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THE STATISTICS OF ACCIDENTS

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To open this discussion of traffic accident data, please consider three research approaches. At one extreme is the statistical approach in which we collect information about a large number of accidents, giving much perspective but sacrificing detail on any one accident. A second approach consists of intensive study of a limited number of accidents, usually by a team of "experts." This gives less perspective and breadth than the statistical approach, but yields considerably more depth — more information about each individual accident. At the other extreme are the experimental, staged car crashes in which "infinite" detail is obtained on individual test crashes, but the number of such tests and the resulting perspective is necessarily limited.

Because of traditionally limited resources for accident research, it has never been possible to combine the first two into a study in which detailed data were collected on a large enough sample of accidents to gain perspective.

Each of the compromise approaches has its unique strengths and weaknesses.

The basic strength of the statistical approach to the study of traffic accidents is that the statistics deal with real events that happen to real people. Accident statistics directly concern the lives and deaths of people; thus findings from carefully compiled accident statistics have an immediacy that makes them believable. The most important weakness of the statistical approach is that by its very nature it looks backward, describing events that have already happened. This fact alone dictates the necessity of other types of accident research that innovate and look to the future.

Finally, we should think of statistics as a language — one dialect of the language of mathematics; statistics, like English or French,

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is a way of conveying ideas of quality and quantity. Numbers, like words, can be manipulated to tell lies or half-truths.

Whatever the characteristics of statistics per se, the fact is that in this country we do not have suitable statistics to provide us with the information needed to combat the problem of accidents, injuries, and deaths. As a nation, we do not have the quantity and quality of necessary statistical information that would allow us to evaluate and weigh the driver factor in accidents. We do not have information that would permit us to assess adequately road environment factors in the production of accidents. This is partly because existing statistical systems usually do not even allow pinpointing the accident location with suitable precision. Obviously, if one wishes to study accidents in terms of road factors, it is at least necessary to know where the accident occurred, and the physical characteristics of that exact spot.

Finally, in our statistical systems today we do not have enough information to provide an evaluation of the role of the vehicle in the production of the accident (matters such as vehicle failure, improper maintenance, etc.) nor in the crash protection phases.

I believe that the clamor today reflects the determination to raise the vehicle to the level of full partnership in the study of the accident process. This has not been the case in past years when the greater weight of our attention has been on driver variables.

By considering road, driver, and vehicle as full partners, perhaps we can eliminate the fruitless numbers game in which we try to decide on a percentage basis how much of the accident toll is attributable to the road, how much to the vehicle, and how much to the driver. As an operating tactic, we might as well assume that each of these three factors produces 100 percent of the accidents, and then set out to find the most cost effective means of combating the problem. For example, it does not necessarily follow that because the driver played the primary role in producing the accident, the driver represents the most fruitful way in which to seek the solution.

Beyond that of a few research projects, the basic sources of accident statistics are motor vehicle, and other state agencies around the country. There are also research projects collecting certain data, but the large mass — the millions of accident reports — is collected by state motor vehicle agencies. The data are so poorly utilized that we do not know the character of the data, or even whether its collection is a worthwhile endeavor. This leads to difficulty in two ways.

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On the one hand, apologists who would justify taking no action to meet this growing problem can shrug and say, "We know of no statistics that suggest that 'X' is a problem warranting action." For example, with respect to vehicles, one might truthfully say, "We know of no statistics suggesting that tires are any greater problem today than ever before."

On the other hand, those who advocate swift, sweeping changes usually have few facts to back them up. Therefore, we move into new and expensive programs without appropriate measurement to tell us that we have moved in a desirable direction. The decisions involve resources of public agencies, of private industry, and of individual citizens; yet, the decisions are made without the reliable data that should be available. For example, what *is* the situation with respect to tire failure in accidents? What is the failure rate? Under what circumstances do tire failures occur? Is the role of tires in accidents greater or less now than in years past? I don't know the answer to these, and I do not think anyone else does; yet the decisions have been made.

This example is only illustrative. There are others. Thus, we are unable to make any kind of a priority evaluation on many changes mandated by the General Services Administration for federally purchased cars. We have no accurate data to tell the level of vehicle failure. Is it now higher than in former days?

Let me hasten to say, particularly to this group of engineers, that obviously we must make decisions every day in the absence of complete data. We cannot delay today's action until we have *all* necessary research, but let us provide a measurement system so that tomorrow's decision will be more rational than today's.

To do this through accident statistics, we must have data in great quantity — accident data by the hundreds of thousands, if not the millions. This is an expensive program to contemplate, but fortunately the data collection operation already exists. Millions of accidents are reported each year. Records are forwarded to state capitals in every state. These records are usually compiled in some kind of a machine records system. Superficial tabulations (I do not call it analysis; I think that would be an inappropriate term) of these data are prepared. For example, from such tabulations, we know with a great deal of certainty that more accidents occur on Saturday and Sunday than on other days of the week, but I am not sure we know very much more about the matter.

The real question is one of utilizing and refining the data. The reason for the low data quality is that in the agencies responsible, appropriate professional staff has been inadequate or non-existent. I do not suggest that all we need is a few statisticians and, by magic, good information will pour out. I wish it were so simple; but no, the systems will take years of refinement. The tragedy is, however, not so much that the questions haven't been answered, but that the questions haven't been asked.

What must come in the future is a suitable charter and a suitable definition of mission for the agencies concerned by which millions of accidents can be suitably recorded and suitably analyzed. In this way, it should be possible to develop information that can guide future programs, and provide the true effectiveness evaluation.

Is it feasible to get this kind of information from a statistical system? Based on experience of the Cornell Automotive Crash Injury Research project, I would say yes, that in certain subject matter areas, even with the modest sample of 5000 accidents per year (contrasted to New York State with its 400,000 reports per year), it has been possible to detect significant benefits of certain vehicle changes when (1) these changes are virtually constant throughout the corporation (data quantity), and (2) when these changes have a profound effect on the outcome.

The questions being asked today are properly much more demanding than have been asked before. Therefore, the broad scale surveillance system that we must achieve has to be equal to these demanding questions. This will require fundamental and sweeping changes in the nation's approach to collection and analysis of accident statistics.

DISCUSSION

Moderator, J. HERBERT HOLLOMON

ROY HAEUSLER: Would you say that there are limitations to the expansion of data and the improvement in its quality because of the pressures upon and limitations of the officials who make the initial reports? Most traffic accident data today are collected by the police, who have minimal training as expert investigators, who may be short on objectivity, who have a great many other duties to perform and pressures to harass them. Should we perhaps make other provision for the recording of data?

MR. CAMPBELL: I believe the question as to who does fundamental accident investigation in the future should have open, frank discussion. There are certain classes of information whose recording is within the capabilities of the police and consistent with their other duties — if police training is upgraded. However, I believe there are some questions that cannot be handled by police investigators. I think that in the future for certain purposes we will supplement the investigation of the police officers with investigation by professionally trained people who will not have conflicting duties. I do not mean to criticize the police. After all, if they are at the accident scene and people are lying there injured, the police must tend the injured, and worry about skid marks later.

ELMER ENGSTROM: You made reference to the alcohol problem. Are there any statistics on the effects of antihistamines and other drugs that are generally available today?

MR. CAMPBELL: As I recall, there was a study of single vehicle accidents in California in which drugs of various types were present in the bloodstream of the driver. Their presence was not as frequent, however, as alcohol.

DR. HADDON: Limited studies in the laboratory show that the effect of various drugs on driving performance, as measured by simple or complex types of driving simulators, is to decrease some of the body functions, such as reaction time. These decreased functions may or may not be particularly relevant to driving performance. Of course, if alcohol is added to the driver's bloodstream, there is an augmentation of the effect of the other drugs. There are some other considerations in regard to the use of these pharmaceuticals. They are undoubtedly maintaining the good health of many people who otherwise would be in serious trouble both off the highway and on the highway. Insulin is a good example. Insulin may well be preventing far more accidents than its overuse might produce.

As for the narcotics type of drug-taking, there is some interesting recent evidence from California, the work of Dr. Julian Waller in the State Health Department. It indicates that persons who have records of conviction for narcotics use and possession have no more accidents per mile than other individuals. Thus it is by no means a definite cause and effect matter. The data are extremely scanty, and

it would be hazardous to join the oversimplifiers who would make a scapegoat of the drug-users group.

Here again we need much more specific information. In the meantime we should adequately warn users of these various agents about the effect they might have on driving performance.

MR. HOLLOMON: Would you reply to the implied question of the statistical role of alcohol with respect to accidents?

DR. HADDON: We have very solid data from a wide variety of locations in this country and elsewhere that alcohol is causally involved in upwards of 50 percent of fatal crashes. One source for this figure is recently tabulated data in a report about the 27-county area in which over 90 percent of the California population lives. Other information from scattered places shows that alcohol is causally involved in 30 or more percent of all fatal pedestrian accidents.

For non-fatal accidents, preliminary studies indicate a much lower figure — 20 percent. In other words, alcohol tends to be involved to a far greater extent in severe traffic accidents than in non-fatal accidents.

The matter does not stop there, however. There is increasing evidence, rather substantial evidence, that although the social drinker is involved to some extent in traffic accidents, and sufficiently so that information and programs should be directed at him, it is primarily the pathological drinker who is involved in traffic accidents. For example, Dr. Waller in his California study showed that the presence of cirrhosis of the liver was surprisingly high — over 60 percent — in those persons who had substantial amounts of alcohol in their bodies at the time they were killed in accidents. In fact, it begins to look as if a small percentage of the population is responsible for a major portion of the accident statistics. I find this encouraging on the one hand because it suggests we can localize the cause of much of our traffic accident problem in a small portion of the public, but discouraging on the other hand because dealing with alcoholics is extremely difficult. There is always hope, however, that scientific research will produce some magic solutions.

H. B. VINSON: You mentioned that most accidents happen on Saturday and Sunday. On which day do most accidents occur?

MR. CAMPBELL: In terms of the frequency, there are more accidents on the weekend, but the rate may not be higher then because

more people drive on weekends. I think perhaps more accidents occur on Saturday.

MR. VINSON: Is there a study that reveals what time of day most accidents occur?

MR. CAMPBELL: Again one has to speak in terms of frequency and rate. In terms of frequency, the afternoon and evening hours are the highest; that is, the homeward-bound rush hour traffic. However, in terms of rate, taking into account the number of vehicles on the road, the "wee small hours of the morning" — somewhere around 3 a.m. — have the highest rate. I am referring to fatal accidents.

J. H. LAKE: Would you say one reason that our present accident record system is a poor tool as far as research is concerned is the fact that the system has been developed over the years to determine legal responsibility for negligence or culpability in an accident, and that this purpose may not be compatible with that of determining the cause of the accident?

MR. CAMPBELL: I think that is quite true. The data collecting system has been developed with no mission for research. The question has been one of determining fault, implying human fault. Doing objective research is incompatible with deciding which driver is at fault. As long as there is a possible penalty involved, drivers will not tell a police officer certain classes of information absolutely necessary for research into the cause of the accident. For example, the driver who goes to sleep at the wheel, runs off the road, and kills another person is not going to tell the police officer that he went to sleep at the wheel. He might tell a confidential research investigator. At Cornell, for example, in our intensive study of accidents, drivers have given us information that I am certain would not have been forthcoming to a policeman or an insurance man. I am not sure how we can solve the problem of drawing out candid, objective research information from all drivers involved in accidents.