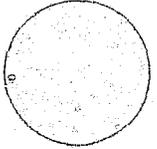


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MOTOR VEHICLE ACCIDENTS AND SELF-CONTROL

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Introduction

Motor vehicle accidents are the result of driver, roadway, or vehicular factors, or some combination of these variables. The term "accident" conjures up images of chance happenings, unknown causes, and unavoidable outcomes. The roles of ignorance and negligence are diminished by both dictionary definitions and standard usage. But under such a "fortuitous happening" paradigm, the frequency distribution of accidents would be expected to take the shape of a normal bell curve. It does not. Seventy years of empirical research have shown that certain individuals have more accidents than are explainable by chance alone. Furthermore, it has been demonstrated that the high accident rate for many of these specific individuals is stable over time, and that high-rate individuals are distinguishable from accident-free individuals on a number of socio-psychological dimensions. This insight indicates nothing about the overall causes of motor vehicle mishap, but it does imply that for some individuals the causes of accidents, or lack of them, lie in personal characteristics of the actor rather than uncontrollable circumstances in the environment.

This paper will draw on some of the more important studies in the fields of accident analysis and criminology. Our purpose is two-fold: First, to describe the concept of accident proneness, its development, and proposed explanations. Second, to explore the relation between accident proneness and crime by defining each as deviance, with the same correlates, age structures, and relatively stable manifestations.

Accident Proneness.

Coined in the late 1930's, the term "accident prone" has become a household word. It is used by the layman to describe the clumsy, the repeatedly unfortunate, or any individual who appears to have had more than his or her share of accidental injury. In the worlds of social science and

accident analysis the term "accident prone" is defined more specifically. Yet even within these scientific communities the seventy year history of accident proneness research has been plagued by, and rightfully criticized for, a lack of definitional, and thus conceptual, congruency (e.g., Arbous and Kerrich, 1951). Simply stated, accident proneness refers to "an enduring or stable personality characteristic that predisposes an individual towards having more accidents than explainable by chance alone (Shaw and Sichel, 1971). Such a concept implies that even controlling for physiological (vision, audition, reaction-time, etc.) and environmental factors, some individuals are intrinsically more likely to have accidents than others. Accident proneness refers solely to "affairs of personality," and is not to be confused with initial accident liability, a broader term encompassing all individual differences (psychological and physiological) that might affect one's overall chances of accidental injury (Greenwood and Wood, 1919).

Greenwood and Wood first demonstrated the existence of unequal initial accident liability in 1919. They analyzed the accident records of a group of 750 similarly exposed and experienced female British munitions workers and noted that a small percentage of the women accounted for the vast majority of accident victims (Greenwood and Wood, 1919). Greenwood and Wood suggested that some biographical, physiological or psychological characteristic must account for the high rate of injury among this group. Observations of this skewed distribution continued most notably through the work of Newbold (1926). While these early statistical studies are applauded still for their precise methodological controls for exposure, reporting, and experience, controls for physiological factors were absent, leading these conscientiously objective experimenters to conclude no more than the finding of unequal initial accident liability. Yet scientific enthusiasm for a psychological theory of accidents peaked in the late 1930's with the coining of the term "accident proneness" and the writing of many hundreds of papers on that subject. The more fashionable the concept, the more loosely its research was conducted, and the more unjustifiably grandiose its conclusionary statements became (e.g., Farmer

and Chambers, 1939). Though much insightful research did continue (e.g., Tillman and Hobbs, 1949; Hakkinen, 1958; Shaw, 1965), the previous lack of scientific objectivity on the part of some researchers had left the field open to question in the 1950's (Arbous and Kerrich, 1951), and rejection in the 1960's (Haddon, Suchman, and Klein, 1964) on methodological, statistical, and even conceptual bases. Nevertheless, the concept has enjoyed something of a scientific renaissance in the 1970's and 1980's due to a renewed concern with methodological precision, coupled with continually mounting evidence of the accident proneness phenomenon.

Methods.

Myriad factors combine to define an individual's total accident liability. It has been one aim of accident proneness research to separate the psychological contributors to accidents from confounding causal variables. To this end researchers have most generally followed one of two broad approaches: the clinical or the statistical.

The clinical approach examines identified high and low risk drivers for distinguishing psychological, sociological or biographical features. Personality factors can be assessed by use of any means from a self-administered questionnaire to an in-depth psychological investigation. Discriminating variables are later correlated with accident record. From this analysis a composite of the accident prone, and the safe driver, emerges.

Clinical Findings on Accidents, Crime, and Social Deviance.

McGuire (1976: 433) describes the accident prone individual as being "emotionally less mature, less responsible, more a/antisocial, and not as well-adjusted." He adds that these individuals "tend to have a more disturbed history, such as an unhappy childhood, delinquency, family disruption and an uneven work record" (1976: 433). More extensive descriptions, but similar in essence, are found throughout the accident proneness literature. Correlations between a proclivity for accidents and a variety of social deviance, including criminal activity have been repeatedly documented. The implication of level

of self-control as an omnipotent variable in both crime and repeated accidents is a fairly new idea (Gottfredson and Hirschi, 1990).

Yet the belief that crime and a high propensity for accidents are in some way interrelated dates back at least forty years. The first systematic clinical study was conducted by Tillman and Hobbs in 1949. Two studies were conducted. The first involved seventy taxi drivers in London, Ontario. Tillman and Hobbs rode with the seventy drivers over a two and one-half month period, giving them a chance to evaluate both the drivers and their driving habits. Two groups of twenty each were then selected as a high and low accident sample. The groups were comparable on age and miles driven.

Extensive interviews were undertaken with these forty men to obtain comprehensive biographical and psychological information. All self-report information was cross-checked against official sources (i.e., police records), management, and recollections of fellow cab drivers. Results of comparisons between the twenty high accident and twenty low accident drivers have been reproduced in Figure 1.

FIGURE 1

PERSONALITY SURVEY ON GROUP OF TAXI DRIVERS

Personality	Characteristic	High Accident Group, 20 Men	Low Accident Group, 20 Men	Statistical Significance X ²
Birth Place.....	Urban.....	15	15
History of Parents.....	Parents Divorced.....	6	1	4.63
	Excess Strictness and Disharmony.....	13	5	6.28
Neurotic Traits in				
Childhood Life.....	Excess Childhood Phobias *.....	11	5	4.48
	Excess Aggression in Childhood **.....	11	0	23.60
School Adjustment.....	Completing Grade School.....	15	15
	Truancy and Disciplinary Problems.....	12	2	10.98
Employment Record.....	Five or More Previous Jobs.....	13	7	3.60
	History of Being Fired.....	10	4	3.98
Armed Service Record...	Member of Armed Service.....	15	9
	Frequent A.W.L.'s.....	11	1	8.60
Marital Status and				
Sexual Adjustment.....	Married.....	8	11
	Admitting Sexual Promiscuity.....	8	2	4.00
Social Adjustment.....	Having Two or more Hobbies.....	9	17	8.50
	Admitting Bootlegging on The Job.....	14	3	12.20
	Conscious of Physique.....	11	3	5.40

*Enuresis, fear of fights, dark, deep water, excessive daydreaming, etc.

**Leader of gang, bully, temper tantrums, Juvenile Court record, etc.

When P = .05, X² = 3.84

Reproduction of Table 1, Tillman and Hobbs (1949:324)

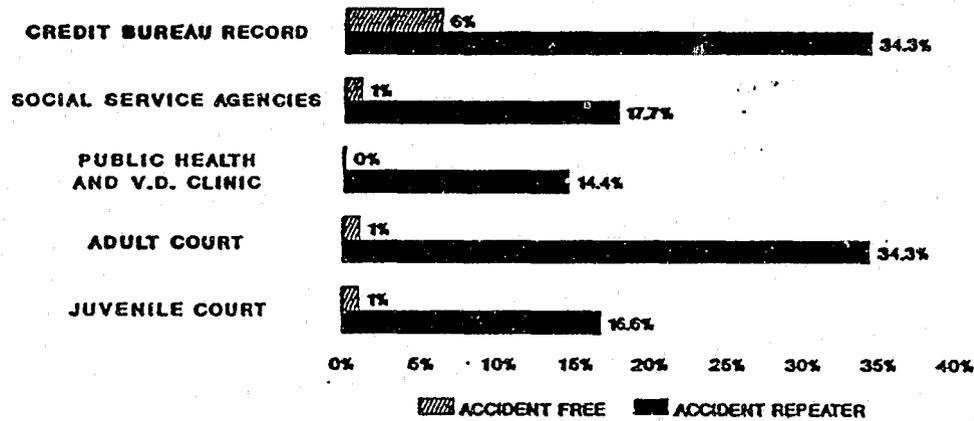
While the population of the study was small, and the hazard of observer bias great, Tillman and Hobbs concluded that the high accident personality was "characterized by aggressiveness and inability to tolerate authority either at the parental or community level." They hypothesized further that this personality "would appear to have its origin in the home background of the individual" (Tillman and Hobbs, 1949: 327).

While small sample size and the possibility of observer bias were obvious points of methodological concern, there was also a problem with generalizing the findings of an experiment with a highly select group (taxi drivers) to the general population. Realizing these problems, Tillman and Hobbs devised a second study. They obtained the names and addresses of 96 male drivers in the area who had official records of four or more serious (damage \geq \$50) automobile accidents. The names of 100 accident-free male drivers in the same district were obtained as a control group. The names of both groups were submitted to the juvenile court, the adult court (for non-traffic related records), to the "public health agencies" and venereal disease clinics, and to three social service agencies. "These were the Family Service Bureau, which handles difficulties of a family nature, and to the two Children's Aid societies, Catholic and Protestant" (Tillman and Hobbs, 1949: 328). In addition, the names were checked by the local credit bureau. Here only names known more than once to the bureau were counted. It was Tillman and Hobbs's hope to turn up evidence which would support and generalize their findings in the taxi driver study. Figure 2 reproduces the findings of the second study.

Tillman and Hobbs report that 66% of the high accident group were known to one or more agencies. Among the 100 accident-free drivers, only nine were known to any agency, and in no case was a person known to more than one. They conclude (1949: 328) that "social maladjustment of various types is to be found quite as frequently among the general driving population with a high accident record as among the high accident taxi drivers, and that one is justified in feeling that the same pattern exists in both groups."

FIGURE 2

SOCIAL RECORDS OF 96 ACCIDENT REPEATERS AND 100 ACCIDENT FREE DRIVERS



• Reproduction of Table 1, Tillman and Hobbs (1949:324)

These findings, while vigorously criticized by Haddon et al. (1964) as lacking in methodological precision (most notably controls on exposure), have been replicated many times since. Following the same line of inquiry with a population of professional truck drivers equatable on exposure, McFarland and Moseley (1954) reached identical conclusions. Accident-repeaters were more likely to have been involved with the criminal justice system and various social service agencies, and to have had childhood histories of "emotional disturbance" (McFarland and Moseley (1954)). Correlations between childhood home-life and future accidents have been found by Rommel (1959, cited by OECD, 1975, and Shaw and Sichel, 1971), Harrington (1971, cited by Naatanen and Summala, 1976), and Sobel (1974) as well as by Tillman and Hobbs (1949) and McFarland and Moseley (1954).

The inverse relation between accident potential and academic achievement further illustrates the formation of attitudes and behaviors predictive of high accident potential long before the age of driver eligibility. While

Tillman and Hobbs found no difference between high and low accident groups in terms of completion of grade school (perhaps a function of the Canadian school system) significant differences were found in regards to a history of "truancy and disciplinary problems."

Subsequent research has shown accident repeaters significantly more likely to have failed an elementary school grade (Kraus et al, 1970, cited by Robertson, 1983), to have played "hooky" from high school (Harrington, 1971, cited by Naatanen and Summala, 1976), to have been enrolled in a "vocational track" curriculum (Kraus et al, 1970, cited by Robertson, 1983), and to have terminated their education at a younger age than their non-accident-repeating counterparts (Schuman, 1967; Harrington, 1971, both cited by Naatanen and Summala, 1976). In fact, Harrington (1971, cited by Naatanen and Summala, 1976) finds poor academic achievement and school adjustment to be among the best predictors of accident potential (see also Carlson and Klein, 1970. Such findings are not new to criminology (Gottfredson and Hirschi, 1990: 105-107).

Most of the traditional correlates of criminality have also been found to be correlated with accident involvement. The accident-repeater is more likely to have begun dating (Harrington, 1971, cited by Naatanen and Summala, 1976), working (Schuman, 1967, cited by Naatanen and Summala, 1976; Kraus et al, 1970, cited by Robertson, 1983), and smoking (Kraus et al, 1970, cited by Robertson, 1983) at an early age. The fact that smoking has been consistently tied to accident involvement led DiFranza to suggest that "the common denominator here may be the willingness to take risks" (1986:466).¹ The accident-repeater is more likely than average to be single or divorced than married (Coppin & van Oldenbeek, 1966, cited by Shaw and Sichel, 1971; Michalowski, 1977), and has more often fathered illegitimate children than his non-accident-repeating counterparts (McFarland and Moseley, 1954). Those in

¹ DiFranza's study found smokers to have 50% more accidents and 46% more traffic violations than non-smokers. Such differences remained when age, alcohol consumption, education, and driving experience were controlled. See also Harrington, 1971.

low skill occupations and the unemployed individuals are over-represented in accident statistics (Coppin and van Oldenbeek, 1966, cited by Shaw and Sichel, 1971; Michalowski, 1977). Accident-repeaters are disproportionately young and overwhelmingly male (National Safety Council, 1989). As of 1988, approximately 51.8% of the estimated 164 million drivers were male. Yet males comprised 69% of those killed in, and 78% of those involved in the motor vehicle fatalities of 1986 (National Safety Council, 1989).

The potential for accidents would thus seem highest among the single, socio-economically and educationally disadvantaged young male. Such a composite is all too familiar to the criminologist who should not be surprised by the fact that a number of other studies, in addition to those of Tillman and Hobbs (1949), and McFarland (and Moseley, 1954), have uncovered similar evidence of the connection between repeated motor vehicle accidents and crime. Larsen (1956) found that the greater the number of recorded traffic violations, the more likely a juvenile would have a (non-traffic) criminal arrest record (see also Carlson and Klein [1970], Kraus et al [1970], and Middendorf [1969]). Willett (1964) found traffic offenders in Great Britain to have a rate of criminal arrests three times that of the general populace. Haviland and Wiseman (1974) found criminals who drive in Dade County, Florida, to have 3.25 as many traffic citations, and to have been involved in 19.5 as many motor vehicle fatalities as the non-criminal driving public.

A General Theory of Accidents.

A general theory of accidents may begin with the assumption that human behavior is motivated by the pursuit of pleasure. Accidents are, of course, not widely regarded as pleasurable. But neither are criminal arrests nor social stigmatization. The factor common to accidents, crime, and social deviance is a pattern of involvement in risky activities without regard, or with little regard for the long-term or low probability consequences of one's acts. Although the literature speaks of a "propensity for accidents," this is really like speaking of a "propensity" for arrests. Accidents and arrests are

unintended or unsought consequences of immediately pleasurable activity. The propensity, if any, must be toward conduct without regard for the distant uncertain consequences of one's acts.

It is estimated that "driver error" is a primary factor in 90% of motor vehicle accidents (Treat et al, 1977,; Sabey and Staughton, 1975; Perchonok, 1972; Finnish Insurance Information Center, 1974; all as cited by Shinar, 1978). After the on-site investigation of 2258 motor vehicle accidents of varying severity, Treat et al (1977) concluded that "driver error" was the exclusive cause of 57.1% of these accidents. An additional 33.2% of the accidents examined were caused by some combination of driver, and vehicular or environmental factors, thus bringing the total percentage of accidents involving apparent driver error to 90.3%. "Driver error" was defined as the commission of, or failure to take, an action "that an otherwise alert, reasonably skilled, and defensive driver would have taken--and which would have prevented the accident" (Shinar, 1978: 112). While reckless driving is merely one component of the many factors labeled "driver error," a number of statistics indicate its significance. For example, The National Safety Council (1989) has cited "improper driving" (consisting of reckless and predominantly illegal maneuvers) as a factor in 67% of motor vehicle accidents.² In such incidents, excessive speed and right-of-way violations were the most commonly specified factors.

Convictions for traffic violations are highly correlated with accident incidence (Campbell, 1959; 1964 California Driver Record Study, Parts 4 & 6, 1965, cited by Shaw and Sichel, 1971; Sobel, 1974; Robertson, 1983) and are,

² "Improper driving" was cited as a factor in 61.4% and 69.5% of all fatal, and severe injury accidents, respectively. In such incidents, excessive speed and right-of-way violations (failure to yield, passed stop sign, disregarded signal) were the most commonly specified factors, being implicated in 30.3% and 11.3% of fatal accidents, and 25.1% and 23.8% of severe injury accidents, respectively (National Safety Council, 1989).

in fact, a better predictor of future accidents than accidents themselves, (Chipman and Morgan, 1974; Miller and Schuster, 1983). Explanation of the finding that violations predict future accidents better than accidents themselves may lie in the fact that accidents, as previously mentioned, are rigged chance outcomes, or occurrences, while recklessness, which invites both citation and casualty, is a behavioral factor, and, as the General Theory would suggest, a relatively stable one. Such correlations are further accentuated by analysis of only those drivers deemed responsible for their accidents (Banks, 1977, cited in Robertson, 1983). Traffic citation records themselves are also admittedly imperfect measures of a propensity for recklessness. Nevertheless, the correlation is strong.

Human action offers psychic as well as material rewards. On the whole, exciting, risky, or thrilling activities are perceived as more pleasurable than routine, harmless, or dull ones. Thus, driving fast and daringly is more pleasurable than driving slowly. But mere thrill-seeking is not the only motivation for traffic law violation. Widely held values regarding self autonomy, competitiveness, and the efficient use of one's time are similarly thwarted by the rigid observance of traffic regulation. The driver must therefore balance the immediate, and often substantial benefits of a risky maneuver (such as passing a line of slow-moving vehicles in an extended "no-passing" zone) against the possibilities of collision or citation, both of which he justifiably views as unlikely. Collision, while severe, is a rare occurrence, and extremely unlikely to result from any given single violation. Citation, while still improbable, is more likely than collision, but also much less severe. While the probability of either event resulting from a single violation is extremely low, the odds increase with the frequency of the violating behavior. Those high on self-control are more likely to consider not only the immediate possible consequences of violating the law, but also the much increased long-term risks of forming a pattern of recklessness.

In a similar vein, the odds of arrest for a single unbungled burglary,

while clearly dependent upon a variety of variables, are relatively low. Bureau of Justice Statistics (1989) show clearance of only 13.8% of all reported burglaries in 1988. However, given the estimate that only 51% of total burglaries were reported in that year the actual odds of apprehension for any single burglary (all else being equal) are more likely in the neighborhood of one in fourteen. Yet despite these seemingly favorable odds, repeated involvement in burglary almost always leads to arrest, or if not, clearly increases the odds of that outcome. A single standard traffic violation is, of course, infinitely less likely to result in physical or political sanction than the single standard burglary. Nevertheless, while both traffic law violation and burglary may "pay" in the short run, perpetual involvement invites disaster. The individual high on self-control, while equally tempted by the benefits inherent in recklessness, is more likely to consider the long-term risks, and is thus less likely to engage in reckless driving.

Age.

The relationship between crime and motor vehicle accidents is further enhanced by an examination of the age curves of the two phenomena. Figure 3 displays the age curve of Part I Index property crime arrests and that of drivers involved (but not necessarily killed) in fatal motor vehicle accidents.³ Like crime, involvement in fatal traffic accidents peaks in the late teens and steadily declines thereafter. Unlike crime, the motor vehicle fatality age curve is bi-modal, displaying a second, though less sizeable rise beginning around age sixty. The presence of this second peak, however, should not be allowed to detract from the striking similarity between the two curves. For motor vehicle accident rates are determined by a variety of factors, self-control being only one. It is the contention here that while the high

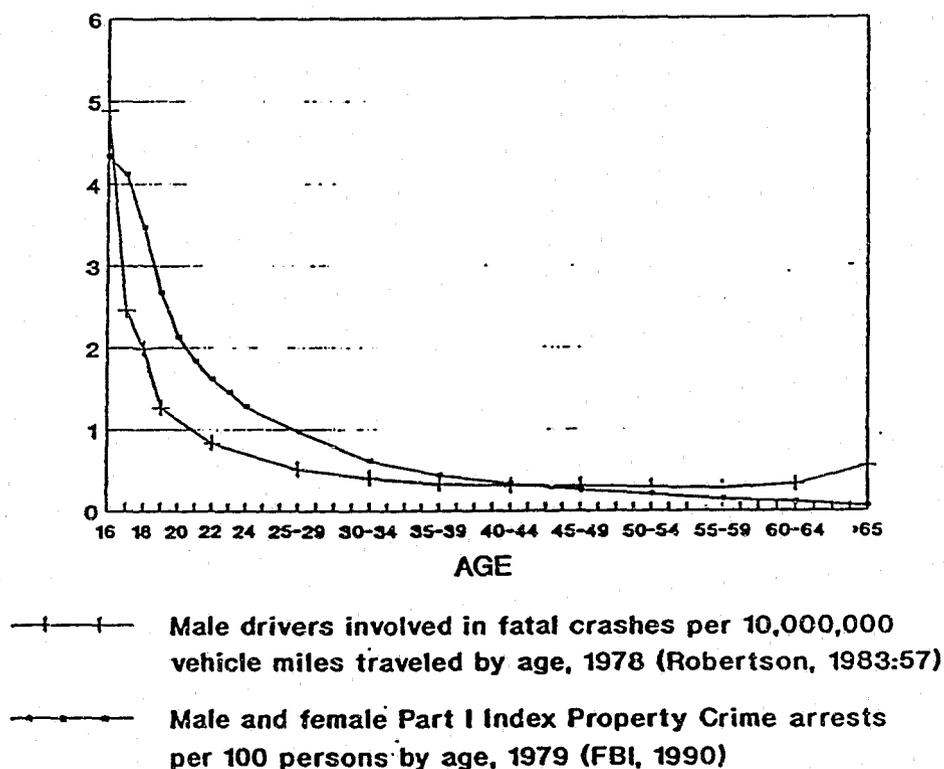
³

An age curve based on drivers involved in fatalities rather than (A) driver fatalities or (B) total fatalities is superior because (A) takes no account of culpability (many times those killed are not those who caused the accident), and (B) is diluted by the ages of passenger fatalities who (while very often similar in age to their driver) are incidental to the accident.

accident rate of youths ages 16-24 is attributable to a greater disregard for consequences (low self-control), increased casualty among elder adults is more likely a function of physiological factors. Such factors affect both the odds of crash involvement and the ability of the individual to survive physical trauma.

FIGURE 3

AGE SPECIFIC ACCIDENT AND ARREST RATES

Young Drivers.

The belief that young people make up an especially dangerous class of drivers is not without foundation. In 1988, drivers age 16-24 made up less than one-fifth (18.6%) of all licensed drivers, but accounted for nearly one-third (31.1%) of the 64,000 drivers involved in fatal accidents (National Safety Council, 1989). Motor vehicle accident is the leading cause of death in this age group, accounting for more fatalities than all other causes of

death combined (National Safety Council, 1989). The involvement of young adults in a considerably greater proportion of single vehicle accidents leaves little doubt as to their culpability (Penn, 1963; Klein and Waller, 1970).⁴ Costs for this age group in terms of permanent disablement and lesser injury are also disproportionate.

Because young adults have been shown to be at the prime of physical acuity, such variables as vision, audition, and reaction-time cannot be used to explain their high rate of accidents. Efforts to account for the high incidence of accidents among the young have focused on exposure, alcohol consumption, and experience. But even these explanations are far from fully satisfying.

Quantitative exposure, as measured by miles traveled, is a significant predictor of accident involvement. But ironically, young adults actually drive fewer miles than their older counterparts (Carlson, 1973, cited by Lewis, 1985). Thus, exposure cannot explain their over-representation in fatality statistics. Furthermore, the age curve depicting drivers involved in fatal accidents (Figure 3) is based on a rate of fatalities per 100 million vehicle miles driven by each age group. Exposure has therefore already been taken into account.

Of course, the quality of exposure also affects total accident liability. While young adults drive fewer total miles, a greater proportion of their total mileage is accumulated during recreational (Fatal Accident Reporting System, A-31, 1987; Klein and Waller, 1970) and night-time driving (Carlson, 1973, cited by Lewis, 1985). Lewis (1985) cites a study by Mayhew et al. (1981) demonstrating young drivers to be between 2.3 and 1.2 times more likely (depending on specific age) to be fatally injured during night-time driving than the general population of night-time drivers. Such results have

⁴ In 1961, California drivers age 16-24 were 5.15 times more likely to be involved in a single vehicle accident than would be expected on the basis of their total vehicle miles of travel (Penn, 1963, cited by Goldstein, 1972, cited by Naatanen, 1976).

led Lewis (1985) to ponder whether this is "because of the inherent risks of night-time driving or because adolescents choose night-time as suitable for particularly dangerous types of driving which they favor?" Cameron (1982) has reviewed a number of studies examining the combined effects of quantitative and qualitative exposure for the 16-24 year old driving population. It was concluded that exposure alone could not account for the over-representation of young adults in fatal motor vehicle accidents.

Alcohol was implicated as a factor in 50 to 55% of fatal motor vehicle accidents in 1988 (National Safety Council, 1989).⁵ The percentage of motor vehicle fatalities involving alcohol was, however, highest among young adults (Fatal Accident Reporting System, 1987). This age group's percentage of alcohol related accidents was also far higher than would be expected on the basis of vehicle miles of travel, all else being equal (Lewis, 1985). Have we now found our explanation of the increased motor vehicle fatality liability of young adult drivers? According to studies reviewed by Lewis (1985), we have not. Lewis cites the Grand Rapids Study by Zylman (1973) that shows young adult male drivers to have a higher risk of motor vehicle accident than older drivers even at blood-alcohol levels of zero. In fact, it is reported that the effects of age are most pronounced in non-alcohol-related accidents (Zylman, 1973). After the examination of one such group of non-alcohol-related accidents Zylman found 16-17 year olds, and 18-19 year olds to be over-represented by 53% and 25%, respectively. While no doubt exists as to the significance of intoxication as a principal cause of motor vehicle fatalities, the evidence suggests that alcohol alone cannot account for the over-representation of young adults in traffic accidents.

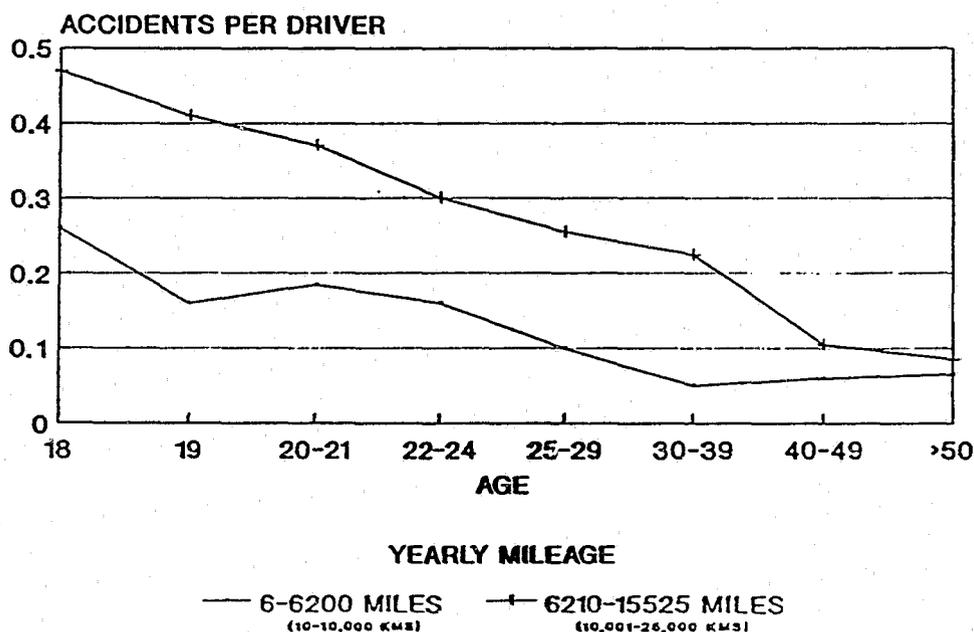
The effects of age and those of experience are intricately interwoven. Attempts to isolate their individual effects have proven difficult.

⁵ "Implicated" refers to "alcohol related" as determined by the presence of a blood alcohol content $\geq .01\%$ in any involved party. Legal intoxication, on the other hand, requires a BAC of $\geq .10$ in most states.

Experience with driving would be expected to improve proficiency. Given such conventional wisdom, it has been argued that the high accident rate of young adults could be largely attributable to a lack of comparable driving experience. Yet despite the palatability of such an argument, evidence to the contrary can be found. For example, Robertson (1983) describes a study by Pierce (1977) in which "14.2% of drivers licensed at sixteen had crashes reported to the police in their first year, compared to 13.4% in their second year and 11.5% in their third year at age eighteen. Among those who waited until eighteen to be licensed, 11.9% reported crashes in their first year, about the same percent as eighteen year olds with two years of experience. Nineteen-year-old-drivers licensed since they were sixteen had 10.2 crashes per hundred drivers compared to 10.5 per 100 newly licensed nineteen year olds" (Robertson, 1983:56). Swedish researchers Kritz and Nilsson (1967, cited by OECD, 1975) arrived at similar findings as apparent in Figure 4.

FIGURE 4

NUMBER OF ACCIDENTS DURING FIRST YEAR OF DRIVING
FOR MALE DRIVERS IN RELATION TO
AGE AND YEARLY MILEAGE



* Reproduction of OECD graph (1975:18) based on figures from Kritz and Nilsson (1967)

Evidence thus far has demonstrated that the high accident rate of young adults cannot be attributed exclusively to the effects of exposure, intoxication, or a lack of experience. With regret, no definitive explanation of the shape of the age curve is offered here. Yet it would seem safe to assume that whatever forces are responsible for the over-representation of youth in crime are similarly responsible for the deluge of accidents among the young.

Stability.

After controlling for exposure, age, experience, reporting, and vision, Hakkinen found the accident rates of 52 bus, and 44 tram drivers to be relatively stable over a period of eight years. Split-half correlations between the first and second four year periods, and between odd/even year periods were $r = +0.577$ and $+0.678$ for bus drivers, and $r = +0.674$ and $+0.726$ for tram drivers, respectively, all coefficients being significant at the .001 level (Hakkinen, 1958, cited by Shaw and Sichel, 1971). Shaw and Sichel (1971), after controlling for exposure, experience, and a number of physiological factors, found split-half correlations of $r = +0.64$ over a six year period for 82 South African bus drivers, again significant at the .001 level. While neither study directly controlled for alcohol consumption, long-term employment and strict company policies regarding intoxication all but precluded that variable.

Studies of industrial populations have yielded similar results. In a recent, and very exacting study by Boyle (1980), exposure, experience, and reporting were controlled for in a group of 84 press operators. The split-half (Spearman's Rank) correlation coefficient obtained for accident involvement over a period of eight years and nine months was $p = +0.67$ (significant at the .01 level). Given all of the reasons why high positive correlations should not be expected, the correlation coefficients produced would appear to confirm the stability of long-term accident involvement.

Predicting Accident Potential.

Attempts at devising tests predictive of accident involvement on the basis of social and individual variables have met with a great deal of success. Such tests project or identify inherent, psychologically-based accident risk under controlled circumstances. As far back as 1954, McFarland and Moseley (1954) were able accurately to identify 85% of the accident-repeaters in a professional driver sample on the basis of motor vehicle files, court records, and "derogatory inspection report(s)." Shaw (1965) reports 78.5% accuracy in the prediction of future accidents for a group of South African bus drivers on the basis of two psychological tests. Shaw employed a South African version of the Thematic Apperception Test (TAT), and the Social Relations Test (SRT), both of which were constructed by her research team. Mayer and Treat (1977) have reported accurate accident record classification for a (very small, N = 14) sample of private automobile drivers. Classification was based on a number of tests, the most discriminating of which examined levels of "citizenship" (voting frequency, church and club attendance, etc.), anti-social tendencies, and psychopathology.

It has been argued that such paper and pencil test should be incorporated into the Department of Motor Vehicle's general licensing criteria. Under such a scenario, applicants deemed "psychologically unfit to drive," like those deemed visually, or otherwise physically below par, would be denied driver's licenses. While such a program might in fact save a great many lives, public reaction would be passionately negative, and justifiably so. Using a test demonstrated to be 80% accurate, one out of every five low-risk drivers would be misclassified as high risk, and on this basis denied driver's license eligibility. Given the integral role of the automobile in the American lifestyle, the accuracy rate of any such test would need drastic improvement before meeting acceptable standards." ⁶

⁶ In lieu of license ineligibility, it has been argued that psychological testing could be used, reasonably and justifiably, for the purpose of recommending "high-risk" individuals for driver education seminars. Yet the long term stability of violating behavior would suggest the hardy resilience of unsafe

Conclusion.

One's concept of the "accidental" changes with knowledge. The more thoroughly one understands the causes and consequences of a phenomenon, the less likely one is to attribute that phenomenon to chance, destiny, or supernatural forces. There was a time when contagious disease was ascribed to the work of fate; a time when criminality was attributed to the power of demons; a time when accidents were considered no more than a matter of chance.

The research on motor vehicle accidents fits reasonably well with the general theory of self-control, including the concepts of versatility and stability, and the decline with increasing age. Those lacking self-control show propensity to violate not one, but a host of social mores both simultaneously and consistently. So why shouldn't this individual's consistence extend also to his driving habits? It was a similar thought that led Tillman and Hobbs to conclude, "a man drives as he lives" (Tillman and Hobbs, 1949).

driving practices to such deterrent/educational measures (Miller and Schuster, 1983).

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