



# National Safety Council

---

## Position/Policy Statement

### Impairment at Low Alcohol Concentrations

Laboratory and epidemiological research indicates that the ability of many individuals is impaired for driving and driving related tasks at alcohol concentrations\* below 0.08, and that for some individuals, impairment does occur at alcohol concentrations below 0.05. Therefore, at alcohol concentrations below 0.05, no statutory presumption regarding the presence or absence of alcohol influence should be made.

-----  
\* Alcohol concentration means either grams of alcohol per 100ml of blood or grams of alcohol per 210 liters of breaths.

Approved by the Committee on Alcohol and Other Drugs, October 1987

Approved by the Policies and Issues Committee, May 1988

Approved by the HTSD Executive Committee, August 1988

Approved by the Highway Traffic Safety Division, October 1988

Approved by the Board of Directors, May 5, 1989

## Resolution Regarding Impairment At Low Alcohol Concentrations

At its October 22, 1986 meeting, the Committee on Alcohol and Other Drugs reaffirmed its 1971 position that there is no individual, regardless of his previous experience with alcoholic beverage consumption, who is not impaired in his driving performance if his alcohol concentration is 0.08\* or more. The Committee further affirms that many individuals show substantial impairment at much lower alcohol concentrations.

Evidence for such impairment can be found in both laboratory and epidemiologic studies. Regarding the former, a list of over 30 laboratory studies is attached (Appendix 1), all of which show that at least some individuals are significantly impaired in the performance of tasks believed relevant to driving ability at concentrations below 0.05. In particular, research involving split tasks – which replicate driving likely to be seen in heavy traffic – indicates impairment for many people at alcohol concentrations below 0.05 and for at least some individuals at concentrations as low as 0.02.

Opinion based on epidemiologic evidence about the alcohol concentration at which crash risk begins to rise has been influenced for many years by the original analysis of the Grand Rapids Study as published by Borkenstein et al in 1964 (Appendix 2, Reference 1). In that study no increase in crash risk was noted at concentrations below 0.05 and, in fact, drivers with concentrations below 0.05 and, in fact, drivers with concentrations around 0.03 were found on average to have a lower crash risk than did drivers with no alcohol at all. This apparent decrease in crash risk has become known as the “Grand Rapids Dip”.

More recent re-analysis of the Grand Rapids data, in which it has been possible to focus on the effects of alcohol on specific driver subsets rather than looking only at all drivers grouped together, have led researchers to reach rather different conclusions. According to these studies both very young and elderly drivers have increased crash risk at concentrations below 0.05 (Appendix 2, References 2, 3) as do drivers in heavy traffic (Appendix 2, Reference 3), and drivers who are infrequent drinkers (Appendix 2, Reference 4).

The last of these three studies is of particular importance because it not only shows that infrequent drinkers have an increase in crash risk above the average for all groups from the most infrequent imbiber to those who consume alcohol at least daily have a progressive increase in crash risk from their own group baseline crash levels as their alcohol concentrations increase. These data appear in Appendix 2.

---

\* Alcohol concentration means either grams of alcohol per 100ml of blood or grams of alcohol per 210 liters of breath

The Grand Rapids Dip, therefore, appears to be an artifact resulting from different mixes of infrequent, moderately frequent, and very frequent drinkers at various alcohol concentrations. (The fact that crash risk with no alcohol varies from well above average to well below average probably is a reflection of different age and sex distribution and other variables rather than being a reflection of usual drinking patterns per se.)

The statutory pattern for many years, and the specific law of some states, has been that drivers with alcohol concentrations of 0.10 or higher shall be presumed to be under the influence of alcohol, that no presumption either way shall be made for drivers with concentrations from 0.05 up to 0.10 and that drivers with alcohol concentrations less than 0.05 shall be presumed not to be under the influence of alcohol.

In light of the research discussed above, the Committee believes that the legal presumption that all individuals are not impaired at concentrations less than 0.05 is inaccurate. We, therefore, take the position that at alcohol concentrations below 0.05, no legal presumption should be made regarding the influence of alcohol that will be applicable to all drivers.

## APPENDIX 1

### “ARTICLES WHICH HAVE REPORTED IMPAIRMENT DUE TO BAC LEVELS OF .04 OR LESS”\*

Adams A. J., Brown B., Flom, M. C., and Jones, R. T., Jampolsky A. Alcohol and marijuana effects on static visual acuity. *American Journal of Optometry and Physiological Optics*, 1975, 52, 729-735.

Attwood D.A., Williams R. D., McBurney L. J. and Frecker R. C. Cannabis, alcohol and driving: effects on selected closed course tasks. In L. Goldberg (Ed.) *Alcohol, drugs and traffic safety*. Stockholm: Almqvist and Wiksell, 1981.

Bjerver K., and Goldberg L. Effect of alcohol ingestion on driving ability: results of practical road tests and laboratory experiments. *Quarterly Journal of Studies on Alcohol*, 1950, 11, 1-30.

Boyd E. S., Morken D. A., and Hodge H. C. A psychomotor test to demonstrate a depressant action of alcohol. *Quarterly Journal of Studies on Alcohol*, 1962, 23, 34-39.

Bragg B. W., and Wilson W. T. Evaluation of a performance test to detect impaired drivers. *Accident Analysis and Prevention*, 1980, 12, 55-65.

Charnwood L. Influence of alcohol on fusion. *British Journal of Ophthalmology*, 1959, 34, 733-736.

Cherry N., Johnston J. D., Venables H., Waldron H. A., Buck L., and MacKay C. J. The effects of toluene and alcohol on psychomotor performance. *Ergonomics*, 1983, 26, 1081-1087.

Coldwell B. B., Penner D. W., Smith H. W., Lucas G. H. W., Rodgers R. F., and Darroch F. Effect of ingestion of distilled spirits on automobile driving skill. *Quarterly Journal of Studies on Alcohol*. 1958, 19, 519-616.

Collins W. E. Performance effects of alcohol intoxication and hangover at ground level and at simulated altitude. *Aviation, Space and Environmental Medicine*, 1980, 51, 327-335.

Connors G. J., and Maistro S. A. Effects of alcohol, instructions and consumption rate on motor performance. *Journal of Studies on Alcohol*, 1980, 41, 509-17.

Drew G. C., Colquhoun W. P. and Long H. A. Effect of small doses of alcohol on a skill resembling driving. London: HMSO, 1959.

Evans M. A., Martiz R., Rodda B. E., Kiplinger G. F., and Forney R. B. Quantitative relationship between blood alcohol concentration and psychomotor performance. *Clinical Pharmacology and Therapeutics*, 1974, 15, 253-260.

Franks H. M., Hensley V. R., Hensley W. J., Starmer G. A., and Teo R. K. C. The relationship between alcohol dosage and performance decrement in humans. *Journal of Studies on Alcohol*, 1976, 37-284-297.

Gruner O. Alkohol and aufmerksamkeit. *Deutsche Zeitschrift fuer die Gesamte Gerichliche Medizin*, 1955, 44, 187-195.

Gruner O., Ludwig O., and Domer H. Zur abhangingheit alkohol-bedingter aufmerksamkeitsstorungen vom blutalkoholwert bei neidrigen konzentrationen. *Blutalkohol*, 1964, 3, 455-452.

Hamilton P., and Copeman A. The effect of alcohol and noise on components of a tracking and monitoring task. *British Journal of Psychology*, 1970, 61, 149-156.

Heacock D., and Wikle R. The effect of alcohol and placebo on reaction time and distance judgment. *Journal of General Psychology*, 1974, 91, 265-268.

Idestrom C.M., and Cadenius B. Time relations of the effects of alcohol compared to placebo: dose-response curves for psychomotor and perceptual test performance and blood and urine levels of alcohol. *Psychopharmacologia*, 1968, 13, 189-200.

Landauer A.A., and Howat P. Law and moderate alcohol doses, psychomotor performance and perceived drowsiness. *Ergonomics*, 1983, 26, 647-657.

Laurell, H. Effects of small doses of alcohol on driver performance in emergency traffic situations. *Accident Analysis and Prevention*, 1977, 9, 191-201.

Linnoila M., Erwin C. W., Bredle A., and Logue P. Effects of alcohol and flunitrazepam on mood and performance in healthy young men. *Journal of Clinical Pharmacology*, 1981, 21, 430-435.

Lister R. G., and File S. E. Performance impairment and increased anxiety resulting from the combination of alcohol and lorazepam. *Journal of Clinical Psychopharmacology*, 1983, 3, 66-71.

MacArthur R. D., and Sekuler R. Alcohol and motion perception. *Perception and Psychophysics*, 1982, 31, 502-505.

Maraman G. V. The effects of alcohol on three levels of complex human behavior. PhD. Thesis, Virginia Commonwealth University, 1970.

Mills K. C., and Bisgrove E. Z. Cognitive impairment and perceived risk from alcohol: laboratory, self-report and field assessments. *Journal of Studies on Alcohol*, 1983, 44, 26-46.

Mortimer R. G. Effect of low blood-alcohol concentrations in simulated day and night driving. *Perceptual and Motor Skills*, 1963, 17, 399-408.

Moskowitz H., Burns M. M., and William A. F. Skills performance at low blood alcohol concentrations. *Journal of Studies on Alcohol*, 1985.

Moskowitz H., and Murray J.T. Alcohol and backward masking of visual information. *Journal of Studies on Alcohol*, 1976, 37, 40-45.

Moskowitz H., and Robinson C.D. Effects of low doses of alcohol on driving-related skills: a review of the evidence. SRA Technologies, Inc. Alexandria, VA. Contract DTNH 22-84-C-07291 for NHTSA Office of Driver and Pedestrian Research, 1987.

Moskowitz H., and Sharma S. Effects of alcohol on peripheral vision as a function of attention. *Human Factors*, 1974, 16, 174-180.

Moskowitz H., and Shea R. An alcohol-dose study of performance on attention tasks, 1971. (unpublished paper) (Described and discussed in: Moskowitz H. A behavioral mechanism of alcohol-related accidents. In: Chafetz, M.E. (ed.) *Proceedings of the First Annual Alcoholism Conference of the National Institute on Alcohol Abuse and Alcoholism*. Washington: U.S. Department of Health, Education and Welfare, 1973, 311-323.)

Palva E.S., Linnoila M., Routledge P., and Seppala T. Actions and interactions of diazepam and alcohol on psychomotor skills in young and middle-aged subjects. *Acta Pharmacologica et Toxicologica*, 1982, 50, 363-369.

Price, D. L., and Hicks T. G. The effects of alcohol on performance of a production assembly task. *Ergonomics*, (1979) 22:37-41.

Saario, I., Linnoila M.D., and Maki M. Interaction of drugs with alcohol on human psychomotor skills related to driving: effect of sleep deprivation or two weeks treatment with hypnotics. *Journal of Clinical Pharmacology*, (1975) 52-59.

Schroeder, S., Ewing J., and Allen J. Combined effects of alcohol with methapyrilene and chlordiazepoxide on driver eye movements and errors. *Journal of Safety Research*, 1974, 6, 89-93.

Sidell F.R., and Pless J.E. Ethyl alcohol: Blood levels and performance decrements after oral administration to man. *Psychopharmacologia*, 1971, 19, 246-261.

Sutton D., and Kimm J. Alcohol effects on human motor unit reaction time. *Physiology and Behavior*, 1970, 5, 889-892.

Wilson G., and Mitchell R. The effect of alcohol on the visual and ocular motor systems. *Australian Journal of Ophthalmology*, 1983, 11, 315-9.

## APPENDIX 2

1. Borkenstein RF, Crowther RF, Shumate RP, Ziel WB and Zylman R. THE ROLE OF THE DRINKING DRIVER IN TRAFFIC ACCIDENTS. Department of Police Administration, Indiana University, Bloomington, IN., 1964.
2. Hyman MM. Accident vulnerability and blood alcohol concentrations of drivers by demographic characteristics. QUART J STUD ALCOHOL. 29 (supp). 4):34-57, 1968.
3. Zylman R. The variability of collision involvement at low blood alcohol concentrations: The Grand Rapids curve explained. BLUTALKOHOL. 9(1):25-32, Jan. 1972.
4. Hurst PM, Epidemiological aspects of alcohol in driver crashes and citations. J SAFETY RES. 5:130-148, 1973.

(Chart from original document goes here)