Cervical Spinal Injuries in the State of New York and the National Transportation Safety Board

UNITED STATES OF AMERICA
NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 9, 1973

Adopted by the NATIONAL TRANSPORTATION SAFETY BOARD
at its office in Washington, D. C.
on the 18th day of July 1973

FORWARDED TO:

Honorable James E. Wilson
Acting Administrator
National Highway Traffic Safety Adm.
Washington, D. C. 20590

SAFETY RECOMMENDATION H-73-30

Data which have recently come to our attention raise a question whether motorcyclists who wear the present standard safety helmets which reduce severe or serious injuries to the head and face, may suffer some degree of counterbalancing increase in fatal neck injuries. The question is raised by one study involving a relatively small number of cases. Whereas the finding is not conclusive, the implication is sufficiently strong that the Board believes the subject should be further investigated without delay.

The study in question, made by Raeder and Negri of the New York State Department of Motor Vehicles in 1969, compared motorcycle accident and injury data for the years 1966 and 1967 in order to detect possible effects of the mandatory helmet law which became

effective January 1, 1967.[1] The study showed, first, a decrease of 39 percent in total number of accidents which were reported - - from 5184 to 3161.

[1] Raeder, P.K., Jr., and Negri, D. B., "An Evaluation of Motor Vehicle Accidents Involving Motorcycles - Severity, Characteristics, Effects of Safety Regulations," Research Report No. 1969-12, State of New York Department of Motor Vehicles, Motorcycle Accidents.

The distributions of severity in these cases were nearly identical:

	Percentage	
Severity	1966	1967
Fatal	1.6	1.6
Personal Injury	92.4	94.4
Property Damage	5.9	4.0
	99.9	100.0

Thus far, these data show no effect of the helmet; the proportion of fatality among all accidents is unchanged.

However, a comparison of the distribution of injuries to head, face and neck before and after helmets were required showed: a) a 34 percent reduction in serious injuries to the head, b) a 27 percent reduction of serious face injuries, and c) a 75 percent increase in the proportion of serious injuries to the neck. Most important, a comparison of the head and neck injuries among fatalities for the two years showed the following:

	l966	
Fatal injury received	Number of Fatalities	Percent of 69 Fatalities
Head-fracture, bleeding-wound, concussion	52	75.4
Neck-fracture, broken	4	5.8

	l967	
Fatal injury received	Number of Fatalities	Percent of the 37 Fatalities
Head-fracture,		

bleeding-wound, concussion	17	45.9
Neck-fracture, broken	14	37.8

From these data alone it appears that wearing the helmet is associated with greatly reduced fatal head injury (75.4% to 45.9%), but greatly increased fatal neck injury (5.8% to 37.8%). And the differences in percentages could be larger than appear here because, while nearly all of the cyclists in the 1967 figures wore helmets, some of those in 1966 also wore helmets before he law required it.

The indication is very plausible in light of some physical characteristics of the helmet. A standard helmet weighs about two to three pounds. If the motorcyclist's body is suddenly stopped, this helmet weight adds appreciably to the momentum of the moving head and puts additional strain on the neck. Furthermore, the helmet is highly rigid. It the helmeted head strikes a barrier while the body continues in motion, the impact is transmitted almost entirely to the neck. Possible remedies would include a reduction in helmet weight and rigidity, if this can be done while affording major protection to the head. The entire approach may need reexamination, if this finding from the New York State data is confirmed.

However, there are reasons to question whether these data give a true picture:

> **a) The numbers of cases are not very large, and there may be many influences at work which are not identified. For example, there may be some unknown factors in the wearing of a helmet which reduced the number of accidents which occurred. If such a factor could be found, the value of the helmet would be greater than it appears from the study.**
>
> **b) The injury data were obtained from reports of police and coroners, rather than from autopsies by medical personnel, who make a more complete examination. For example, the observed presence of a skull fracture on a fatality by a nonmedical examiner could make it less likely that a less obvious neck fracture would be looked for and/or reported. If the head is preserved from gross injury by the helmet, a more thorough analysis to find the cause of death might reveal a fatal neck injury. This could account for the findings.**
>
> **c) The data on injury were incomplete. For 1966, 69 of 87 fatalities had such data, or 79 percent; for 1967, 37 of 52 of the fatalities, or 71 percent, had such data. There is always the possibility of unknown and unintended biases in the manner in which case data were obtained.**

The net effect of the wearing of helmets needs to be reexamined in light of the New York analyses. The data from that study do show reduced fatal head injuries associated with helmet-wearing; but these benefits may have been offset by the increased incidence of fatal

neck injuries. Further the results of that study raise the question of net benefit from helmets shown in other studies, which did not analyze for fatal neck injuries in connection with helmet-wearing.

The conclusion of the New York State report, favorable to helmet-wearing, does not mention the factor of fatal neck injuries; only careful study of the report brings the implication of the data to light.

The Safety Board recommends that:

> **NHTSA take immediate steps to confirm or disconfirm the implications of the New York State report that the wearing of helmets, as currently designed, increases the number of fatal neck injuries.**

REED, Chairman, McADAMS, THAYER, BURGESS, and HALEY, Members, concurred in the above recommendation.

(Signature)
By: John H. Reed
Chairman

National Transportation Safety Board

Report Date: 12/29/1993

Report:

Accident Data: August 09, 1973

Accident City:

Accident State:

Recommendation Numbers:

_____

H-73-030

Abstract

DATA WHICH RECENTLY COME TO OUR ATTENTION RAISE A QUESTION WHETHER MOTORCYCLISTS WHO WEAR THE PRESENT STANDARD SAFETY HELMETS WHICH REDUCE SEVERE OR SERIOUS INJURIES TO THE HEAD AND FACE, MAY SUFFER SOME DEGREE OF COUNTERBALANCING INCREASE IN FATAL NECK INJURIES. THE QUESTION IS RAISED BY ONE STUDY INVOLVING A RELATIVELY SMALL NUMBER OF CASES. WHEREAS THE FINDING IS NOT CONCLUSIVE, THE IMPLICATION IS SUFFICIENTLY STRONG THAT THE BOARD BELIEVES THE SUBJECT SHOULD BE FURTHER INVESTIGATED WITHOUT DELAY.

Log Number: H-0050

Recommendation number: H-73-030

Date of Issue: August 09, 1973

NTSB Status: CLOSED - ACCEPTABLE ACTION

Closeout Date: January 01, 1980

Recommendation Subject:

_____

THE NTSB RECOMMENDS THAT THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION: TAKE IMMEDIATE STEPS TO CONFIRM OR DISCONFIRM THE IMPLICATIONS OF THE NEW YORK STATE REPORT THAT THE WEARING OF HELMETS, AS CURRENTLY DESIGNED, INCREASES THE NUMBER OF FATAL NECK INJURIES.

Addressee : NHTSA

**National Transportation
Safety Board**

Washington, D.C. 20594

MAR 22 1978

Honorable Tom Steed
House of Representatives
Washington, D.C. 20511

Dear Mr. Steed:

This is in reply to your inquiry in behalf of Ms. Marcia Colyer, 1804 S. W. 11th, Lawton, Oklahoma 73501.

The standard concerned with use of helmets by motorcyclists was formulated and published by the National Highway Traffic Safety Administration (NHTSA), Department of Transportation. Your letter is therefore being referred to NHTSA for direct reply to you.

The National Transportation Safety Board has had no experience in accident investigations bearing on the Controversy surrounding mandatory use of helmets by cyclists. We have, however, issued one Safety Recommendation (H-73-30) on the subject, a copy of which is enclosed for your information. On September 18, 1974, NHTSA responded to this recommendation by informing us that NHTSA had completed an analysis of the New York State study and published their findings in a NHTSA Technical Report, DOT HS-801-137, A Motorcycle Safety Helmet Study. The findings of that study were inconclusive with respect to neck injuries. In September 1974 NHTSA indicated that they planned "to Initiate clinical research to resolve the question fully". The Safety Board has not been advised as to the status of such research.

If I can be of further assistance, please let me know.

Sincerely yours,

/s/
Webster B. Todd, Jr.

National Transportation Safety Board

Report Date: 12/29/1993

Date Of Response: 02/21/1974

NHTSA (LEW BUCHANAN) STATED VERBALLY THAT THE NHTSA RESEARCH INSTITUTE HAS BEEN REQUESTED TO COMPLY WITH THIS RECOMMENDATION AND THAT THE NECESSARY DATA COLLECTION FROM

THE STATES IS UNDERWAY. THIS RECOMMENDATION WILL BE COMPLIED WITH AS SOON AS POSSIBLE. 8-1-74 NHTSA LETTER RESPONDED BY SAYING THAT. IN AN EFFORT TO DETERMINE THE EFFECT OF MOTORCYCLE HELMET USAGE ON THE INCIDENCE OF NECK INJURIES, SEVEN RELEVANT AVAILABLE DATA FILES HAVE BEEN ANALYZED. THE RESULTS OF THE ANALYSES IN EACH CASE CLEARLY SHOWED A LARGE REDUCTION IN FATALITIES DUE TO HEAD INJURY AS A RESULT OF HELMET USE. HOWEVER, THE ANALYSES WERE INCONCLUSIVE WITH RESPECT TO NECK INJURIES, AND THE IMPLICATION OF INCREASED INJURIES BY HELMET USERS. EXPRESSED IN THE NTSB REVIEW OF THE NEW YORK STATE DATA, CAN NEITHER BE REFUTED NOR SUPPORTED. ALTHOUGH THE DATA DO NOT INDICATE AN INCREASE IN NECK INJURIES, THE DATA COLLECTED SUFFERS FROM THE VERY REAL POSSIBILITY OF BIASED REPORTING OF THE NEW YORK DATA. IN EACH CASE, NECK INJURY WAS NOT THE PRIME SUBJECT OF THE STUDY AND COULD HAVBE BEEN INADEQUATELY REPORTED. SINCE THE EXISTING DATA ARE INCONCLUSIVE, A RESEARCH PROGRAM WOULD BE NEEDED TO DETERMINE THE EFFECT OF MOTORCYCLE HELMET USE ON THE INCIDENCE OF FATALITIES CAUSED BY NECK INJURIES. RESEARCH IS PLANNED TO BEGIN IN FY 1975. 9-18-74 NHTSA LETTER REPORTS THAT IT HAS COMPLETED A PRELIMINARY ANALYSIS OF ALL AVAILABLE STATISTICAL DATA AND THEIR FINDINGS HAVE BEEN PUBLISHED IN NHTSA TECHNICAL REPORT DOT HS-801-137. "A MOTORCYCLE SAFETY HELMET STUDY." HE STUDY INDICATES THAT HELMET USAGE DOES NOT ADVERSELY AFFECT THE NECK TO A SIGNIFICANT EXTENT DURING ACCIDENTS. BUT IT DOES NOT PROVE THIS TRUEBEYOND ALL DOUBT. THE NHTSA PLANS AS SOON AS POSSIBLE TO INITIATE CLINICAL RESEARCH TO RESOLVE THE QUESTION FULLY.

Date of NTSB followup Ltr:
