

Crash Causation Studies (1979, 2006, 2008)

The Purpose & the Belief

(NHTSA) “objectives ... are to:

- Identify the causes and mechanisms of motor vehicle accidents and subsequent injuries, so that effective measures, devices, and traffic safety programs can be initiated.”

The Question: How does knowledge of causes help to devise a program of prevention?

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What caused Eric's crash?
...and what could be some prevention actions?



Eric's accident

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EHT

The Tri-Level study, 1979

The MDAI Team: Human factors specialist, automotive engineer, reconstructionist, technical writer, (engineering assistant, draftsman)

TRI-LEVEL STUDY OF THE CAUSES OF TRAFFIC ACCIDENTS Executive Summary

J.R. Treat, N.S. Tumbas, S.T. McDonald, D. Shinar,
R.D. Hume, R.E. Mayer, R. L. Stansifer and N.J. Castellan

The chosen definition of Cause:

"...a factor was considered a cause if **'but for'** that factor, the accident would not have occurred."

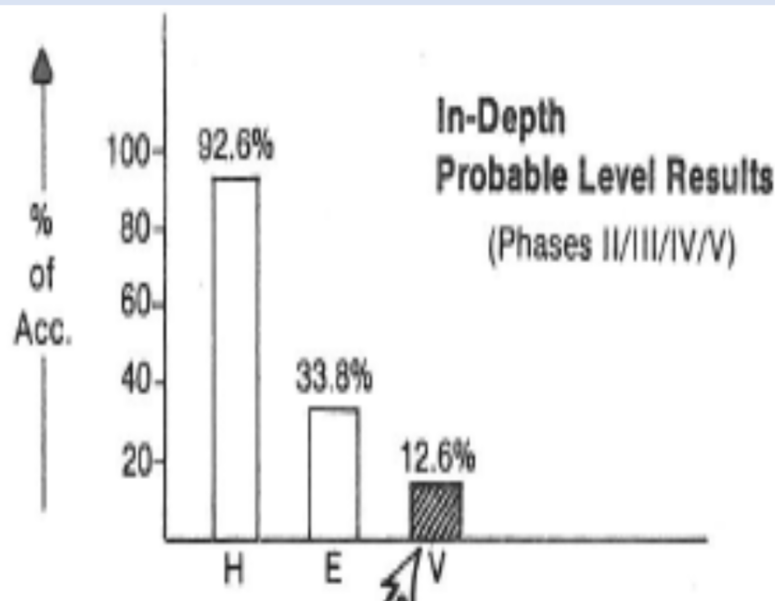
The BF&S cause

&

The factor involved "...**substandard performance** of any component in the driver-roadway-vehicle system."

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Main findings



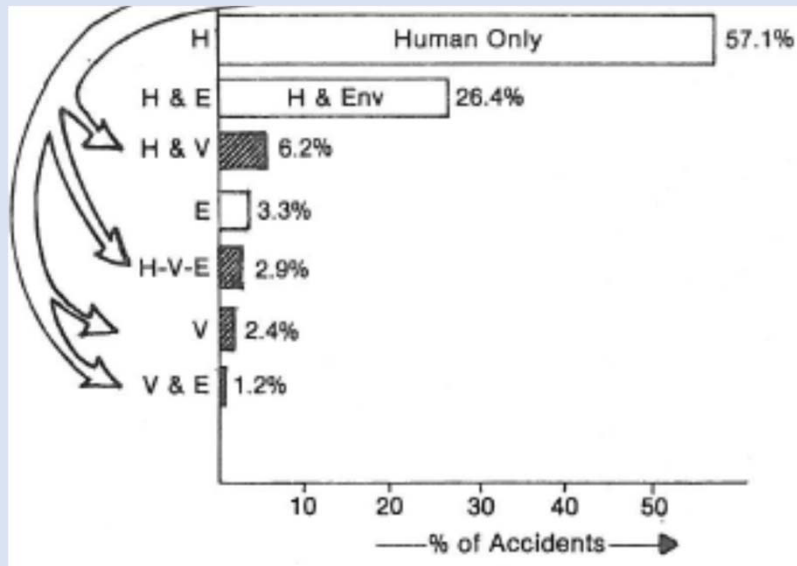
Human: 1. Recognition,
2. Decision,
3. Performance,
4. Blackout, Dozing
5. Suicide

Environmental: Slick roads, highway-related, ambience-related

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Main findings



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What are the 'But For & Substandard' causes of Eric's crash?



Eric's accident



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Results preordained, factors uncounted

The choice of the BF&S definition of cause inevitably led to:

1. Almost all crashes (92.6%) fell into the 'Human' cause bin.
2. Factors that affected the occurrence and severity of the crash but were not BF&S remained uncounted as causes.

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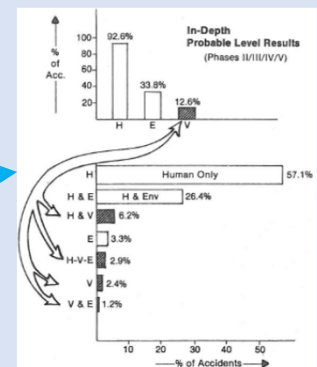
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Tri-level recommendations

"1. The causal factor tabulations serve ... in planning future countermeasure activity. It certainly does not follow that because a factor has been classified as, for example a human factor, the most cost-effective solution will be one aimed at changing driver behavior. ... For example ..."


If so, what are we to make of the 92.6%?

How exactly do these tabulations serve ?



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

Large Truck Causation Study, 2006


National Motor Vehicle Crash Causation Survey, 2008



NHTSA
www.nhtsa.gov

Critical Reason	% of all crashes
Driver	87%
Vehicle	10%
Environment	2%

Critical Reason	% of all crashes
Driver	94%
Vehicle	2%
Environment	2%



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Critical Event, Critical Reason (CR)

Critical event: The action or event that make the collision unavoidable
Critical reason: The immediate reason for the critical pre-crash event

To elucidate LCTTS uses this example:
 “On a four lane divided road, an SUV turns left at a stoplight and is hit in the intersection by a wrecker which is unable to avoid a crash.”

Critical Events: { For SUV – turning left;
 { For wrecker – SUV encroaching on its lane.

Critical Reason: “... failed to look or looked but did not see...”

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Factors and Example continued

“Associated Factors – any of approximately 1,000 conditions or circumstances present at the time of the crash is coded. The **factors** ... are thought to contribute to crash risk.”

Example: “... There were no vehicle or environmental factors coded...”

But why not?

Permissive



Protected

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Concluding Observations

1. Fact: A moment before a crash only the involved road users could have prevented it.

It follows that **if** one chooses a definition of ‘Cause’ or ‘Critical Reason’ that are based on events that have happened moments before the crash, **then** the ‘finding’ that road user action or inaction was the dominant cause or reason for crashes is merely a confirmation of the **‘Fact’**.

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Concluding Observations, continued

2. The **Fact** (that a moment before the crash only the involved road users could have prevented it) and the **artifact** based on it (that almost all crashes are 'caused' by the involved road users)

do not imply that preventive actions should concentrate on the alteration of behavior.

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Concluding Observations, continued

3. The merit of a preventive action is to be judged on the basis of:

- (a) the prevalence of the related causal factor in crashes,
- (b) the ease or difficulty of changing it, and
- (c) the reduction in crash frequency and severity which a change in that causal factor is expected to engender.

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Concluding Observations, continued

4. The chosen definitions of 'Cause' (and of 'CR') are deficient because:

- a. Factors that do influence the occurrence and severity of crashes but are not 'But For' (or make the crash inevitable) do not count as 'Cause' (or CR);
- b. Factors that influence the occurrence and severity of crashes but are not 'Substandard' do not count as 'Cause' (or 'CR');
- c. Factors that influence the outcome by their absence do not count as 'Cause' (or 'CR').

When a factor is not counted as cause (1) one cannot know its prevalence and (b) one may think of it as a target for prevention.

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