



U.S. Department
of Transportation
Federal Motor Carrier
Safety Administration

**Report to Congress on the
Large Truck Crash Causation Study**



U.S. Department
of Transportation
National Highway
Traffic Safety
Administration

DOT HS 811 059



July 2008

**National Motor Vehicle
Crash Causation
Study Report to Congress**



Report to Congress

Transport Research Laboratory
Creating the future of transport



PUBLISHED PROJECT REPORT PPR808

**The methodology and initial findings for the Road Accident
In Depth Studies (RAIDS) Programme**

CCS
**What are they and
what's their purpose?**



**Deliverable 5.8: In-depth accident
causation database and analysis report**

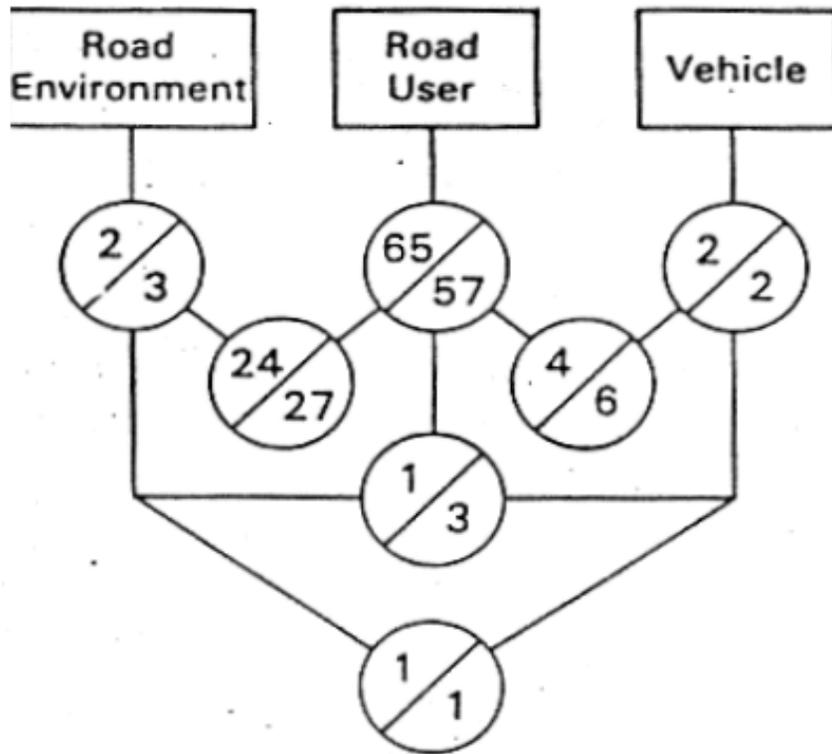
Contract No: TREN-04-FP6TR-SI2.395465/506723

Acronym: SafetyNet

Title: Building the European Road Safety Observatory

Integrated Project, Thematic Priority 6.2 "Sustainable Surface
Transport"

What they all find...



1975-2019
65%,95%



If so then ...

But is that so?

To answer the 'is that so' question I have to say

What are the causes of crashes?
and
How to link cause to prevention?

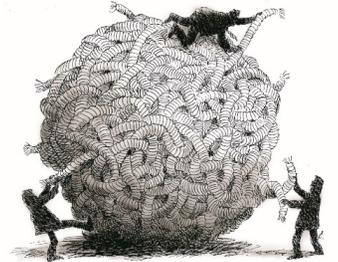
So, what is 'cause'?

Metaphysical



Instrumental (serves a **purpose**)

cause-in-fact, but-for cause, proximate cause, ultimate cause, primary cause, root cause, direct cause, basic cause...



Our purpose is crash prevention.

If so, what is to be 'crash cause' when the purpose is crash prevention ?

Clarify

Clarify

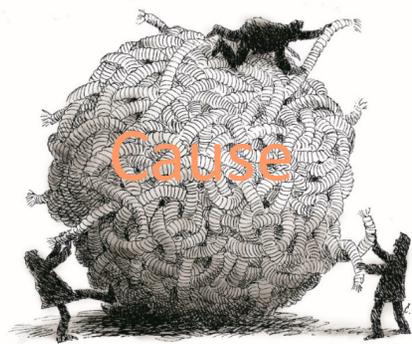
CRASH PREVENTION are actions intended to reduce the probability of future occurrence of crashes of some kind and/or their severity.



Agreed?

Back to the main question:

What is 'crash cause' when prevention is the purpose?



**To unravel the Gordian knot,
pick up a fertile loose strand.**

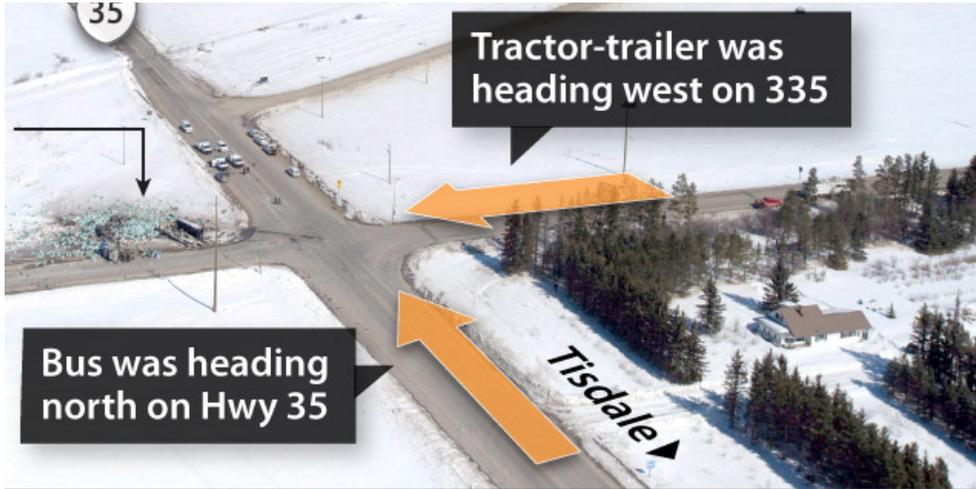
My fertile loose strand:

Is the road user the sole cause in 65%



A real example will help. →

April 2018



The Aftermath

- Prevention Action 1: The Trial etc.
 - (Prevention) Action 2: The MHI Report
 - Prevention Action 3: MELT



Investigation and Cause

Trial Verdict: “The actions of Mr. Sidhu while operating the semi-tractor unit **caused the collision.**”

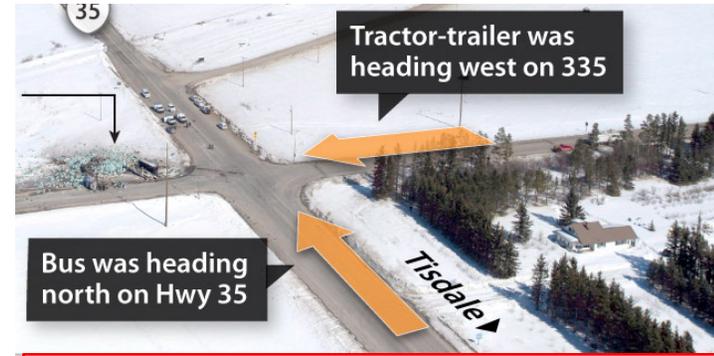
OK, but were the trees not also a cause?



They said: "No"

Why?

Their **purpose** was to establish guilt (or innocence) and liability. For that, in law, the **'But For'** test is used.



Highway 35 & Highway 335 Intersection

Intersection Safety Review

November 2018

Prepared By:

MHI Report



Explain

The 'But-For' test (+ proximate)

The test: “The defendant’s action is CAUSE if **But-For** that action the harm would not have occurred?...”



In Crashes:

A circumstance or action is a crash cause if 'but-for' it the crash would not have occurred

So, why did they say that the trees were not a cause?



Mr. Sidhu's action passes the but-for test → was cause
The trees in the corner do not pass it → was not cause

Different purposes: Theirs is not prevention and ours is not determination of guilt and liability.

Using their test (the But-For test) for our purpose (prevention) leads to a **Problem!**

The But-For Problem illustrated

1. Research shows that crashes are fewer when insufficient intersection sight distances are improved.
2. But-For test: Insufficient intersection sight distance is not a crash cause.
3. Effect without cause?

Isaac Newton



No!

All causation studies used the But-For test

1972 Perchonok. "... critical event... that behavior which transforms a situation into one in which short of highly skilled driving an accident is imminent".

1975, 2016 Sabey & Staughton, Cuerden & McCarthy those factors without which "the accident would not have happened"

1977 Treat et al. "had the factor not been present in the accident sequence, the accident would not have occurred"

2006, 2008 FMCSA and NHTSA "'critical event' is ...the action or event which put the vehicle or vehicles on a course that made the collision unavoidable, given reasonable driving skills and vehicle handling" ...'critical reason' is the "reason for the critical event"

B-F Cuts the link between cause and prevention

explaining 'critical reason'

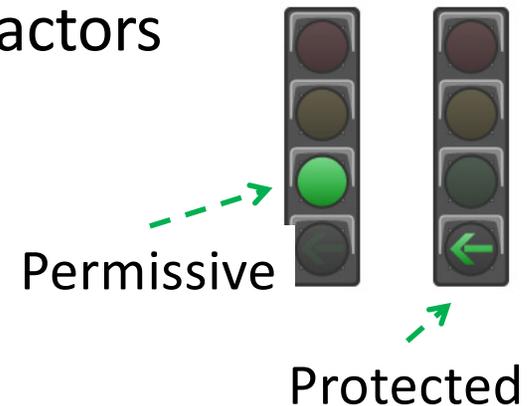
“On a four lane divided local road, an SUV turns left at a stoplight, and is hit in the intersection by a wrecker which is unable to avoid a crash.”



“...The critical reason for the crash is ... failed to look or looked but did not see...

... There were no vehicle or environmental factors coded for the SUV.” (LTCCS, 2006)

What countermeasures?



The systemic bias inherent in the B-F test

Almost no circumstance present or action occurring minutes before the crash can pass the 'but-for' test.

Conversely, what the road user did or did not do seconds before the crash will almost always pass the 'but-for' test.

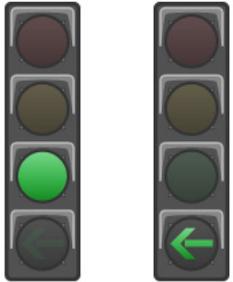
The 65%, 95% is a consequence of defining crash cause by the But-For test.

It is not a finding.



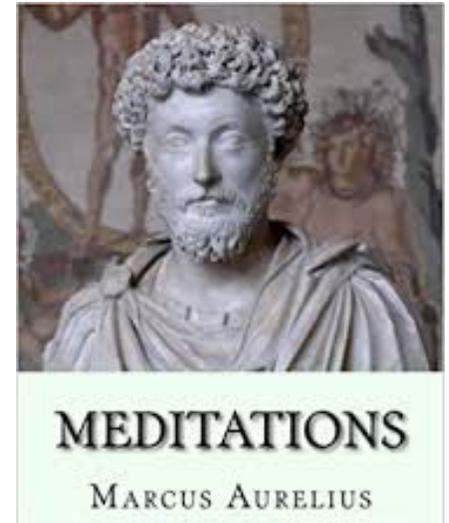
The main issues

‘We are too much accustomed to attribute to a single cause that which is the product of several, and the majority of our controversies come from that.’



1. Causes are many
2. Link causes to prevention

121-180 AD



We need a definition of cause that addresses these issues

Proposed definition (similar to Haight and others)

The cause of a crash is a circumstance or action which, had it been different, the probability of such crashes to occur and/or their severity distribution would be different

Consequences →

Consequence 1: Causes are many

Is Cause if:

(a) could be different and

b) would affect probability and/or severity of such crashes

For Bronco crash
not only Sidhu but also

1. Present intersection sight distance
2. Prevailing regulation of truck driver hours of work
3. Current frequency of Stop sign running
4. Prevalent speed limits ...

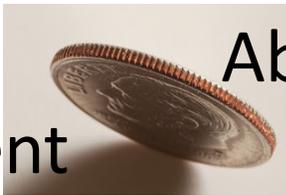
What are the 'clues to prevention'?

Consequence 2: What is absent is also cause. Bias

I used the words 'Present', 'Prevailing', 'Current' for the various causes. These can be seen at the crash site.

But

Present



Absent

E.g.



Advanced Driver Assistance Systems (ADAS)



Consequence 3: Norms do not determine what is cause; Change in probability or severity does.

Action or circumstance	Why is it a cause?	
	Because	Not because
Trees in corner	↑ Chance	Not compliant
Not wearing seatbelts	↑ Severity	Illegal
Stop sign running	↑ Chance	Illegal

Speed was cause even if drivers did not exceed limit.

No ADAS was cause even if not currently required.

...

And yet, all CCS's did so. (Proximate=Substandard)

The CCS definition of Crash Cause:

“...a factor was considered a cause if **‘but for’** that factor, the accident would not have occurred.”

&

The factor involved is a “...**substandard performance** of any component in the driver-roadway-vehicle system.”



In CCS, if something complies with

- Road design standards and practices,
- Traffic control warrants and practices,
- Urban planning guidelines and practices,
- Current laws and policies, etc.

Then, it is not recorded as cause or factor.

If not cause or factor, not a clue to prevention action

Compliance with a norm does not remove a circumstance or action from being a crash cause.

Illustration:

The Bronco crash drivers did not speed. Speed limit=Norm.

But (a) speed limits could be lower and

(b) If they were, crashes would be less severe.

Therefore, Speed Limits are CAUSE

Thinking they are not is to fail to consider a potential prevention action.

Consequence 4: Support for 'Safe Systems'

Sight distance, hours of work, speed limits, no seat belts in buses, ... **do not pass the But-For test.** What the road user did or did not do just before the crash **does.**

The But-For test → Supports User-Centered safety management.

New definition → Justifies Safe-Systems safety management.



ELSEVIER

Contents lists available at ScienceDirect

Accident Analysis and Prevention

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



Crash causation and prevention

Ezra Hauer



ResearchGate

