

PSYCHOLOGICAL AND SOCIODEMOGRAPHIC CHARACTERISTICS  
OF ACCIDENT INVOLVED DRIVERS:  
A SURVEY OF THE LITERATURE

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## ABSTRACT

This report reviews selected portions of the literature concerning the psychology of negligent driving. In particular, it stresses those studies which attempt to quantify and predict aberrant driving behavior. Reviewed are such topics as the role of demographics and driving records in accident occurrence and accident proneness, and the use of personality factors in predicting driving behavior.

While much of the research previously conducted has not yielded significant results in terms of predictive validity, recent work seems promising in light of the multivariate techniques being introduced in the traffic safety field. The primary accomplishment of these multivariate studies thus far has been in the area of relevant variable identification and method validation for use in individual driver examination and in highway safety in general.



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The objective of all highway safety programs is to reduce the number of accidents and fatalities which occur each year and to minimize their subsequent toll to society and the individual. The study of accident involvement has been approached from several standpoints. Studies have examined such factors as characteristics of the roadway, the condition and crash worthiness of the motor vehicles involved, factors leading up to the accident, and the accident environment. These studies, however, have chosen to ignore one of the most influential and least quantifiable variables in traffic accidents — the driver himself. Recently, preliminary work has been done in examining the medical, psychological, biographical, and sociological variables involved in traffic accidents. Results of these studies indicate that there are demographic and driver related correlates of negligent driving behavior. While these findings are not immediately useful, they are of interest in relation to the formation of a theory of driving behavior. Ultimately, the goal of such research is to apply these related variables to the prediction of high risk drivers, those who are likely to be involved in traffic crashes. Up to now, the predictive ability of such variables, taken individually and in small groups, has been extremely limited. In light of very recent research, however, there are indications that research strategies involving multiple driver variables taken simultaneously are promising in terms of future predictions.

PURPOSE AND SCOPE

The undertaking of a study of any kind is a commitment in time, effort, and expense. Therefore, no matter how intuitively valid a study may seem or how easily attempted, it should be determined beforehand which variables are relevant to the work, whether sufficient knowledge and equipment are available to complete the research in a correct manner, and whether its completion will be practical in terms of time and expenditures. The purpose of the present investigation is to determine the state of the art concerning the psychology of negligent driving and to pinpoint areas

which could yield productive future research. The report stresses those portions of the literature dealing with concepts which could prove useful in the fields of driver examination and general highway safety. To assist the author, the following questions concerning the above criteria were asked:

- (1) Is the criterion event (in this case, traffic crashes) predictable? Is there reasonable evidence to indicate that the event is causally related to some underlying set of variables and does not occur solely by chance? Are there stable trends which would indicate a nonrandom pattern of occurrence?
- (2) What research has been conducted? Have other researchers studied this problem in a thorough and methodologically correct manner? What theories are put forth and what variables are relevant to this subject?

This survey of the literature is an attempt to furnish suitable answers to these questions.

#### Is The Event Predictable?

If highway crashes and related fatalities occurred completely by chance, there would be no meaningful role for highway safety personnel. There would be no way to determine what situations or variables lead to accidents and fatalities and no way to prevent them from occurring. Indeed, in a world where accidents occurred in a totally unpredictable manner, the only appropriate safety slogan would be "Every man for himself." Fortunately, there is evidence to support the conclusion that this is not the case. Examination of the available records on automobile crashes leads the researcher to conclude that highway crashes do not occur by chance but rather according to some pattern that is amazingly constant from year to year. For example, the number of fatalities among men within given four-year age ranges varies little across years. The same holds true for women of given age ranges, for pedestrian fatalities, and even for the ratio of male to female fatalities within certain age groups.<sup>(1)</sup> Similar consistencies exist for designated accident types and for accident totals within various roadway systems.<sup>(2)</sup> The figures become more conclusive when it is noted that these underlying forces are not founded on mere probabilities, since certain demographic groups are overrepresented in crash data summaries as compared to their representation in the total population. For example, in 1970 males between the ages of 20 and 24 years comprised 10.1% of all males in Virginia

and 4.98% of the total population of the state.<sup>(3)</sup> However, this demographic group (males aged 20 to 24 years) comprised 20.7% of all male fatalities in Virginia and 15.8% of all crash fatalities during the same year. Similar disproportions hold true for other demographic groups, such as blacks of all ages. The inverse of this disproportion applies to all female groups. Thus, it is fair to conclude that a pattern does exist independent of chance probabilities, and that this pattern may be related to some set of underlying or intervening variables.

### What Research Has Been Conducted?

Consistencies in so many demographic categories suggest the existence of some undetermined catalytic force affecting the "selection" of fatally injured drivers. This section attempts to review the major philosophical constructs, theories, and experimental background in this area in chronological order, as well as in the order of complexity. Previously proposed hypotheses are presented below.

#### Natural Selection

The hypothesis for natural selection states that increases in population size may trigger an increase in frustration among societal members, and that this increased frustration level may lead to more risk-taking behavior. Risktaking has been shown to be a factor in accident occurrence, particularly among single vehicle fatalities.<sup>(4)</sup> In this respect, the automobile may be regarded in the same way some demographers regard war — as a form of population control.<sup>(5)</sup> As a typical element of our extremely technological society, the automobile may select out those individuals who cannot cope with the increased frustration inherent in a highly mechanized civilization. In essence, this hypothesis states that while medicine and social work are attempting to serve those weak or handicapped individuals who would ordinarily succumb to "natural" forces, some underlying force may be using the automobile to restore the balance of natural selection.

#### Demographics and Driving Record

Theories involving biographical information state that it is possible to use demographic variables (race, sex, age) or driving records to distinguish between high and low liability drivers. Traditionally, driving record has been considered the best predictor of future violations and accident involvement. Virginia's system of suspension and revocation is administered according to this principle, and habitual offender legislation is enacted for

the same reason. Evidence exists, however, to indicate that this use of driving records is not a valid premise with regard to the general population. Of general concern is the accuracy and completeness of driving records. According to Zylman the probability of a violation or accident being reported to the Division of Motor Vehicles is directly related to the strictness of local enforcement practices.<sup>(6)</sup> Thus, the adequacy of traffic records may vary widely from place to place.

Stewart and Campbell state that while past accidents are better predictors of future accidents than are past violations, neither category does a particularly adequate job of discriminating between high and low risk drivers.<sup>(7)</sup> Burg states that violations are more stable across time than are accidents.<sup>(8)</sup> Selzer found that fatally injured drivers tended to records of more violations and more accidents than did nonfatally injured drivers.<sup>(9)</sup> Baker found that those fatally injured drivers who were adjudged to be at fault had had more accidents and violations than those adjudged to be not at fault.<sup>(10)</sup> Those who died as a result of natural causes, such as having a heart attack while driving a car, were involved in fewer pre-fatality accidents and convictions than those who died solely as a result of the fatal accident. Since many of these studies deal with very small groups and were done retrospective of the fatal accident, only conditional inferences should be made from the data. However, these findings would indicate that when fatal injuries are involved, past driving record has some predictive potential. It is interesting to note that many of these studies came across driver record-related findings as by-products of investigation in other areas, as in the case of research into the psychological problems associated with fatal injury.

This is also true of demographically related findings. While studying the psychological traits of fatally injured drivers, Selzer discovered that they more often came from the lower classes, particularly class IV.<sup>(9)</sup> Later he and Vinokur found that income is negatively related with accident occurrence.<sup>(11)</sup>

Waller and Koch evaluated accident data and types of driving exposure in terms of a small number of sociodemographic variables.<sup>(12)</sup> They found that middle-aged drivers had the most exposure, followed by males of all age groups. They also found that the type and time of exposure were related to the number of accidents incurred. In addition, it was found that the more highly educated individuals drove more than the less educated, but did not have a higher accident rate. Pelz and Schuman, (unpublished) found that among young drivers, those who were alienated from the educational system (dropouts, those with poor grades) had more accidents and incurred more violations.<sup>(13)</sup> Baker found that more males and more young drivers were at fault in their fatal accidents, and that the lower



class drivers were also more often at fault.<sup>(10)</sup> However, this last finding may be due to the fact that those individuals who are not represented by a lawyer are more likely to be convicted of accident related violations. Schmidt, et al. found that subjects involved in different types of fatal accidents seemed to have different basic demographic characteristics. Those individuals killed in multiple vehicle accidents were generally older than those killed in single vehicle accidents. They were usually married and were less likely to be at fault.<sup>(14)</sup>

These studies also deal with relatively small samples and do not make extensive use of available demographic variables beyond age, sex and race. However, as is the case with driving record, a potential exists for the prediction of future auto accident fatalities.

While this theory has some intuitive validity, it certainly cannot be classed as an adequate hypothesis. It is not readily amenable to experimental work since it fails to operationally define the characteristics of those individuals who would be "selected out" of the driving population and therefore offers no predictive value. However, while in itself it is not strictly based on research findings, the idea of natural selection among automobile drivers may be thought of as one of the philosophical constructs upon which many of the later studies conducted to distinguish between high and low risk drivers are based.

### Accident Proneness

The theory of accident proneness attempts to answer the question of why some individuals have more accidents than others, and thus operate under increased risk. The hypothesis states that since a small group of individuals account for a larger number of accidents than would be expected, there must be a set of enduring and stable traits which, when applied to these individuals, would explain their increased accident liability. This increased liability was first observed by Greenwood and Woods among factory workers in England during World War I.<sup>(15)</sup> Later, Farmer and Chambers applied the concept of accident proneness to accident occurrence among "motor drivers."<sup>(16)</sup> With accident proneness established as a safety concept, work was undertaken to determine what variables distinguished between high and low risk drivers. Newbold established a relationship between accident proneness and certain demographic characteristics, such as age and experience.<sup>(17)</sup> In another study, Farmer and Chambers attempted to relate accident proneness with stable personality traits but with little success.<sup>(18)</sup> The instruments used in this study lacked validity and were considered primitive at best. In addition, as

better tests were developed, the methodology was changed to accommodate them. Thus, tests were not administered consistently across subjects. Later Tillman and Hobbs attempted to relate social adjustment with accident proneness.<sup>(19)</sup> While this attempt was somewhat more successful, it was also subject to serious methodological considerations, since it was conducted retrospectively, without controls for exposure, with a small sample, and with dubious testing procedures and instruments.

Thus far, researchers have not developed an adequate operational definition of the accident prone personality. In addition, even assuming there is a definite trait involved, members of the group of accident prone individuals are not always the same. While a small group of drivers account for a larger than expected number of accidents, the individuals who make up that group may vary. It may be said that an individual member may "grow-out" of being accident prone. This does not suggest the existence of a stable trait. Furthermore, within a large group of individuals, certain members will have more accidents than others merely by chance alone — a fact which undermines the statistical foundations of the theory.<sup>(20)</sup>

The idea of accident proneness, in itself, should not be considered an explanation for the problem of accident victim selection but should be thought of in the same way as the idea of natural selection — as a development of the problem area and a basis for further research.

### Life Change or Stress

After it was determined that accident proneness was not a stable trait among individuals and could not be considered stable for any group with a static membership, various theories were introduced to explain this instability. McGuire suggested that perhaps there exist two types of accident proneness — short-and long-term.<sup>(21)</sup> Long-term accident proneness characterizes the high risk driver, whose semipermanent personal, medical, or psychological problems (including chronic alcoholism) place them under increased risk of having an accident. These drivers constitute the small but stable portion of the accident prone group, which will be discussed in a later section of this report. The larger portion of that group, which is in a constant state of flux, comprises drivers who are placed under short-term risk by situations of unusual stress, financial/vocational problems, short-term medical problems, marital difficulties, or radical change in the driver's life style. The theory states that "unusual negative, distracting stress upon the organism increases its liability to accidents or to other low quality behavior."<sup>(22)</sup>

Intuitively, this is a pleasing solution to the accident proneness controversy. The relationship between life stress and accident occurrences has been supported by recent research. Stuart Brown, in attempting to determine significant psychological differences between fatally injured and nonfatally injured drivers, interviewed the significant others of 25 fatalities.<sup>(23)</sup> He discovered that, according to their scales, 80% were adjudged to be "maladjusted" or had experienced some severe emotional stress within a 24-hour period prior to the fatal crash, as compared to 12% for the control group. From a number of similar studies on fatally injured drivers conducted by M. L. Selzer and his colleagues, it was determined that more fatally injured drivers had been operating under severe social stress during the year preceding the accident and that 20% had experienced an acute disturbance within the preceding 6 hours. These disturbances most often included personal/marital conflicts and vocational/financial stress.<sup>(9,24)</sup> Dr. Selzer also correlated aggressive traits and "life change-subject stress" variables with the occurrence of nonfatal accidents, the best predictors being parental and familial disturbance, pressure in school, and disturbances concerning broad social issues.<sup>(11)</sup>

Waller et al. then approached the subject from the standpoint of violation incurring drivers rather than fatalities.<sup>(25)</sup> Subjects were assigned to the "crisis" group if they had experienced a relatively sudden deterioration in driving record, i.e., they had incurred three or more violations during the one-year test period but had incurred no violations during the three-year period prior to the test year. The control group members were matched to crisis subjects by age, race, and sex. There were no differences between the two groups in relation to socioeconomic status, while more control subjects were married. The crisis group had experienced more changes in personal health, more generalized arguments and disagreements, and more break-ups of relationships such as separation, divorce, or planned divorce. (McMurray substantiated the increased risk level incurred during divorce proceedings, since accident rates for participants doubled during the period six months before and after the divorce decree.<sup>(26)</sup> Crisis subjects were also more likely to subscribe to the attitude that there is no reason for living. Stress scores and response to stress scores were calculated, and neither were found directly related to numbers of accidents and violations incurred.

In their most recent research, Selzer and Vinokur have attempted to develop a life change and stress questionnaire for the prediction of high risk driving.<sup>(27)</sup> The study was conducted using several groups of subjects — drivers seeking renewal of their license, drivers attending safety schools, and alcoholics. High risk drivers differed from lower risk drivers on such variables

as aggression, anxiety, cautiousness, physical stress (smoking, insomnia, headaches, ulcers), average numbers of drinks per sitting, disturbances with parents or in-laws, disturbances and pressure in school, and concern with broad social and ecological issues (negative correlation). The best predictive variables were life stress factors. However, correlations were too low ( $R = .14$  to  $.17$ , multiple  $R = .21$  to  $.26$ ) to allow for accurate forecasting of risk. While 80% of the high risk drivers were predicted by the questionnaire, total predictive ability was low. In an examination of driving records for the following 12-month period, 38% of the high scoring drivers were found to have had accidents or incurred violations compared to 15% of the low scoring drivers. While this finding indicates a relationship between scale score and accident occurrence, the relationship is not strong enough to allow for useful prediction.

A number of criticisms have been leveled at research in the area of life stress. First, much of the research has been entirely retrospective, often dealing with accidents which occurred far in the past. Much of the data which indicate life stress have been retrospective as well. According to Selzer and Vinokur,

It seems that the lack of predictive validity for our accident-risk score stems from the fact that the score was based on retrospective rather than prospective evidence.(11)

In addition, much of the research has ignored individual psychological differences that interact with life stress. Waller, et al. suggest that "future research should focus on ways in which people respond or cope with their problems to determine whether it is stress per se or the way a person deals with stress that makes a difference".(25)

### Personality Factors

The theory on personality factors pertains to the drivers described by McGuire as being under long-term accident proneness. These drivers make up the small, static segment of the accident prone population for whom increased accident risk is a stable factor due to abnormal or unusual psychological traits. Until recently, much research in driver behavior was perceptual, which is understandable because perceptual psychology involved easily quantifiable behaviors and virtually ignored individual, internal differences which were difficult to measure. For many years, most of this research followed a black box approach, constructing an external or internal environment in which a task was to be performed, and

measuring the outcomes. While these perceptual studies do not directly relate to negligent driver psychology, their findings do pertain to increased accident risk and will be reviewed very briefly.

Visual perception is generally considered to be one of the most potent perceptual variables in accident evaluation. (This is not to de-emphasize the importance of the Kinesthetic senses as a part of driving. However, kinesthetics are adaptable over a relative short period of time, while visual handicaps are relatively stable.) While a number of visual skills have been suspected of correlating with driver performance, very few have been proven to do so. Amazingly enough, testing procedures prerequisite for receiving a driver's license measure only one of these.

It has been determined that "the static visual acuity test at high levels as presently used [the Standard Eye Chart] is probably not very relevant to the driving experience."<sup>(28)</sup> Dynamic visual acuity, "The ability to perceive details of an object where there is relative motion between the observer and the object,"<sup>(29)</sup> is more highly correlated with driving record.<sup>(30)</sup> Lateral or peripheral vision has also been shown to be related,<sup>(31)</sup> but only in the context of a complex set of tasks, such as are involved in driving.<sup>(32)</sup> Finally, night vision and glare reduction have been shown to be related to driving performance.<sup>(33)</sup>

Later, single variable psychological studies began to appear, in which a number of measures are correlated or compared between groups on a one-to-one basis. At best, these studies involve multiple correlation. Brown et al. interviewed families of 25 fatally injured drivers through the technique of psychological autopsy\* to determine the nature and strength of psychiatric factors influencing drivers prior to their respective accidents.<sup>(22)</sup> Medically related factors were determined by autopsy while behavioral patterns were determined during interviews conducted by qualified psychiatrists with the family and close associates of the deceased. Of the fatally injured drivers studied, 72% had a blood alcohol content (BAC) of .15% or over, and 60% were classified as alcoholics. Many other studies relating personality problems and stress to fatal injury also relate a high BAC to the same occurrence.<sup>(4,9,10,12,13,24,27)</sup> Seventy-six percent of the fatally injured drivers were classified as suffering from "personality disorders," as compared with 2% of the control group. One of the main personality patterns shared by 20% of the experimental group was labeled "over-controlled aggression." According to the authors, these drivers were submissive and did not express their hostility

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\*For a more thorough discussion of the use of psychological autopsy in accident research see Albert Zavala, "Affective States Influencing Drivers' Decisions and Motor Skills," Symposium on the Psychological Aspects of Driver Behavior, Institute of Road Safety Research, The Netherlands (1971).

openly. When they lost control, this suppressed, "bottled up" aggression could be extremely destructive. This aggression factor has been confirmed by a number of researchers. (30,34,35) Another 8% of the experimental group were classified as paranoid in some way. Gross sociopathology was found in 24% of the fatally injured drivers, independent of problems relating to alcohol. While these data would indicate that severe emotional problems influenced the fatalities, there exist certain sampling considerations in that subjects may have been selected for their psychopathology, rather than being randomly sampled. In addition, interview data were collected several months after the fatal accident and may have been "colored" by the emotional state of the deceased's family.

Similar results were found in three studies conducted by M. L. Selzer and his colleagues. (9,11,24) They found that more fatally injured drivers were diagnosed as mentally disturbed than were those nonfatally injured drivers who comprised the control group. These disturbances centered around paranoid ideation, suicidal tendencies, and clinical depression. This depression factor has also been confirmed in the literature. (26,34) While these results seem quite conclusive, the problem of retrospective interviewing again exists.

Other studies dealing with single and multiple vehicle fatalities found that the single car group had significantly more psychopathology than the multiple car fatalities. Schmidt, et al. found that single vehicle male fatalities scored higher than the norms in belligerence, negativism, general pathology, and hyperactivity, but lower on withdrawal as measured by the Katz Adjustment Scales. (14) It is interesting to note that single vehicle female fatalities and individuals involved in multiple vehicle fatal accidents did not score above these norms on the adjustment scales. While this study was conducted on a relatively small number of fatalities, it dealt with an entire population and was not confounded by sampling deficiencies. However, it did not employ a nonfatal control group and is therefore suspect when making inferences to the general population.

Kuzma, et al. discovered that psychological traits associated with religiosity (high scores in benevolence, friendliness, and objectivity; low scores on alcohol tendencies, ambition, and masculinity) were related to the number of nonfatal accidents which occurred, which in turn is related to fatal accident liability. These traits were not related to the number of violations incurred. (36) However, the religious group chosen for this study was primarily white and the sample entirely male. This demographic bias might enhance the tendencies that were found and therefore, this study must also be regarded with some suspicion.

Quenault compared convicted with non-convicted drivers on a number of psychological variables.<sup>(37)</sup> He found that these two groups differed as to their extroversion score. Olsen also found that extroversion was related to increases in travelled speed and increases in numbers of car control uses, while both decreased in normal drivers.<sup>(38)</sup> Finally, impulsivity was found to relate to negligent driving.<sup>(39,40)</sup>

These cited reports tend to portray the fatally injured or high liability individual as an aggressive and hostile driver, one who may suppress these tendencies in most situations but releases pent up energies in cases of extreme stress. Many are subject to alcohol addiction, suffer from serious psycho- and sociopathological problems, and some have been diagnosed (post-humously) as psychotic. Even with the methodological problems encountered in these studies, there is evidence to suggest that these traits may be overrepresented within the negligent driver population. However, these research findings must be judged in relation to their applications. While these studies identified relevant variables and expanded the literature, they did not yield a clear picture of driver personality nor did they offer any evidence of predictive ability.

Only recently have multivariate techniques come into vogue in relation to driver psychology. This type of approach seems promising and has been successful in negligent driver prediction. A study by Harano, McBride, and Peck illustrates the success rate of the few studies being conducted.<sup>(41)</sup> Two groups of drivers were selected on the basis of driving record — one group having experienced no accidents during the previous three-year period and the other having experienced three or more during the same time. These subjects underwent two hours of testing in the areas of biographical information, driver attitude, parental relations, perceptual style, sensory and motor skills, physical condition, criminal and driver record, and driving simulation score. Significant predictive factors discovered through multiple regression and cluster analyses were marital status, exposure, traffic conviction record, socioeconomic factors, rating of one's driving ability against elderly drivers, and personality and attitudinal factors as measured by the California Inventory of Driver Attitudes and Opinions (CIDA0). The concurrent prediction equation correctly classified 68.9% of the accident free drivers and 71.2% of the accident involved drivers. This is a much higher overall prediction success rate than was achieved by any of the studies previously mentioned. However, although these findings survived cross validation, they were not applied to future driving records and thus, may suffer from the retrospective limitations previously mentioned.

Summary

The main accomplishment of previous studies in the areas of demographics and driving record, psychological factors, and lifestress variables has been to establish and clarify the relevant variables in negligent driving behavior. They have yet to offer any significant predictive ability and thus, their applicability is questionable. However, the attitude that it soon will be possible to predict poor driving behavior is becoming more prevalent. According to Olsen,

With sufficient diligence and control of testing environment, it may be possible to refine the observations and other criteria until they become sensitive enough to predict success in driving . . . . As each predictive quality is identified and its effect on driving behavior is established, it becomes possible to formulate positive or negative feedback to mold that behavior. (38)



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