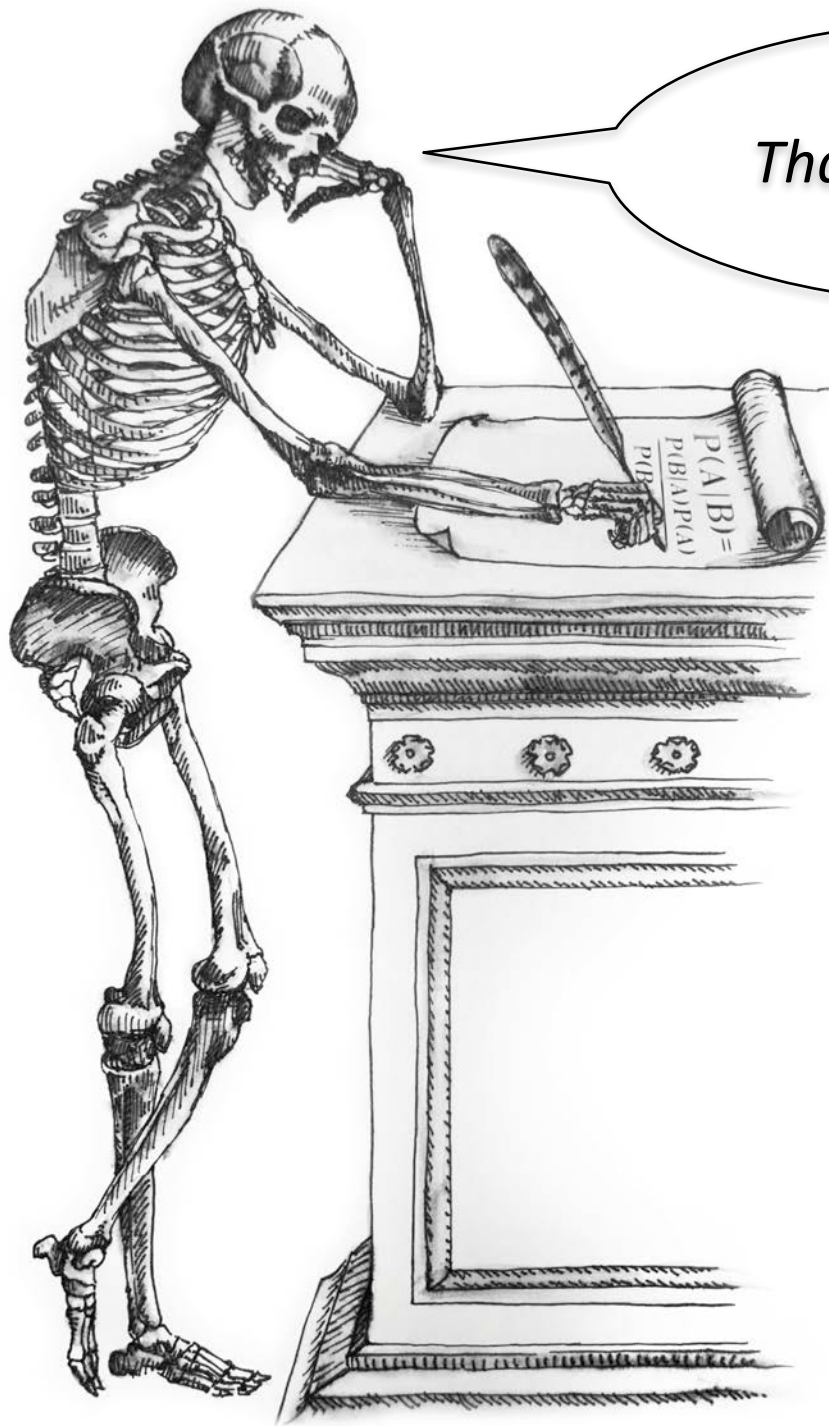
$$\frac{18\%}{1.8\%} = 10:1$$

Died	Roof Crush	
	>1 foot	<1 foot
+	363	175
-	20140	144865
%	1.77%	0.12%



Distribution of side impact collisions by delta V (mph) for 2000-2013. The red arrow indicates the delta V of the subject collision, which is in the upper 1.5% of all side impact collisions for severity.





Thanks for listening