

## PHILOSOPHY, CRITERIA, AND METHODS OF DRIVER LICENSING

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The following statement introduced a recently published paper concerned with driver vision at freeway on-ramps (1):

Automobile drivers are required to perceive, collate, analyze, and act on information which impinges itself on their conscious intellect in a matter of split seconds. This information, complete or incomplete, is composed of a multitude of elements, each of which must be instantly placed in its proper relationship with respect to all other components of the system in which the driver and automobile travel.

If we assume that the information the driver receives always is complete, which in fact is not the case, then the goal of driver licensing is to permit driving by persons who can appropriately receive, analyze, and act on information with high consistency and to screen out persons who cannot or will not do so. From the administrative point of view, however, this statement of goal, although basically accurate, also is basically platitudinous because it fails to give boundaries for identifying and dealing with those who perform poorly.

Although there are a relatively few individuals who never seem to "get it all together," the average driver can effectively cope with the average driving task almost ad infinitum. It is only when he is faced with a more demanding task, with an unusual event, that he may get into

trouble. Whether he fails depends both on the suddenness and size of the demand and on the amount of spare capability he has to meet that demand.

Restated, therefore, the goal of driver licensing is to license only those individuals who are consistently able to avoid creating demanding situations and also are consistently able to cope with demands placed on them from outside.

### SPECIAL LICENSING

I will identify groups of persons who do not meet these vague criteria and explore the methods and likelihood of accurately identifying the individuals within these groups either at the time of initial licensing or after the license has been issued.

There are some types of impairments that are related to crashes. Figure 1 shows some human factors in major crashes, i.e., crashes in which someone has been seriously injured or killed. It is clear that some sort of impairment plays a substantial role. Although we have much less information about minor crashes, I have tried to estimate some relative contributions in these as well. These are shown in Figure 2. Figure 3 shows crash rates per 100 drivers and per unit of exposure according to age. This figure points out the special problems of the very young and the very old.

Figure 1. Impairment of drivers or pedestrians in major highway crashes.



Figure 2. Impairment of drivers or pedestrians in minor highway crashes.

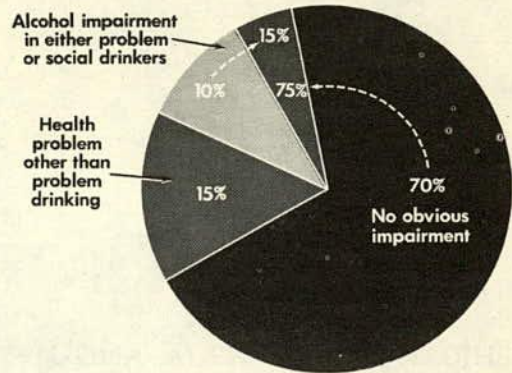
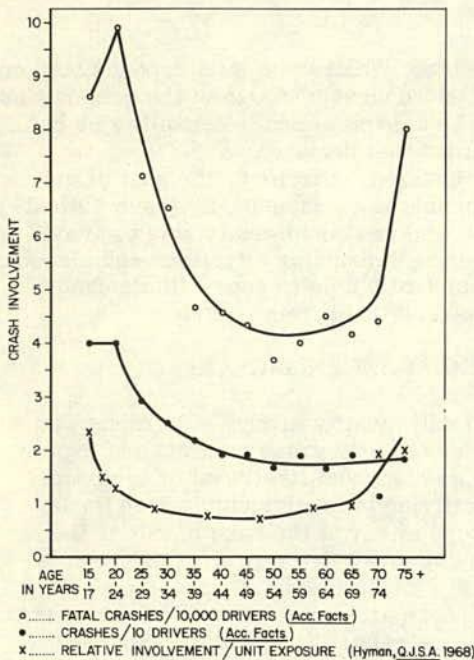


Figure 3. Involvement in fatal crashes and all crashes by age.



There are four groups of drivers that require special licensing approaches.

Persons Who Are Basically Unskilled

Group 1 consists of individuals who have difficulty handling even normal driving tasks. They are not identified in the written test, which has been shown to distinguish almost nothing with respect to safety; but the worst of them are screened out by the skill test in which vehicle handling in traffic is observed by an examiner. Studies have shown that crash rates are somewhat higher for those who pass the skill test with low scores than for those who pass with high scores. It is reasonable to assume that those whose scores were below passing, and who consequently were not licensed, would have even higher crash rates.

Two questions need to be asked here. Inasmuch as the skill test usually is given only to initial licensees, would it be worthwhile to repeat it periodically? My answer is no, because many if not most of those who are unskilled also are inexperienced and they gain skill as they gain experience.

The few who do not learn from experience, I believe, can be picked up in other ways. Second, because low passers have higher crash rates than high passers, is it worthwhile to retest the low passers? If we assume that the test is reliable over time and with different examiners, which has not been adequately tested yet, then it may be cost-effective to retest after 1 year of driving persons who score in the lowest 5 or 10 points above passing. Given that I am neither an economist nor a mathematician, I am in no position to calculate the actual cost of the modest excess of crashes among the low passers versus the administrative costs of retesting and excluding those who remain low scorers. To this must be added the costs of the false positives among passers who are screened out the second time. Such a calculation is not impossible, however, and I urge this as an option to be explored further.

### Those Who Are Skilled But Inexperienced

Group 2 consists of individuals who have not yet internalized the boundaries of safe behavior and so are more likely to get into tight situations. Once in such situations, they have not developed sufficient spare capacities of skill and judgment to handle themselves successfully. One or two minor crashes may be all the learning they need. The epitome of this group is the teenaged driver.

I do not believe these drivers can be identified through the usual skill test; they commonly pass with flying colors. We can, however, identify the sorts of emergency mismaneuvers most commonly made by new drivers who crash, develop training for these, and also test for these during initial and first renewal licensing. Only those who pass both the usual skill test and the emergency maneuver test would be licensed. Actually, some important work is already under way at Ohio State University to identify the visual scan patterns of new drivers and at General Motors and elsewhere to teach handling of skids and blowouts.

Is this likely to be cost-effective? The only way to answer, of course, is to try it with adequate evaluation. However I would give this very high priority because new drivers are substantially overrepresented in crashes both per person and per unit of exposure. This excess exists even in the absence of alcohol but is accentuated by alcohol.

A recently proposed federal standard on driver licensing suggests that new drivers be given probationary licenses so that corrective efforts can be made quickly if the driver has one or two traffic offenses or mishaps during the probationary period. As I noted, at present there is not only greater likelihood that they will have mishaps but also high probability that these will provide the necessary learning experience. No further corrective action need be taken for most of these drivers; moreover, I do not believe the average licensing inspector is capable of distinguishing which of these drivers needs further action or what action is most appropriate. Therefore I suggest that the screening level for administrative action be more than one or two episodes after the initial license is given.

### Those Who Create Demanding Situations

Group 3 consists of those who have skills and experience but create demanding situations beyond their spare capacities. Within group 3, there are three subgroups: problem drinkers, sociopaths, and those with serious medical impairment.

#### Problem Drinkers

Because alcohol is a factor in about half of all serious crashes and because persons with drinking problems are estimated to constitute about two-thirds of those involved with alcohol, identification of individuals in this particular group is crucial to highway safety. Most of the social drinkers in alcohol crashes are teenagers in group 2 or heavy-drinking males in their early 20s.

Currently, two projects are under way to determine whether problem drinkers can be identified through questions given at the time of licensing. One of those is the Selzer-Mortimer MAST test; another is the driver profile originally developed by Perrine and being used by Project CRASH in Vermont. I suspect that these tests will have relatively few false positives but perhaps as many as 50 percent false negatives. Even with such a low "hit rate," however, they are much better than what we have had in the past for screening.

For those individuals who get through the net the first time, we can improve the secondary identification process by (a) lessening the sentence for DWI so that arrest and conviction rates are likely to increase; (b) requiring mention of the presence or absence of alcohol in all citations issued, whether or not the citation is for DWI; (c) identifying at license renewal or even earlier persons with a DWI arrest or with alcohol mentioned at least twice in other traffic infractions; (d) evaluating before sentence or before license renewal persons with alcohol involvement on their records to determine whether

a chronic drinking problem exists; and (e) referring those with drinking problems to treatment and license revocation or restriction. Again, what is perceived as a good idea does not necessarily make an effective program. I am simply suggesting therefore that this is another set of options to be carefully tried and even more carefully evaluated.

#### Sociopaths

I am not sure how sociopaths can be screened out at the time of licensing. Usually they are identified only after they have gotten several tickets, and I have no method to suggest for identifying them earlier or dealing with them more effectively once identified. Fortunately, they represent only a relatively small part of the crash problem.

#### Serious Medical Impairments

Probably about one in every five drivers has a medical condition other than problem drinking that may carry some potential for impairing driving ability. Only relatively few have such severe conditions, however, that they actually create a hazard. I refer, of course, to those who have seizures or other periods of altered consciousness or conscious control while operating a motor vehicle. I will discuss the identification and licensing of such drivers in the context of all drivers with medical conditions, however, a subject that is considered in the next group.

#### Those Who Lack Spare Capacity

Group 4 is probably the largest. It consists of those who lack spare capacity to respond effectively to demanding driving situations. Any task can be made so demanding that all but a rare few will fail at it. Unfortunately, we still know relatively little about the driving environment. Even more unfortunately, we still apply much too little of what we do know, so that almost all of us occasionally are faced with demands beyond our capability to react effectively and consequently get into crashes. Those of us who do so represent those who have crashes in one license period but not in the next.

Some individuals, however, have the skills and experience to handle most driving but have less-than-average capabilities for dealing with stress. Consequently, they have higher-than-average crash rates, much of this attributable to crashes at intersections or in relatively heavy traffic. Because they require somewhat different approaches I will identify two categories of persons here—those with medical impairment secondary to cardiovascular disease, diabetes, epilepsy, or other medical condition, and older persons with aging processes, including evidence of cerebral vascular disease. It is important to recognize that, when these individuals have crashes because of reduced spare capacity, generally their medical impairment is not obvious to an investigating police officer. Nevertheless, the fact that such reduced spare capability exists has been identified in laboratory and epidemiologic studies.

Those with general medical conditions should be required to report any diagnosed medical condition at the time of license renewal or when a new condition is discovered. These conditions should be reported by physicians. The third line of defense, of course, is and has been reporting of individuals already licensed who have crashes or citations attributable to clinically obvious episodes, that is, persons in group 3.

I believe that reporting by individuals and physicians is both warranted and feasible, but only if the following guidelines are adhered to.

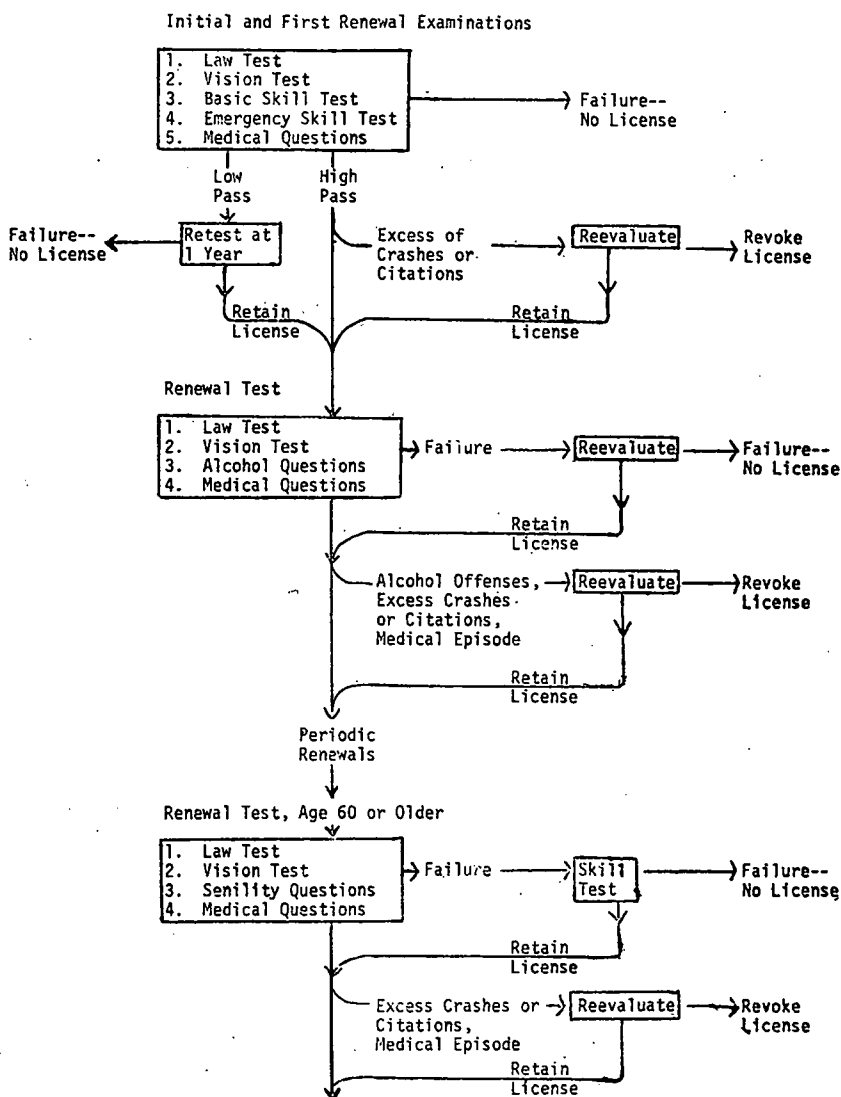
1. Conditions are reportable only if active within a specified time period (e.g., 3 years) and only if in persons of driving age. Some state laws and regulations still require drivers and physicians to report seizures that have occurred in childhood.
2. There must be an active and capable medical advisory committee to the Department of Motor Vehicles with clearly defined criteria to guide evaluation and regulation of drivers.
3. Probably no more than 25 percent of persons with medical conditions need have their driving privileges removed for a period of time.

The point is that all persons with medical conditions should be known to the Department of Motor Vehicles, but only about one in every four should be restricted. If the public and physicians can be made to realize that reporting is not tantamount to loss of a license, there will be much better cooperation with the reporting laws. In fact, even with the current misunderstanding of the law, there was evidence that, in California at least, most persons with epilepsy are coming to the attention of the motor vehicle authorities.

Can reasonable criteria be established for evaluation and regulation? I think yes, especially based on recent work by a group of Israeli physicians, which relates ability to handle driving stresses specifically with functional status of the cardiovascular system.

Identification and regulation of drivers with cerebral vascular disease and other deficits related to aging present other problems. I have noted elsewhere that elderly drivers present an administrative dilemma because they do not have higher crash rates

Figure 4. A scheme for driver licensing.



per unit of drivers (because many of them do not drive very much). Per unit of exposure, however, they are at greater risk of crashing and of serious outcome from even relatively modest injuries. From the epidemiologic point of view they clearly require special attention. From the administrative viewpoint, however, the argument could go either way. If a decision is made to take special action, I believe the following steps are warranted:

1. A few key questions can be asked of all drivers age 60 and older at the time of license renewal to identify those persons who drive 5,000 miles per year or more and who show signs of cerebral vascular disease. Those identified should have driving skill tests.
2. All older drivers who have two or more crashes, citations, or both in a period of 2 years should be reexamined, including the driving skill test. Family members and family physicians should also be questioned inasmuch as these individuals often are quite concerned about the increasingly erratic driving they observe but feel hesitant to notify the motor vehicle authorities without specifically being asked to comment.

At this point, I would like to place the categories mentioned and the countermeasures into broader perspective. I am always a bit uneasy when asked to discuss only a single type of countermeasure, because such a discussion cannot be justified without consideration of cost-effectiveness relative to other types of countermeasures. This is especially the case with driver licensing.

The question of spare capacity relates not only to the abilities and characteristics of the driver, but also to the sorts of traffic situations he is exposed to. In a study of highway crashes in Birmingham, England, Mackay and his associates indicated that vehicular and roadway factors contribute to 88 percent of crashes. Based on other data, even this high figure may be an underestimate. In my opinion, removal of stress points in the driving task is as important as regulation of the people who drive. We have traditionally placed too much attention on the doer and not enough on the deed.

#### SUMMARY

With this important word of caution I would like to summarize in graphic form the groups, subgroups, and methods proposed (Fig. 4). I believe that such a schema is administratively feasible and, after evaluation, may also be found to be warranted as well. Despite its apparent complexity, it would actually introduce very few tasks not already being done by agencies such as the California Department of Motor Vehicles. These additional tasks are the emergency skill test for new drivers, the retest at 1 year for initial low passers, the alcohol questions, and the senility questions.

#### REFERENCE

1. Sinha, K. C., and DeCaboote, P. H. A Computer Simulation Model of Driver Vision While Emerging From Freeway On-Ramps. *Traffic Quarterly*, Vol. 26, October 1972, p. 589.

#### Discussion

Frederick E. Vanosdall, Michigan State University

Waller presented a straightforward and methodical discussion. After introducing Sinha and DeCaboote's description of the behavioral demands that drivers must meet at freeway on-ramps, Waller very succinctly restates the goal for driver licensing—"to license only those individuals who are consistently able to avoid creating demanding

situations [exceeding their abilities to control] and also are consistently able to cope with demands placed on them from outside."

Waller's discussion of four groups of drivers who require special licensing approaches actually presents as the final criterion drivers' capacity to cope with demands of the driving task, a noncompromising position often advocated by many driver licensing people.

Waller discusses drivers who are basically unskilled, those who are skilled but inexperienced, those who exceed their capacity for performance, and those lacking spare capacity to respond effectively to demanding driving situations. It appears that Waller has taken the divided attention concept, inherent in the driving task, as the basis for discriminating between groups of drivers. For each group he describes the deficiency of driver licensing testing procedures for identifying their capacity to drive safely.

Those in group 1 pass the written test, but fail the road test if they are obviously ineffective. Realistically a road test route may not yield demands that exceed the driver's capacity, which enables him to pass it. A few seconds later, a situation could develop that might exceed his capacity, and he might fail the test. Although Waller does not suggest it, many driver licensing people recognize such limitations in driving tests.

Waller suggests that repeating road tests periodically for selected drivers in the unskilled group seems practical: Experience may increase skill and with it spare capacity for low scorers (a valuable point for licensing authorities to consider). The followup driving test has potential for more than just this group.

Perhaps those in group 2 should recognize their own limits, providing that their driving exposes them to a wide range of experiences in which their performance is inadequate but not disastrous.

Accident involvement is rarely predictable; therefore, Waller's insight into group 1 for retesting some drivers may be applied to group 2, providing for additional instruction or tests if near-misses or emergency mismaneuvers are realized and reported during a driver's first 6 or 12 months of driving experience.

However, Waller's suggestion of increasing the ability of licensing inspectors to distinguish skilled but inexperienced drivers' needs seems premature. The techniques for testing drivers' performances on the street can be developed to yield far more critical test situations and performance measures if exploratory efforts in this direction are pursued. The economics of such improvement may however be impractical initially.

Waller's experience in alcohol and medical studies justifies his recommendations for group 3, which reflects the need for practical methods for early identification and experimental treatment programs. In an epidemiological sense, current field projects in these areas, both alcohol and physical impairment, should yield data and insight on methods for developing programs that reduce alcohol abuse and medical conditions as regular components of driver licensing examination and driver improvement programs.

In discussing group 4, Waller presents a logical argument concerning the average driver whose usual performance and capacity enable him to resolve typical emergencies. By introducing an invisible stress, Waller identifies a factor that reduces spare capacity and increases chances for crashes. He suggests other invisible factors that may also reduce spare capacity and thereby contribute to crashes (e.g., cardiovascular disease, diabetes, and aging).

Early discovery and control of these conditions are possible through driver licensing efforts. Traditional fears of drivers, young and old, that medical impairments will delay or result in denial of a license results in their falsifying statements of physical condition. Waller's views seem to focus on the importance of honesty and integrity in driver licensing to emphasize one critical aspect—a report "is not tantamount to loss of a license."

Driver license administrators have revised and are revising policies on medical issues, relying on medical advisory boards to overcome the real problem of gaining public understanding and confidence in government by informing the public of the successes achieved, i.e., establishing trust in the licensing agency. Waller's suggestion concerning medical impairment reflects his long interest and involvement in this area. Consideration of his suggestions for experimental programs will offer licensing authorities valuable experience in achieving improved public support while protecting motorists.

From this paper, the need for accurate measures of driver reaction to critical driving situations, where deficiencies in information processing, judgment, and vehicle control are identifiable, should receive high priority in future studies for improving the validity of license examinations.

Few driver license administrators would find serious disagreement with the basic concepts presented here. Waller's insight to drivers' problems and their interaction with such problems suggests that future driver licensing research needs Waller's involvement to an increasing degree.