Published As: Chemical Tests in Driver Research", National Safety Congress Transactions, 24: 82-87, 1961.

> COMMENTS WITH RESPECT TO HIGHWAY SAFETY RESEARCH WITH PARTICULAR REFERENCE TO "CHEMICAL TESTS"

> > William Haddon, Jr., M.D.

Director, Epidemiology Residency Program, New York State Department of Health,

Albany, New York

Read before the Symposium "What Direction Chemical Tests", General Session, National Safety Congress, Chicago, October 18, 1961. It would be impossible in the time available here to discuss or even to list the many ways in which chemical tests for the presence of alcohol have been, are being, and will in the future be used for highway safety research. Such purposes relate to the entire gamut of questions which arise in connection with the uses and misuses of motor vehicles. This follows from the remarkable prominence of the use of alcohol as a factor in motor vehicle accidents, both fatal <u>and</u> non-fatal. As a result, the scientific evaluation of almost any other aspect of motor vehicle accident causation requires a determination of the extent of its relationship with the drinking-driving, drinking-accident problem. In view of this, it is noteworthy that in a number of **rec**ent, uncontrolled and controlled investigations seeking causes of accidents, this has not been done with even minimum adequacy.

Fundamentally considered, the "Chemical Tests", as they are referred to here, are merely a tool, a yardstick, available for the measurement of one characteristic of drivers, whether under experimental or non-experimental conditions. There is nothing magical, or unique, about these tests - they have many parallels in related fields, notably in forensic and clinical medicine - and their use requires, regardless of the purpose for which they are employed, the same competence, care and intelligence as do such other analytical procedures; requirements which must be observed for the work in question to be both scientifically acceptable and practically useful. These tests for alcohol have a necessary role in research concerned with groups of drivers and their accidents for the very same reason that they have a necessary role in the investigation of the accidents of given individuals. This follows from the well-documented fact that except in clear-cut and extreme cases these tests, when properly performed, provide the only reliable yardstick of the presence of alcohol and of its concentrations in the pertinent tissues of the body. It has been repeatedly demonstrated that competent professional observers will frequently miss even the very presence of alcohol when confronted with a drinking driver, and that their estimates of the blood alcohol concentrations and degree of impairment involved when its presence is recognized frequently underestimate the actual state of affairs to such an extent as to make such subjective methods largely useless for research purposes.

This would not necessitate the routine application of such tests in field studies of drivers involved in accidents, and of those not so involved where controlled work is done, if it were not for the work of Heise, ¹Smith and Popham, ²Lucas et al, ³ Barmack and Payne, ⁴ Freimuth et al, ⁵ Haddon and Bradess, ⁶ McCarroll and Haddon and others. These workers have all shown that wherever and whenever the matter has been investigated with objective methods, pertinently high blood alcohol concentrations have been found to be the common denominator of large percentages of drivers in both fatal and non-fatal accidents.

- 2 -

In view of this and, in particular, because of the (e.g.8) documented, frequent and substantial unreliability of other methods, it has now become mandatory in field research concerned with eliciting causes of accidents, whether on a case study or scientifically controlled basis, for such tests to be applied in a routine, uniform fashion to very high percentages of all of those studied, whether or not the investigators concerned happen to suspect the presence of abcohol or believe this variable to be of importance in that aspect of the motor vehicle accident problem with which they are concerned. Where this is not done, and the complete practicality of doing so in the case of both fatal and non-fatal accidents has been well established by the same workers referred to above, \square the biases discussed may be expected to lead to gross underestimations of the extent to which this factor is present in the groups in question. This in turn may be expected to lead to very substantial errors in the relative importance placed on other factors which may also have contributed to the accidents in question. The scientific adequacy and practical value of any investigation concerned with the field study of the causes of either fatal or non-fatal motor accidents, in which this has not been done must be, for the reasons cited, most strenuously questioned. This holds regardless of the source involved and regardless of the difficulties, whatever their nature, cited in excuse. Theoretical and practical difficulties are the rule rather than the exception in research, and the ability to overcome them is the measure of scientific adequacy.

- 3 -

The mere fact, however, that such tests are employed in connection with the study of a group of drivers whether accident involved or experimentally studied - for example, in connection with their performance on a driving range - does not in any way guarantee that the work in question deserves to be either described by the word "research" or regarded as worthwhile. In short, the use of this particular tool, or any other, does not in any way absolve those using it from the responsibility of meeting at least the same minimum standards of scientific method customary in other fields of scientific activity. This has long been overlooked, chiefly by non-professional workers, undoubtedly sincerely interested in highway safety, but who appear to labor under the misconception that <u>any</u> process in which data are collected, particularly in great volume and heavy with anecdote and reasonable sounding detail, automatically thereby ranks as scientific research. This is unfortunately not the case.

The few dozen workers in the world now engaged in scientifically acceptable research with respect to highway safety are acutely aware of this situation, whether it involves the use of "Chemical Tests" or other aspects of highway safety. They are daily deluged with volumes of material: releases, reports, anecdotes, official pronouncements and statistics, speculations and opinions, claims of program efficacy, alibis and explanations, all of which must be waded through in the hope that an occasional item will prove the exception to the rule that virtually none are

- 4 -

worth the paper on which they are printed.

This is not a harmless situation. Much of this volume of material is publicly dubbed with the magic label "research", often by responsible groups which should certainly know better, with the result that improvement in the quality of safety research is even further delayed. In addition, the public standing of the sources from which this material is derived, and by which it is endorsed, the confidence with which it is proclaimed, all nicely hide the state of our ignorance and the scientific poverty upon which these statements are so often based.

If this seems an overstatement of the nature of certain of the forces delaying understanding of the problems of accident causation and prevention, consider the statement of the secretary to a then prominent official of one state after several years of daily concern with this problem: "The most important thing we found out (about highway safety)", he said, "was that the bulk of the information we were getting from those in the field was the product of the sheerest and most mediocre of speculation and guesswork. Until we found this out, we did not know that our highway safety program was substantially without acceptable scientific or factual foundation." To a major extent the few years which have elapsed since that statement was made have not diminished the accuracy of pertinence - nationwide - of this comments. (This is particularly true, incidentally, in connection with the many current proposals and programs

- 5 -

to deny drivers licenses on medical grounds, since there is now no acceptable evidence that <u>any</u> medical group now known has an accident rate in any way different from that of otherwise similar drivers, or that even if this were the case that such measures would either constitute fair and reasonable measures of social policy or contribute to highway safety to any significant or worthwhile extent.)

It would be too much to hope for improvement in this chronic problem now entering its seventh decade if it were not for the slow but increasing entry into this field of increased numbers of professional research workers well trained in the disciplines which its problems entail, and who are little impressed with the methods and pronouncements still dominant in it. Such workers, together with the small number of scientists long active in the field, a number of whom are present here today, have already thoroughly documented the falsity of a number of items in the long established folklore of highway safety. Three examples, two from the subject area of this panel, should suffice to illustrate this, and the hazard inherent in the type of guesswork, subjective opinion and "common sense" on which so much in highway safety is based.

It was long believed by many, for example, that it was advantageous to the occupant of a car involved in a crash to be, as it is customarily phrased, "thrown clear", a belief which has apparently persisted unquestioned, but widely endorsed, for more than a half

- 6 -

century. We now know, as the result of the excellent work of the Cornell Crash Injury Research program, that the chance of fatal or other grade of injury is very greatly increased if the car occupant is thrown out of the "package" in which he has been riding. If highway safety experts had only faced up to and pointed out their ignorance of the facts even of this one aspect of the picture when the issue first arose decades past, it is likely that the matter would have been studied and decided before as many thousands were killed in this fashion.

As a second example of the harmful effect of such subjective guesswork and "common sense" as the basis of highway safety policies and pronouncements, consider the seemingly simple problem of the determination of the fraction of fatal accidents in which alcohol has been used by one of the principals (i.e., drivers and adult pedestrians). At the time four years ago of the Westchester County study of the frequency with which drivers killed in single vehicle fatal accidents had been drinking, a number of the policies and official statements of the state involved were based on an official statistic that alcohol was present only in some 2% of the state's fatal accidents, a figure totally unsupported by scientifically adequate methods of data collection. The inappropriateness of this figure and its use in policy determination became quickly apparent when at very little cost, and with simple but scientific methods, it was found that for at least eight years the actual percentage of such single vehicle accidents

- 7 -

in the large and heavily populated area studied was in reality 70%. Very similar data have now been obtained on a controlled basis for fatal accidents of this and other types occurring in New York City. Again, another example of the need for basing opinion and policy on scientifically derived fact rather than guesswork, and of the harm which can accrue if this is not done.

As a third example, consider the widely believed, but scientifically unsupported folklore, that the very intoxicated driver poses no problem. This belief is nicely indicated by the following from an authoritative text: "It is the slightly intoxicated driver who constitutes the real threat ... who characteristically demonstrates impairment of judgment more than impairment in sensory functions or psychomotor responses ... The 'cockeyed drinker' constitutes neither a pedestrian nor a driving problem. Most of these individuals are either too drunk to drive or walk and hence sleep it off "⁹ Unfortunately, whenever the blood alcohol concentrations of fatally injured drivers have been scientifically analyzed, a relatively simple procedure, a very different picture emerges. For example, in Baltimore, among 156 drivers killed consecutively in accidents of all types in a five year period, 37% had blood alcohol concentrations of at least 0.15%. Similarly, in Westchester County in the eight years 1950-1957, 49% of drivers killed in single vehicle accidents had blood alcohol concentrations meeting or exceeding the liberal prima facie

- 8 -

definition of intoxication (0.15% by weight) and some, as has been often observed elsewhere, had concentrations which exceeded twice that value.⁶ Finally, in the recently completed comparison of the blood alcohol concentrations of drivers fatally injured in New York City with those of nonaccident involved but similarly exposed drivers, 46% of accident responsible drivers had concentrations of 0.25% (!) or higher in comparison with 0% ("!) among those similarly exposed, but not involved.⁷ These results, although also of significance in many other respects, here emphasize, again, the need for appropriate methods as opposed to those currently serving in their stead.

These remarks have deliberately been chosen to cover certain of the broader problems of the sources of facts used by those who are either given the serious public responsibility of designing and directing control measures or who as members of the public particularly share the common concern with our continuing tolls of crushed bodies and vehicles. The same general and specific principles apply to research and facts relative to the use of chemical tests, whenever, wherever, and for whatever purpose employed. In the absence of such a foundation there should be a moratorium on statements and conclusions with respect to the subject, public or private.

That this is indicated is shown by the fact that as far as can be determined, there is not now a single United States or

- 9 -

foreign jurisdiction reporting adequately collected and analyzed data with respect to the frequency of given blood alcohol concentrations among all principals (i.e., drivers and adult pedestrians) fatally injured in motor vehicle accidents grouped by accident type and length of survival. Until accurate reporting is instituted, it is impossible to measure the impact, if any, of prevention programs. It is even impossible to state the exact magnitude of the problem or to discuss the reasonableness of given proposals for its control. Since we do not now have such continuing baseline information, we do not now know whether or not we are through our extensive and expensive programs of education and enforcement in any way influencing the occurrence of drinking-driver accidents. This is not to suggest the discontinuation of these programs nor to suggest that they are unreasonable or without effect. Rather it is to point out that until we begin to use what this symposium refers to as "Chemical Tests" in a routine, scientific manner, we will not have any yardstick with which to measure the impact of our programs and the ways in which they can by improved. No industry with a budget a fraction of that of organized safety would proceed year in and year out without a highly sophisticated and carefully designed program of quality control. With respect to the prevalence of the drinking driver and the drinking driver accident, there is at present no such system anywhere in the world today. The time is long overdue.

The minimum requirements for adequate baseline reporting have been spelled out elsewhere in detail.¹⁰ The general

requirements in the case of fatal accidents, the area which should be cleaned up first, however, are very straightforward. First of all, it is necessary that a qualified medical examiner system, or its equivalent, be in operation and that the post-mortem, blood alcohol concentrations of <u>all</u> of the adult principals (drivers and pedestrians) killed in the given jurisdiction be determined routinely, without exception. This is done at present in very few areas.

Second, post-mortem results derived from those living more than a few hours after their accidents should not be combined with those dying more quickly, since the body's metabolic processes reduce the concentrations of alcohol in such cases the longer the post-accident antemortem survival. This is but rarely done in the handling of such data.

Third, it is essential, a point almost universally overlooked, that the results be reported not as a hodge podge derived from accidents of all different types, but rather, in terms of cleanly defined, discreet accident categories. For example, it makes little sense to include the alcohol concentration, if any, of a driver killed while stopped at a stoplight with that of one killed by hitting a bridge abutment.

It is a relatively simple matter to divide accidents into one group in which the driver or his vehicle was probably responsible and a second, in which he and his vehicle were clearly not responsible

- 11 -

or less obviously so. In the former group fall drivers killed in accidents in which only their own vehicles are in motion and drivers killed in hitting other drivers in situations which leave little doubt as to their responsibility. An example of the latter is the driver who completely crosses the median strip on a divided highway and is killed in hitting an innocent car headon. In the second category, composed of questionably responsible and non-responsible drivers, fall those killed either through no fault of their own or under circumstances in which responsibility is unclear. When these measures in the collection and analysis of data are instituted, a very different picture as to the alcohol concentrations of accident responsible drivers may be expected to emerge than that frequently given by official statistics.

Reference has already been made to the recent New York City work, one of the very small number of investigations in which these requirements of adequate data collection and analysis have been observed. That investigation demonstrated, as had the earlier Westchester County work, the complete practicality and usefulness of adopting such long overdue methods. The organized highway safety profession will not be able, again, to measure with any degree of adequacy the pertinence and efficacy of its programs in this area until similar methods of data collection and analysis are adopted nationwide. When this is done, it will be discovered as has already been the case in some areas, that there is often something

- 12 -

very wrong with the ways in which accident data are now being collected and employed in justification of safety measures. This should not in any way pose a threat to those sincerely interested in the alleviation of the burdens which now result from our annual tolls of highway fatalities and injuries. The agencies responsible for highway safety have thereby a responsibility to supply this information. The applied research involved is straightforward and relatively simple, and these results are at present more needed than those of any other simple type of research which involves the use of chemical tests: the subject of this symposium. There is no reason why the immediate future should not see the substitution of fact for the present over-abundance of opinion and guesswork in this as in the entire arena of highway safety. To the extent to which this is not done, extensive and expensive programs said to be pertinent to the saving of thousands of lives and the prevention of the maiming of millions more will continue to lack a rational, factual and scientifically defensible foundation.

84 Holland Avenue, Albany, New York

- 13 -

References

1. Heise, H.A.: Alcohol and Automobile Accidents, J.A.M.A. 103, 739-741, 1934.

2. Smith, H.W., and Popham, R.E.: Blood Alcohol Levels in Relation to Driving, Canad MAJ 65: 325-328 (Oct.) 1951.

3. Lucas, G.H.W., Kalow, W., McColl, J.D., Griffith, B.A., and Smith, H.W.: Quantitative Studies of the Relationship Between Alcohol Levels and Motor Vehicle Accidents, Proceedings of the Second International Conference on Alcohol and Road Traffic, Toronto, 139-142, 1953.

4. Barmack, J.E., and Payne, D.E.: Injury-Producing Private Motor Vehicle Accidents Among Airmen: I. The Role of Drinking, <u>Hwy Res Bd</u> Bull 285, 1961, in press.

5. Freimuth, H.C., Spencer, R.W., and Fisher, R.S.: Alcohol and Highway Fatalities, J Foren Sci 3: 65-71, (Jan.) 1958.

6. Haddon, W., Jr., and Bradess, V.A.: Alcohol in the Single Vehicle Fatal Accident: Experience of Westchester County, New York, JAMA 169: 1587-1593 (April 4) 1959.

7. McCarroll, J.R., and Haddon, W., Jr.: A Controlled Study of Fatal Automobile Accidents in New York City. To be published.

8. Penner, D.W., and Coldwell, B.B.: Car Driving and Alcohol Consumption: Medical Observations on an Experiment, <u>Canad MAJ</u> 79: 793-800 (Nov.) 1958.

9. Alcoholism, edited by G.N.Thompson, Charles C. Thomas, Springfield, Ill., 1956.

10. Haddon, W., Jr.: Alcohol and Highway Accidents. Read before the Session on Medical Aspects of Automobile Injuries and Deaths, Section on Miscellaneous Topics, One Hundred and Tenth Annual Meeting, American Medical Association, New York, June 27, 1961. To be published.